Continuing Education Units: An I/ITSEC Opportunity

Continuing Education Units (CEU) were established in 1970 to create a unit of measurement to quantify continuing education and training activities. CEUs apply to technical and educational settings such as I/ITSEC. The primary focus of I/ITSEC is to highlight innovative implementation of simulation and education technologies as tools to achieve cost efficient training and increased military readiness. Therefore, CEUs are offered for all **Tutorials, Paper Sessions, and the Professional Development Workshops**. CEUs are being sponsored and maintained by the University of Central Florida, Division of Continuing Education.

WHY SHOULD I EARN CEUs AT I/ITSEC?

- Participation in the tutorials, papers and Professional Development Workshops for CEU credit reinforces your commitment to remain current in the evolving technologies relating to training and simulation.
- The CEU transcript indicates your active participation in the technical program of the conference to your employer.
- Previous attendees have indicated that CEUs have assisted them in securing approval to attend the conference.

WHAT SESSIONS ARE CEU-ELIGIBLE?

- All Tutorials, Papers, and Professional Development Workshops are CEU-eligible.

WHO MAY ATTEND THESE EVENTS?

- Tutorials and Professional Development Workshops are open to everyone. The Paper Sessions are limited to registered conference attendees.
- Does attending mean I automatically receive CEU credits? No. You have to let us know, via your registration, that you are interested in the credits. There is no charge for Paid Conference Attendees. However, if you are in an unpaid category (i.e., Exhibitor Personnel) there is a $45 charge, payable during registration. You may also register separately for the CEUs if you missed this step in your conference registration process.

HOW DO I RECEIVE CEUs AT I/ITSEC?

1. Be sure you are appropriately registered (you can confirm when you check in onsite) for CEU credits.
2. Be sure to have your conference badge scanned by a conference volunteer at each session you attend. Attendance is recorded electronically and required for CEU credit.
3. Your CEU transcript will come to you via the University of Central Florida, Division of Continuing Education. Ten contact hours equate to one CEU credit.

Contact Jana Breburdova at jana.breburdova@ucf.edu or 407-882-0247 for additional information.

Continuous Learning Points (CLPs)

The U.S. Department of Defense (DoD) acquisition workforce members are expected to earn Continuous Learning Points (CLPs) to stay current in leadership and functional acquisition skills that augment the minimum education, training, and experience standards established for certification purposes within their acquisition career fields. It is each acquisition member's responsibility to meet the goal of 40 CLPs each year and to meet the mandatory requirement of 80 CLPs every two years. Acquisition Professional Activities are allowed to count toward CLPs. CLPs are awarded in accordance with DoD-wide guidelines as augmented by Service-specific policies. I/ITSEC provides an excellent opportunity for the DoD acquisition workforce members to earn mandatory CLPs.

TUTORIAL GRID

ROOM	0830–1000	1245–1415	1430–1600
TRACK 1: BEST TUTORIAL			**CHAIR: LEE LACY, PH.D., CMSP**
W307A	Putting the When and Where into Simulations 22T47	A Comprehensive Introduction to Medical Simulation 22T30	Practical Guide to Learning Engineering 22T15
TRACK 2: INNOVATION AND TRAINING DESIGN			**CHAIR: SCOTT HOOPER**
W307B	International Trade Compliance: Regulatory Developments and Key Risk Areas 22T56	Principles for Designing Effective, Efficient, and Engaging Training to Accelerate Expertise 22T45	Operational Impact: Quantifying Training Solution Value 22T46
TRACK 3: DESIGN APPROACHES FOR LEARNING ENGINEERING			**CHAIR: RAMONA SHIRES**
W307C	Avoid the Illusion of Knowing: Reshaping Design in ADDIE 22T39	Introduction to Competency-Based Experiential Learning 22T44	Leading by Design: User Experience (UX) for the Department of Defense 22T43
TRACK 4: BUILDING CONFIDENCE FROM DESIGN TO APPLICATION			**CHAIR: SIMONE YOUNGBLOOD**
W307D	Simulation Conceptual Modeling Theory and Use Cases 22T10	Addressing the Challenges of Rigorous Model Validation 22T26	Accreditation of Simulation-Based Experiments and Training: Beyond the M&S 22T18
TRACK 5: XR			**CHAIR: GORDON KING**
W308A	The WHY & How of eXtended Reality (XR) Enterprise Adoption 22T12	Machine Learning and the Benefits of Applying it to XR Training Systems 22T54	Anytime, Anywhere Adaptive XR Training 22T27
TRACK 6: LET'S GET STARTED			**CHAIR: JAMES COOLAHAN, PH.D.**
W308B	The I/ITSEC Professional Development Primer: M&S Fundamentals, Certification, and Contemporary Applications 22T17	Introduction to Defense Modeling and Simulation 22T22	A History of Games for Military Training: From Sheep Knuckles to the Metaverse 22T31
TRACK 7: THE R FACTOR			**CHAIR: RONALD VENTURA-MOORE**
W308C	Powerful & Accessible Immersive Experiences – Visualizing & Transforming Large Data Sets in eXtended Reality 22T24	Evolution of RF Signal Visualization from Spectrum Analyzers to Augmented Reality 22T34	Sharing Environmental Data for LVC using RIEDP 22T32
TRACK 8: SIMULATION INTEROPERABILITY PART 1			**CHAIR: ROB LECHNER**
W305A	IEEE 1278TM Standard for Distributed Interactive Simulation (DIS): Concepts and Techniques 22T51	Introduction to HLA 22T21	TENA, Interoperability, and Data Management 22T13
TRACK 9: SIMULATION INTEROPERABILITY PART 2			**CHAIR: JOHN DIEM**
W305B	A Process for Distributed LVC Event Integration and Execution 22T23	Live, Virtual and Constructive (LVC) Interoperability 101 22T29	Secure Distributed Simulation Training Systems Anywhere, with OMG DDS 22T28
TRACK 10: FROM C TO SHINING C			**CHAIR: RANDOLPH JONES, PH.D., CMSP**
W306A	An Introduction to Cognitive Systems for Modeling & Simulation 22T25	Secure Private Wireless Network Architecture Applied to LVC Environments 22T53	Transform Your Training by Migrating Content to cmi5 22T41

TUTORIAL SYNOPSES BEGIN ON PAGE XX • PRESENTER BIOGRAPHIES BEGIN ON PAGE XX

0830 – 1000

TRACK 1: BEST TUTORIAL
0830 – 1000 • W307A

PUTTING THE WHEN AND WHERE INTO SIMULATIONS

22T47

All simulations take place somewhere on terrain or in the sea or atmosphere, amidst natural and man-made structures. The action takes place at a particular time of day and season of the year. These descriptors of the when and where of a simulation are not simply visual effects, but in a constructive or virtual world they provide a real context for the behaviors of humans, vehicles, sensors, communications and weapons. This tutorial is intended to introduce the simulation user and developer to the fine art of creating the environmental playground for a simulation. The tutorial will cover the land, atmosphere and the ocean, citing sources for data and the problems that typically exist in the original source data as well as those that inevitably result from combining information from a variety of diverse sources. The difference between geo-specific and geo-typical will be discussed and why one is chosen over the other. The issues of correlation will be illustrated within a single domain (just land features), across different simulations, and across domains (correlating land, sea, and air). The tutorial illustrates how the environment and its changes affect simulated entities – vehicles and sensors in particular. Finally, the tutorial shows how a dynamic environment can be developed and provided to the simulation. As part of the discussion, the tutorial will direct attention to the DoD-provided sources for creating a reasonably correlated synthetic environment and the emerging international standards for representing environmental data. The effects of the environment span not only the domains of land, sea, and air, but electromagnetics, space, and cyber by way of communications effects.

PRESENTER

S. K. "SUE" NUMRICH, PH.D., CMSP, Institute for Defense Analyses

TRACK 2: INNOVATION AND TRAINING DESIGN
0830 AM – 1000 • W307B

INTERNATIONAL TRADE COMPLIANCE: REGULATORY DEVELOPMENTS AND KEY RISK AREAS

22T56

In this session, we will provide a basic overview of the key export control regimes, the International Traffic in Arms Regulations (ITAR) and the Export Administration Regulations (EAR), as well as the economic and trade sanctions programs administered by the Office of Foreign Asset Control (OFAC). We will provide an explanation of how to determine what controls and authorization requirements apply to particular activities and transactions, and when and how defense contractors may be able to leverage exemptions from the licensing requirements. We will talk through recent regulatory changes and the practical impact of those changes, and provide tips for best practices on risk mitigation in this space.

PRESENTERS

ADELICIA "ADDIE" CLIFFE, Crowell and Moring, LLP
DAVID "DJ" WOLFF, Crowell and Moring, LLP

TRACK 3: DESIGN APPROACHES FOR LEARNING ENGINEERING
0830 – 1000 • W307C

AVOID THE ILLUSION OF KNOWING: RESHAPING DESIGN IN ADDIE

22T39

Often training follows the process of receiving a topic/task list, writing learning objectives, developing lessons by copying in doctrine or regulation as content, writing test questions, and voilà, the course is ready for implementation. What's wrong with this process? If you think about taking a boat ride, first we need to make a plan, launch the boat, map points of interest, refuel, stock supplies, and have experienced personnel steer the boat. Our training development processes need to be very similar to preparing for a boat ride. Following the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) model is one way. We cannot stop at getting the boat in the water. What's the learning outcome? Did we design waypoints for learners to practice and get effective feedback? Did we apply scaffolding and chunking? Did we design it for how we learn and how we retrieve learning to transfer to the performance environment? Or in our rush to get the boat in the water did we ignore the learning science that supports designing effective learning? When we skip design, we miss opportunities to create learning experiences that are effective, efficient, and encourage the deep learning required to meet mission readiness. So why do we skip or gloss over the design phase? Sometimes the illusion of knowing creeps into the decision making of inexperienced training developers or senior leadership. We make judgments about what good learning is by instinct and our own personal experience. Often these judgments have very little to do with how the brain learns or how learning theory is applied. Sometimes it is the result of the "that's the way we've always done it" syndrome. This can severely burden the unit level when we make poor design decisions. The goal of the tutorial is to help training developers, their supervisors, and anyone involved in the training development and decision-making process, design effective learning based on evidence from the learning sciences. This introductory tutorial will focus on the psychological and cognitive activities required for effective learning, present common learning myths that prevent us from creating efficient learning products, and provide design strategies that improve the relevance and rigor of the learning experience regardless of delivery method. When we do not use learning science, we only get the boat in the water; it never truly arrives at its destination, steering off course, and burdening another resource to rescue it when it is lost at sea.

PRESENTERS

PATRICIA MULLIGAN-RENAUD, TTD Learning Solutions
HEATHER SEISER, TTD Learning Solutions

TRACK 4: BUILDING CONFIDENCE
FROM DESIGN TO APPLICATION
0830 • 1000 • W307D

SIMULATION CONCEPTUAL MODELING THEORY AND USE CASES

22T10

Simulation conceptual modeling is a critical step in simulation development frequently overlooked in the rush to demonstrate program progress. A simulation conceptual model is an abstraction from either the existing or a notional physical world that serves as a frame of reference for further simulation development by documenting simulation-independent views of important entities and their key actions and interactions. A simulation conceptual model describes what the simulation will represent, the assumptions limiting those representations, and other capabilities needed to satisfy the stakeholder's requirements. It bridges between these requirements and simulation design.

This tutorial will present the theory and application of simulation conceptual modeling as documented during the research done by the NATO MSG 058. In addition, Use Cases that have been drawn from previous conference presentations will be presented to illustrate how conceptual modeling has been performed. Additional work is necessary to mature the state-of-the-art of simulation conceptual modeling before a recommended practices guide could be standardized. This tutorial has been created to continue the maturation of the simulation conceptual modeling best practices.

PRESENTER

JACK BORAH, Borah Enterprises, LLC

TRACK 5: XR
0830 – 1000 • W308A

THE WHY & HOW OF EXTENDED REALITY (XR) ENTERPRISE ADOPTION

22T12

The business case for adoption of eXtended Reality (XR) technology within Industry 4.0 is compelling… increased productivity, training effectiveness, engagement, retention, and motivation, with decreased time to proficiency, human error, downtime, and operating costs. Yet, adoption has been languid, as barriers to XR implementation abound. While high-quality, affordable, wearable augmented reality (AR) and VR (virtual reality) gear are readily available, high-value use cases are little understood; start-up costs are high; the requisite supply of compelling content and anticipated high-end user experience are yet to be realized; there are a paucity of empirical studies on learning outcomes and performance gains; there are no readily available tools to support scalability and sustainability; and cybersickness is still a challenge. To facilitate adoption, XR ecosystems are needed that can readily overcome the current lack of content by automating the production process. At the same time, content must be coupled with XR enablers, including new XR-specific user experience design paradigms that are contextually rich, intuitive, and uniquely suited to 3D interaction, along with the ability to plug-in to digital twins that reflect the reality and complexity of real-world systems to fuel predictive analytics and close the loop between operator and system. The future of industry relies on the ability of such XR ecosystems and XR enablers to generate value-added use cases that not only justify adoption costs but proportionally outweigh them. This tutorial will dive into how enterprises could derive immense value from XR adoption by providing insights into: key drivers of XR adoption; key barriers to XR adoption; value-added uses cases; and guidelines on where an organization might consider starting their XR adoption journey.

PRESENTERS

KAY STANNEY, PH.D., Design Interactive, Inc.
MATT ARCHER, Design Interactive, Inc.

TRACK 6: LET'S GET STARTED
0830 – 1000 • W308B

THE I/ITSEC PROFESSIONAL DEVELOPMENT PRIMER: M&S FUNDAMENTALS, CERTIFICATION, AND CONTEMPORARY APPLICATIONS

22T17

This Tutorial serves as a holistic primer for Professional Development across the full spectrum at I/ITSEC 2022, whose prevailing theme is *Accelerate Change by Transforming Training – "It's Time to ACTT!!"* Major topics include a notional introduction to core I/ITSEC fundamentals (e.g., M&S basics; the Live-Virtual-Constructive/LVC taxonomy; Model Verification/Validation), followed by an overview of the officially recognized (and recently upgraded) professional designation within the M&S discipline: the Certified Modeling and Simulation Professional (CMSP).

To tie it all together, the primary technological lynchpin for this Tutorial is an example-driven exploration of contemporary applications - culled from peer-reviewed literature - to visualize how core principles (e.g., M&S, LVC, VV&A) are being actively leveraged within diverse fields and disciplines: 1) Engineering Design/Manufacturing, 2) Sustainable Transportation, 3) Education, Training, and STEM, 4) Health Care (e.g., COVID-19), and finally, 5) the Entertainment Industry, for which the greater Orlando region is world-renowned.

PRESENTER

KEVIN HULME, PH.D., CMSP, The Stephen Still Institute for Sustainable Transportation and Logistics (SSISTL)

TRACK 7: THE R FACTOR
0830 – 1000 • W308C

POWERFUL & ACCESSIBLE IMMERSIVE EXPERIENCES — VISUALIZING & TRANSFORMING LARGE DATA SETS IN EXTENDED REALITY

22T24

Extended Reality (XR) is the umbrella term that covers the technology stack of Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR). XR has seen rapid growth as a new medium for users to see and interact with data that would not be possible through traditional input devices. As adoption of this technology grows, it will drive the need to visualize increasing amounts of data. One of the major challenges to large data visualization in XR is that it either requires a tremendous amount of processing power to fully visualize the content, or extreme scale cuts must be made to show such data sets on lower end hardware like mobile devices or head-worn displays. This tutorial will cover lessons learned in visualizing extremely large data sets using the Unity Real-Time Development Platform, including challenges of visualizing vast amounts of 3D data using the traditional Unity Game Object system, associated limitations, and how to overcome them with Unity's Data Oriented Technology Stack (DOTS). This tutorial will also provide a practical example to cover the visualization of publicly available 3D data from National Oceanic and Atmospheric Administration's Multi-Radar/Multi-Sensor System as a source, including the data extraction process, initial testing with Unity's traditional Game Object System, and the transition to the Unity DOTS that allowed for a jump from displaying a few hundred weather data points in 3D to over one million data points. This tutorial will also discuss the techniques that can be used to view and manipulate this data in XR along, with an evaluation of the benefits and limitations realized from utilizing the capabilities explored.

PRESENTERS

ERIC MARTIN

PEYTON BAILEY, Design Interactive, Inc.

JOANN ARCHER, Design Interactive, Inc.

CLAIRE HUGHES, Design Interactive, Inc.

TRACK 8: SIMULATION INTEROPERABILITY PART 1
0830 – 1000 • W305A

IEEE 1278TM STANDARD FOR DISTRIBUTED INTERACTIVE SIMULATION (DIS): CONCEPTS AND TECHNIQUES

22T51

As any gamer will tell you, it is compelling to connect simulations and play with other actual human participants, whether in the next room or on the next continent. The state of the art for computer networking starting in the 1980's to connect Army tank training simulations over local and wide area networks.

The desire to expand this to all military training and engineering simulations resulted in a large industry and government effort to standardize the network protocol for simulation interoperability. Distributed Interactive Simulation (DIS) was the result, using the IEEE standards process to create technically sound and widely accepted protocol to link military training and engineering simulations. IEEE 1278TM-1995 and additions in 1998 were the first full DIS standards that contained the protocol and rules for real-time simulation interoperability of military land, sea, and air platforms, weapon interactions, radar, radio, IFF, laser designators, underwater acoustics, logistics, simulation management functions, and more.

The success of DIS expanded into the Simulation Interoperability Standards Organization (SISO) in 1996. SISO took over the development of the DIS standard and launched a much wider range of simulation standards. The 2000's saw the development of the next round of improvements, resulting in IEEE 1278.1TM-2012. Continued development within SISO is working toward the next version, referred to as Version 8, expected to be completed in the mid-2020's.

This tutorial explains how DIS achieves real-time high-fidelity interoperability over best-effort networks. The basic concept and some of the technical details will be introduced to give students a foundation for starting and expanding the implementation and use DIS in their simulations. The standards process, history, and future directions of DIS are also presented.

PRESENTER

ROBERT MURRAY, SimPhonics

TRACK 9: SIMULATION INTEROPERABILITY PART 2
0830 – 1000 • W305B

A PROCESS FOR DISTRIBUTED LVC EVENT INTEGRATION AND EXECUTION

22T23

Integration and execution of large distributed Live, Virtual, Constructive (LVC) events consume substantial time and resources. While the underlying distributed LVC technologies are mature, the processes for integrating events are not. The IEEE Std 1730-2010 Distributed Simulation Engineering and Execution Process (DSEEP) standard defines a process model for developing an event. DSEEP defines a set of seven steps divided into activities. The process model provides representative inputs and outputs for each activity. However, the user still must instantiate the process and develop artifact templates. The development of a robust process based on DSEEP is a substantial effort.

The goal of the process is to produce a verified distributed LVC environment to conduct the event. While distributed LVC environments can be created without using a process, not using a process adds risks to the event. The first risk is that the integration fails, and it may be difficult to discover the reason. The second risk is that the unverified environment produces invalid results that might not be apparent until the results are used.

An instantiation of DSEEP was developed based on the authors' integration and execution of many distributed LVC events. This implementation has nine steps, divided into 27 activities. This process adds two additional steps to the process. One of the steps adds a tabletop wargaming step to work through the requirements. The second additional step develops a digital twin of the target system. A detailed set of processes, templates, and guidance on how to perform the selected activities is provided. The process covers the integration of simulations and tactical systems to meet the objectives of the LVC event.

The tutorial will provide an overview of the complete process. Selected steps are described in more detail. This will provide the detailed inputs, tasks, outputs, and examples for each activity in the step. The process includes issues related to distributed LVC environments using multiple distributed simulation architectures, live entities, and cyber.

The process described in this tutorial was developed to support distributed LVC Test and Evaluation. However, the process applies to research and development, training, and experimentation. This tutorial is beneficial for anyone involved in the integration and execution of large distributed events. The tutorial is particularly beneficial for engineers tasked with planning and executing distributed events. The tutorial does not require knowledge of the DSEEP standard. Integration and execution of large distributed Live, Virtual, Constructive (LVC) events consume substantial time.

PRESENTERS

MICHAEL O'CONNOR, CMSP, Trideum Corporation
KENNETH LESUEUR, PH.D., U.S. Army Redstone Test Center
ROY ZINSER, Trideum Corporation
BRETT BOREN, Redstone Test Center

TRACK 10: FROM C TO SHINING C
0830 – 1000 • W306A

AN INTRODUCTION TO COGNITIVE SYSTEMS FOR MODELING & SIMULATION

22T25

There is continuously increasing demand and enabling technology for automated reasoning abilities across the broad spectrum of training, simulation, and education, as well as in battlefield information, command, and control systems. Cognitive systems represent an approach to automation that "raises the bar" from data and information processing to robust, scalable, and adaptive decision making. This tutorial provides an introduction to cognitive systems, concentrating on high-level design and implementation patterns for human-like reasoning systems. We discuss the development cycle and the role of requirements definition for such systems, emphasizing that cognitive systems must encode not just WHAT decisions to make, but also WHY to make them. We draw examples and comparisons from existing cognitive systems, focusing on the trade-offs between cognitive and non-cognitive engineering approaches. We focus on examples that highlight the differences between standard software engineering and a cognitive approach that uses "least-commitment reasoning". We then summarize the criteria by which one can decide which approach is more suitable for a particular problem. The tutorial content does not require any specialized knowledge, but some experience with software engineering or behavior modeling can be helpful. Attendees will learn to recognize problems that most benefit from cognitively based solutions, and they will be better able to assess risks, costs, and benefits of different approaches. This tutorial emphasizes reasoning systems, not learning systems, but it includes a discussion of how the integration of cognitive systems and machine learning can advance the future state of the art. This tutorial is targeted toward developers who might be interested in cognitive approaches to software engineering, as well as customers who have problems that may benefit from automation of reasoning and decision making.

PRESENTERS

RANDOLPH JONES, PH.D., CMSP, Soar Technology, Inc.
DYLAN SCHMORROW, PH.D., Soar Technology, Inc.

1245 – 1415

TRACK 1: BEST TUTORIAL
1245 – 1415 • W307A

A COMPREHENSIVE INTRODUCTION TO MEDICAL SIMULATION

22T30

Simulation tools and techniques have been a part of acquiring medical knowledge and skills for over 4,000 years, with more scientific approaches emerging hand-in-hand with the European Renaissance. These devices were initially used as a means to convey homeopathic experience and the knowledge gained through cadaveric dissection. More recently, the devices have been computerized and restructured according to modern learning theories.

This tutorial is a comprehensive overview of medical simulation to include their history, learning taxonomies, devices and techniques for representing external and internal anatomy and physiology, the role of team training, specialized military medical applications, the growing role of AI in medical simulation, criteria for current simulation-based medical training accreditation, and their role in preparing for pandemics like COVID-19. The story includes manikins, part-task trainers, game-based systems, surgical simulators, standardized patients, physical prostheses, team training events, and certifications. These categories are drawn from taxonomies initiated by the American College of Surgeons and the Society for Simulation in Healthcare.

The innovation and acceleration section shares new tools, techniques, and technologies that are changing the nature of traditional training systems and events.

PRESENTERS

ROGER SMITH, PH.D., in[3] Thinking
DANIELLE JULIAN, AdventHealth Nicholson Center
ALYSSA TANAKA, Soar Technology, Inc.

TRACK 2: INNOVATION AND TRAINING DESIGN
1245 – 1415 • W307B

PRINCIPLES FOR DESIGNING EFFECTIVE, EFFICIENT, AND ENGAGING TRAINING TO ACCELERATE EXPERTISE

22T45

Good instruction should be effective, efficient, and engaging (e3) and be based on tasks that fit together to solve real-world problems. However, more often than not, only two priorities can be accomplished at the expense of the third. On the other hand, from surgeons to teachers to warfighters, performance is more complex and more scrutinized than ever. While the systematic design of instruction (SDI) supports the creation of training programs that can move many performers to certifiable competence, it has less to offer the progression from competence to proficiency and expertise. Although enabling effective, efficient, and engaging learning is a priority concern for practitioners and researchers in many performance domains, it remains a constant challenge for instructional designers to create training programs that accomplish all three and at the same time accelerate the development of performers to higher levels of expertise.

This tutorial addresses this challenge. It provides an overview of the systematic design of instruction components as well as expertise studies, specifically the findings from Naturalistic Decision-Making research. The presentation will review the cognitive aspects of learning (such as diagnosis, sensemaking, decision-making, and immediate feedback) to facilitate rapid learning and specifically guide mental model development. It will address the application of these cognitive aspects to the design and development of part-task training programs. The presentation will discuss a scenario-based method of training emerged from Naturalistic Decision-Making research that allows trainees to practice some of these complex cognitive skills and learn from an expert without an actual expert being present (effective) and in a highly accessible (efficient) and engaging environment.

This tutorial is for those interested in using systematic design of instruction model to create training programs and learning technologies that will accelerate expertise. Participants will learn about each component of the SDI model and how theories and methods of the Naturalistic Decision Making can be incorporated to build better training. Trainers, learning developers, instructional technology managers, training managers, researchers, educators, commanders, and decision makers should attend.

LEARNING OBJECTIVES

- Learning components of the systematic design of instruction model.
- Learning different types of knowledge and skill development stages.
- Learning the Naturalistic Decision-Making approach and tools.
- Appreciating the cognitive dimension and mental model development.
- Learning scenario-based method of effective, efficient, and engaging training to accelerate expertise.

PRESENTERS

MOHAMMADREZA JALAEIAN, PH.D., ShadowBox Training, LLC
JOSEPH BORDERS, ShadowBox, LLC
EMILY NEWSOME, ShadowBox, LLC
JOHN SCHMITT, ShadowBox Training, LLC
GARY KLEIN

TRACK 3: DESIGN APPROACHES FOR LEARNING ENGINEERING
1245 – 1415 • W307C

INTRODUCTION TO COMPETENCY-BASED EXPERIENTIAL LEARNING

22T44

Many competencies related to military and workplace functions require repeated practice under varied conditions to learn, master, and maintain proficiency. These are called experiential competencies, and the process of training these skills through deliberate drills and exercises designed to stimulate their application is called experiential learning. This tutorial will provide an introduction to experiential learning and provide insights into the design and execution of experiential learning, how to gather evidence during the training process, and how to iteratively apply this evidence to improve the training process.

The materials presented draw upon the presenters' involvement in developing the U.S. Army Synthetic Training Environment (STE), and in particular, the

STE Experiential Learning for Readiness (STEEL-R) project, which for the past two years has been working to create a foundation of technologies and methods to maximize the effect of experiential learning across an ecosystem of fully synthetic, semi-synthetic, and live training modalities. A key component of STEEL-R is the development of methods, based on the U.S. Advanced Distributed Learning (ADL) initiative's Total Learning Architecture, the Competency and Skills System (CaSS), and the U.S. Army Research Laboratory's Generalized Intelligent Framework for Tutoring (GIFT), that enable data from training systems in all of these modalities to be captured in a common format and processed to inform both individuals and teams on the best approach to increasing their proficiency.

The tutorial will start by introducing basic concepts of experiential learning, with a practitioner's focus on skills acquisition and decay, spaced repetition, experience design, stress induction, and difficulty variance. The presenters will give examples and discuss the theoretical underpinnings. This will be followed by a segment on competency-based experiential learning, as applied to teams as well as individual roles, and how evidence can be used to reliably detect competence levels. The presenters will then demonstrate how the concepts and theory previously presented can be embodied in tools and interfaces and how evidence can be collected from an array of experiential exercises. This will be followed with a discussion of how to leverage data standards and data structures such as xAPI, xAPI Profiles, and standards relating to competency definitions to model and track experiences. The tutorial will conclude with a general discussion of the experiential learning, the lessons learned, and relevant goals of STE and other U.S. military training initiatives.

PRESENTERS

KEVIN OWENS, Applied Research Laboratories: The University of Texas at Austin
BENJAMIN GOLDBERG, PH.D., U.S. Army DEVCOM SC STTC
SHELLY BLAKE-PLOCK, Yet Analytics, Inc.
ROBBY ROBSON, PH.D., Eduworks Corporation

TRACK 4: BUILDING CONFIDENCE FROM DESIGN TO APPLICATION
1245 – 1415 PM • W307D

ADDRESSING THE CHALLENGES OF RIGOROUS MODEL VALIDATION

22T26

The process of validation is essential to the credible and reliable use of any simulation. Although Department of Defense policy and guidance increasingly emphasizes the importance of rigorous validation founded in the application of strong statistical analysis, implementation of rigorous validation continues to face multiple challenges. This tutorial will address several of those challenges:

- How to identify, collect, and combine validation referent data (what the simulation results will be compared to).
- How to identify the simulation measures and metrics to use as the basis of comparison (the aspects of the results that will be compared to the referent).
- Validation methods to apply when performing the results/referent comparison.
- Methods to evaluate the performance of selected validation methods.
- How to quantify risk and residual uncertainty associated with the application of the simulation.

The tutorial will enhance the learning experience by incorporating lessons learned derived from the many VV&A applications with which the authors have been involved.

PRESENTERS

SIMONE YOUNGBLOOD, The Johns Hopkins University Applied Physics Laboratory
MIKEL PETTY, PH.D., University of Alabama in Huntsville

TRACK 5: XR
1245 – 1415 PM • W308A

MACHINE LEARNING AND THE BENEFITS OF APPLYING IT TO XR TRAINING SYSTEMS

22T54

As in many other industries, the use and spending of machine learning (ML) technologies has drastically increased for the Department of Defense. Contract spending for 2019 yielded $973 million for ML related projects and is projected to rise to $2.8 billion by 2023. ML methods and technologies have existed for many years but have quickly become critical in fields such as engineering, medicine, and consumer services. Recently, ML has found enormous benefits in XR-enabled environments used for a variety of purposes such as product and process design as well as training. Understanding the vast field of ML and its specific application to training systems can be extremely challenging. Miscomprehension can lead to poor management and development activities that will result in more costly and disappointing training solutions. Understanding the fundamentals of ML, and its application to Extended Reality (XR), will empower managers to make appropriate strategic and costing decisions and allow designers, developers, and engineers to successfully implement effective training systems.

This tutorial provides an overview of ML technologies from early research to today's modern algorithms. This tutorial will include how ML can be combined with XR environments to fundamentally change how humans interact with training systems. The presentation will review how specific ML and XR tools can produce more immersive training solutions while providing deeper insights from a variety of data that can be collected and analyzed about trainee performance. This tutorial will also present examples demonstrating ML's use in designing, testing, and optimizing XR training systems and evaluate the efficacy of incorporating this technology to aide in warfighter training to improve efficiency, reduce costs and training time.

This tutorial is for a wide range of stakeholders from those interested in gaining a basic understanding of ML for administrative level decision making to those who want detailed methods and integrations within XR-enabled training environments to gain specific performance improvements.

PRESENTERS

ADAM KOHL, Virtual Reality Applications Center
ELIOT WINER, PH.D., Iowa State University
ROSELYNN CONRADY, Iowa State University

TRACK 6: LET'S GET STARTED
1245 – 1415 PM • W308B

INTRODUCTION TO DEFENSE MODELING AND SIMULATION

22T22

This tutorial will describe the fundamental technologies, terms and concepts associated with Modeling and Simulation (M&S) as used in the U.S. Department of Defense (DoD). The tutorial will cover key M&S terms and concepts that describe M&S technology, development, and application. It will include: (a) M&S terminology and concepts; (b) M&S technology, architectures, and interoperability protocols; and (c) The processes for developing valid representations of: DoD warfighting capabilities, threat capabilities, complex systems, and mission environments. The attendee will become familiar with how M&S is used in the DoD for operational purposes - especially training and other areas of direct warfighter support. This tutorial will highlight the role of Verification, Validation and Accreditation (VV&A) in ensuring credible models and simulations meet the needs of their users, the use of M&S Standards, and the integration of M&S with DoD Mission Engineering and Digital Engineering in the development and acquisition of DoD warfighting capabilities. The tutorial will describe the characteristics and associated challenges of M&S application within DoD functional areas including Training, Analysis, Acquisition, Test and Evaluation, Planning, Medical, Mission Engineering, Autonomy, Artificial intelligence, DoD Research and Development/Employment, and Intelligence. The tutorial will also identify accessible DoD M&S information resources.

PRESENTERS

JOHN DALY, Booz Allen Hamilton
JAMES COOLAHAN, PH.D., Coolahan Associates, LLC

TRACK 7: THE R FACTOR
1245 – 1415 • W308C

EVOLUTION OF RF SIGNAL VISUALIZATION FROM SPECTRUM ANALYZERS TO AUGMENTED REALITY

22T34

We are surrounded by invisible radio frequency signals created by human technology like radio and cellular. Traditionally, we see these signals through spectrum analyzers. However, the capabilities of existing analysis tools are being outpaced by the rapid modernization of wireless networks and topologies like 5G, IoT, and Bluetooth. RF is inherently multidimensional, but conventional analyzers display signals in 2D slices, limiting real-world applicability to highly technical users. Emerging technology that combines Augmented Reality displays and AI/ML algorithms is capable of spatializing RF data into its natural 3D location for easier understanding and communication.

This tutorial will provide an overview of the evolution of RF visualization tools from flat interfaces to immersive ones that can be used to discover and map RF signals and networks. The audience will gain a broad understanding of the emergence of immersive interfaces and how they can be applied successfully to spatial data visualization. Building upon proven UI/UX principles, we will walk participants through challenges with the design and development process, theory behind decisions, and usability issues to overcome in actual deployments. Resulting best practices will be shared openly. Finally, the audience will learn about future applications of these tools and forecasted innovations as the underlying technology matures.

PRESENTERS

JAD MEOUCHY, BadVR
SUZANNE BORDERS, BadVR

TRACK 8: SIMULATION INTEROPERABILITY PART 1
1245 – 1415 PM • W305A

INTRODUCTION TO HLA

22T21

The High-Level Architecture (HLA) is the leading international standard for simulation interoperability. It originated in the defense communities but is increasingly used in other domains. This tutorial gives an introduction to the HLA standard. It describes the requirements for interoperability, flexibility, composability and reuse and how HLA meets them. It also describes the new features of the most recent version: HLA Evolved (IEEE 1516-2010) and the upcoming HLA version (HLA 4). Finally, it provides some recent experiences of the use of HLA in NATO M&S groups as well as an overview of recent evolution of Federation Object Models for military platform simulation, space simulation, cyber simulation and air traffic control simulation. This tutorial is intended for all audiences; however, some familiarity with basic principles of distributed computing is recommended.

PRESENTERS

BJÖRN MÖLLER, Pitch Technologies
KATHERINE MORSE, JHU/APL

TRACK 9: SIMULATION INTEROPERABILITY PART 2
1245 – 1415 • W305B

LIVE, VIRTUAL AND CONSTRUCTIVE (LVC) INTEROPERABILITY 101

22T29

The purpose of this tutorial is to provide managers the necessary insight needed to support intelligent decision making when employing LVC to solve their needs. The tutorial will discuss the various solutions and domains of the technology and how it can potentially support their LVC needs. The tutorial provides a relevant use case as the mechanism to explain the concepts and the solutions required to achieve success. The tutorial will not be an in-depth technology review of LVC interoperability yet will provide sufficient management-level insight into interoperability solutions and standards like Distributed Interactive Simulation (DIS), High Level Architecture (HLA), and the Test and Training Enabling Architecture (TENA) product line.

PRESENTERS

KURT LESSMANN, Trideum Corporation
DAMON CURRY, Pitch Technologies U.S.

TRACK 10: FROM C TO SHINING C
1245 – 1415 • W306A

SECURE PRIVATE WIRELESS NETWORK ARCHITECTURE APPLIED TO LVC ENVIRONMENTS

22T53

More expansive LVC training requirements mandate an increasingly expansive and broadly connected network – connecting many users/devices to data and applications. Users/devices interact with data and applications via a network that spans from edge to cloud. The underlying architecture must enable integration of many types of live and virtual connected systems, connection of users/systems from multiple locations, and means to connect users/devices of differing characteristics (e.g. mobile, fixed, low-latency demand, constrained bandwidth). The employment of a Heterogeneous Network (HetNet) architecture in the demanding LVC environment manages complexity while optimizing performance and security. A HetNet architecture delivers the desired connectivity and performance that enables the entire ecosystem (edge-network-datacenter-cloud) to operate as an integrated, secure LVC training platform. A HetNet approach also allows for a Zero Trust Architecture (ZTA).

A HetNet Architecture brings together wired and multiple wireless access technologies such as LTE, 5G, Wi-Fi 6, LoRaWAN, Ultra-Reliable Low-Latency Communication (uRLLC), and massive Machine-Type Communications (mMTC). The role of the network architecture is to provide secure connectivity between all nodes – most especially ensuring seamless wireless connectivity for mobile nodes. ZTA is an increasingly critical approach to any network architecture employment and can be applied to an LVC HetNet environment. ZTA spans across all components of the LVC Network including training participants and support, user/device connections and connection of data and applications no matter how they connect to the network and associated resource.

Greater adoption of wireless technology by the Department of Defense creates a revolutionary shift for IT operations that the LVC training environment should embrace. These technologies enable operators to exchange data at greater speeds, over increased bandwidths, with secure connectivity, and in support of ubiquitous access methods. LVC training must enable new transformative mission threads and potentially allow for the experimentation of the consumption of the features offered by these mediums while remaining aligned with training objectives. These developments necessitate that the underlying network provides the LVC the ability to host applications using wireless technologies.

A ZTA enables users, devices, and applications to exchange data while integrating into data centers and edge distribution nodes; all based on least-privileged access principles. Integration of massively scalable, low latency-enabled applications opens new mission capabilities and creates new demands on the LVC environment. A comprehensive HetNet architecture able to leverage diverse mobile/fixed connectivity requirements at the edge, with ZT security incorporated, provides the full potential of the LVC environment, ensuring mission success.

PRESENTERS

JASON HESTER, Cisco Systems, Inc.
ANDREW STEWART, Cisco Systems, Inc.

1430 – 1600
TRACK 1: BEST TUTORIAL
1430 – 1600 • W307A

PRACTICAL GUIDE TO LEARNING ENGINEERING

22T15

Alexander Fleming discovered penicillin. However, the Nobel Prize–winning scientist and his colleagues never developed the ability to produce the drug at scale. By June 1942, U.S. labs had only enough penicillin available to treat about ten patients. The urgency of lives being lost in the war meant that production of penicillin needed to move out of the laboratory and into mass-production. This was no longer just a scientific endeavor; it required engineering. The goals of science and engineering are different. The goal of science is to discover the truth about the world as it is. The goal of engineering is to create scalable solutions to problems using science as one tool in that endeavor.

Learning engineering is a process and practice that applies the learning sciences, using human-centered engineering design methodologies and data-informed decision-making, to support learners and their development. Learning engineering brings together professionals from different fields, including the learning sciences, assessment, learning experience design, software engineering, and data science.

Learning engineers design learning experiences, but that's not all they do. They also address the contexts and conditions that lead to great learning. These might include the architecture of physical or virtual learning environments, social structures, and learners' mindsets as well as more obvious targets such as curriculum design, educational technology, and learning analytics.

This tutorial introduces learning engineering, starting with its definition, purpose, and foundations. Next it covers the core components, beginning with the learning engineering process model and followed by the field's primary contributing disciplines: learning sciences, human-centered design, engineering, data collection, data analytics, and ethical design. This initial portion of this tutorial will give attendees a solid understanding of the discipline as well as its definitions, utility, and distinctions from related fields. We will use real-world case studies throughout to illustrate concepts.

Following this, we will outline the steps practitioners can use to form learning engineering teams and to execute applied learning engineering processes. This portion will include tools and recommended practices for uncovering learning challenges, assembling and managing lean-agile learning engineering teams, creating human-centered designs, integrating learning science, motivating learning, implementing learning technology (particularly at scale), instrumenting learning for data, and using learning analytics to continuously improve outcomes.

This tutorial is a primer suitable for anyone involved—directly or indirectly—in training, education, or talent management. This tutorial will give attendees important tools to optimize their work.

PRESENTERS

SAE SCHATZ, PH.D., Bedrock Learning, Inc.
JIM GOODELL, QIP

TRACK 2: INNOVATION AND TRAINING DESIGN
1430 – 1600 • W307B

OPERATIONAL IMPACT: QUANTIFYING TRAINING SOLUTION VALUE

22T46

The goal of training is to establish or increase knowledge and performance of skills, with improved performance realized in an operational setting. But quantifying the impact of training in operational terms is oftentimes seen as unachievable. Stakeholders are left to make acqusition decisions based on requirements met, not on how much of an impact a given training solution will have on operations.

By starting with integrating clear measures of operational impact right at the beginning of an agile product development lifecycle, insightful supporting and transfer documentation can build knowledge and skills based on clear objectives that directly leverage those measures of impact. This can then be assessed in an incremental approach, and the documents become readily adaptable to formal training requirements.

Implementing the key steps, one can best quantify the learning impact on the individual, team and organization. (1) Clearly define the identified performance gap in terms of operational impact; (2) develop impact-based learning objectives to address the gap, and (3) establish clear metrics to measure achievement of learning objectives and anticipated performance outcomes. To be successful, evaluating operational impact requires a transparent upfront needs analysis.

Using Kirkpatrick's model of training evaluation can help to ensure operational impact is evaluated across all four evaluation levels: Reaction (Was the training well received?); Learning (Did the trainees learn?); Behavior (Did this learning result in changed behaviors/transfer of training?); Impact (Did the training make the desired organizational impact?). Through this Operational Impact Analysis, one can align business indicators with skills/knowledge gained, and provide quantitative validation that training will have the desired impact. Stakeholders want to see impact in terms of time, lives, or money saved. Incorporating user-in-the-loop evaluations implementing key metrics of success during early product releases can provide operational impact indicators, and not only show the potential value of the training solution, but also guide development in identifying opportunities for increased training transfer capabilities, often in a more compressed timeline to sustainment.

This tutorial will provide attendees with insights on why Operational Impact is critical for training success, and how measuring Operational Impact can be integrated into the training development process. Implementing methods of evaluation can provide attendees with a means to formulate outcomes that will more clearly demonstrate the value and impact of their training solution - not only with initial knowledge and skill transfer, but also the overarching beneficial impact to the program office and organization.

PRESENTERS

KELLY HALE, PH.D., Draper
AMY TABER, Gemini Technologies, Inc.

TRACK 3: DESIGN APPROACHES FOR LEARNING ENGINEERING
1430 – 1600 • W307C

LEADING BY DESIGN: USER EXPERIENCE (UX) FOR THE DEPARTMENT OF DEFENSE

22T43

As data and technology become increasingly intertwined in everything we do, User Experience (UX) design — the intentional creation of an experience that offers utility and value to the end user — is even more critical to mission success for our warfighters. In the military, poorly designed experiences, often involving software, processes, and tools — those with "bad" UX — have critical consequences for our warfighter. Bad UX serves as a detriment to battlefield outcomes and mission success, overloading warfighter processing capabilities, introducing errors into the mission, and potentially compounding those errors to such an extent that it results in mission failure and loss of life.

In the modeling, simulation and wargaming communities, good UX can help:

- Generate requirements for products that are based on end user input.
- Iteratively design and test experiences with end users.
- Focus solutions on solving the right problem and avoid over-engineering solutions that are solving unnecessary problems.

This tutorial will explain the UX design process and explain how it reduces overall risk to delivery. Participants will also learn how incorporating UX design principles ensures the output of modeling and simulation is aligned to the intended application.

This tutorial is for those interested in understanding the basic principles of UX and how these principles can be applied in processes like waterfall and agile within the modeling and simulation and the U.S. Government. Project managers, software developers, and anyone who wants to deliver better experiences to the warfighter should attend. A knowledge of training is recommended but no background knowledge of UX is required to fully participate in this session.

PRESENTERS

AMANDA HAWKINS, Data Society
VEL PRESTON, CyberWorx

TRACK 4: BUILDING CONFIDENCE FROM DESIGN TO APPLICATION
1430 – 1600 PM • W307D

ACCREDITATION OF SIMULATION-BASED EXPERIMENTS AND TRAINING: BEYOND THE M&S

22T18

The Department of the Army has no individual or organization that accredits a simulation-based experiment (SIMEXp). Army Regulations require that the modeling and simulation (M&S) be accredited – but not any of the other components required to execute a SIMEXp such as the operational scenario, analysis, or computational environment (hardware and network, for example). The purpose of this tutorial is to present a framework for overall SIMEXp or training event accreditation and enable attendees to understand all the areas which must

be accredited for the overall accreditation of a SIMEXp. Accreditation of the M&S will be discussed, as it serves as the foundation for an overall accreditation, but there are other equally important components requiring separate accreditations. After participating in the tutorial, attendees will be able to identify the components of tactical and operational scenarios which must be validated by current warfighters – and that the person who accredits those aspects must have credible knowledge of the current state of doctrine, military organizations, and operational concepts (friendly and enemy) to be studied. Attendees will learn that a properly certified expert must accredit the physical and computational environment- that software, operating system, information assurance, and network updates or changes haven't impacted the performance of a previously accredited simulation. The same applies if the event is being executed in a distributed environment- what other locations have updated or changed in their environment may cause performance changes across the federation. The hardware and network on which they are running to ensure processors are robust enough to execute as required, the network transmission speeds are sufficient, and no packets are being lost during execution. Finally, attendees will learn how to design and assess the analytical methods used during a SIMEXp to ensure accreditation of the analytical portion of the SIMEXp. The analysis plan, data collection and reduction methodology, and computational methods for analyzing the data must all be documented and accredited in a peer-reviewed final report for the overall SIMEXp to be accredited. This tutorial is intended for those interested in gaining a better understanding of proper SIMEXp or training event design and why more than just the M&S must be accredited.

PRESENTERS

THOMAS YANOSCHIK, SAIC
MAJOR SEAN FRASER, USA, Maneuver Battle Lab, Army Futures Command
CYNTHIA DUNN, SAIC
MAJOR LARRY BACA, USA, Maneuver Battle Lab
STEPHEN MILLER, SAIC

TRACK 5: XR
1430 – 1600 • W308A

ANYTIME, ANYWHERE ADAPTIVE XR TRAINING

22T27

Training is often consumed in the classroom or remotely in a one-size-fits-all format with limited opportunity to practice hands-on skills in contextualized situations. Providing training which can be used anytime, anywhere and also offers the ability to "act out" or practice critical skills to instill muscle memory, embody actions, and employ critical thinking, is integral to trainees reaching proficiency. Virtual and augmented reality technologies are rapidly being adopted across the DoD for simulation, training, education, and operations, however, these component technologies are often used in isolation and require costly form factors. The benefits of these emerging technologies can be realized more fully by utilizing eXtended reality (XR), which blends a contextualized virtual environment with augmented overlays and real-world objects, on a cost-effective mobile device. When XR training applications are used, an opportunity exists to provide psychomotor practice in a highly engaging environment leading to significant gains in both primary and refresher training. Further, available evidence shows that when these XR training applications are adaptive, varying content and progression as a function of trainee proficiency, substantial gains in training efficacy are expected. This is especially evident when using artificial intelligence (AI) to allow the system to adapt training to the proficiency of the trainee, thereby enhancing training effectiveness and increasing field readiness. Providing trainees adaptive XR training anytime, anywhere using mobile devices enables consumption to be readily available and learner centered, offering an action-oriented supplement to typical classroom and remote training.

It is crucial when developing XR training solutions to evaluate the utility of the novel, contextually-based design elements and embodied interactions afforded by XR. Careful examination of these features can highlight positive and negative experiences in XR, possible improvements to usability, and future directions for evaluating the extensibility of contextualization and embodied cognition principles in the design of XR training solutions.

This Foundations Training tutorial will dive into the key elements of an XR training framework that leverages pedagogically based, formative assessments to infer trainee proficiency by providing insights into: key drivers of adaptive, accessible training in XR; potential barriers to embodied training; value-added case studies with end-user feedback; and user-centered guidelines for designing, developing and implementing mobile XR training systems. By the end of this tutorial, attendees will be able to implement effective techniques for adaptive, accessible XR training applications based on case studies of anytime, anywhere adaptive training being implemented for Tactical Combat Casualty Care training.

PRESENTERS

JOANN ARCHER, Design Interactive, Inc.
FRANK KARLUK, DLH Corporation
CLAIRE HUGHES, Design Interactive, Inc.

TRACK 6: LET'S GET STARTED
1430 – 1600 • W308B

A HISTORY OF GAMES FOR MILITARY TRAINING: FROM SHEEP KNUCKLES TO THE METAVERSE

22T31

There is evidence of games being used for business trade, future prediction, and military strategy for at least 5,000 years. In this tutorial we explore the history of games as tools of military strategy, planning, and training from 3,000BC to the present. We reveal the long evolution of the basic components that are necessary to create a complex game. Concepts that first emerged in India and Asia at the end of the last millennia are still embedded in the games that we create today.

The tutorial has four major sections:

(1) Ancient games from 3,000BC to 500AD, with a focus on the essential mechanics and the emergence of game pieces and rules.

(2) Modern game design and early computer implementations from 500AD to 1980AD, in which the mathematics of wargames emerged and offered a format that was amenable to programming in the earliest analog computers of the 1940s through 1980s workstations.
(3) Serious games and the recent embrace of the technology by military leaders at all levels. In these last forty years computer-based games have been transformed from crude experiments with the technology to a major workhorse for training in all domains and at all echelons.
(4) Finally, we speculate on the possible future impacts of the metaverse, AI, and global mobile connectivity.

PRESENTERS

ROGER SMITH, PH.D., in[3] Thinking
PETER SMITH, PH.D., University of Central Florida

TRACK 7: THE R FACTOR
1430 – 1600 • W308C

SHARING ENVIRONMENTAL DATA FOR LVC USING RIEDP

22T32

Data sharing for distributed simulation remains a difficult problem, especially when dealing with stovepipes or proprietary solutions. As a M&S standards development organization, SISO (the Simulation Interoperability Standards Organization) provides open and standardized solutions to address M&S data sharing issues.

Within SISO, the Reuse and Interoperation of Environmental Data and Processes (RIEDP) specifications simplify the terrain data sharing problems by providing standardized rules, methods, and clear semantics for exchanging data from key stages of the simulation terrain database generation process.

RIEDP concepts and components are embodied in two SISO products: the RIEDP Data Model Foundations and the RIEDP Detailed Features Description.

This tutorial provides an overview of the general terrain database creation process, how RIEDP solves the M&S terrain data sharing problem, and how RIEDP promotes reusability of database generation efforts, while l everaging commonly used GIS and simulation data formats. The tutorial focuses on the fundamental terrain/environment questions that LVC simulation federations have to address.

The key RIEDP concepts covered in this tutorial include the RIEDP Reference Process Model (RPM), the RIEDP Reference Abstract Data Model (RADM), and the use of semantic constructs and attributes to share and exchange environmental data. The tutorial will also highlight how existing formats are leveraged in RIEDP data sharing, data organization on media, use of dedicated metadata constructs, and a set of profiles for specific application sub-domains.

PRESENTERS

JEAN-LOUIS GOUGEAT, Sogitec Industries
FARID MAMAGHANI
CHRISTOPHE RIND, Sogitec Industries

TRACK 8: SIMULATION INTEROPERABILITY PART 1
1430 – 1600 • W305A

TENA, INTEROPERABILITY, AND DATA MANAGEMENT

22T13

The Test and Training Enabling Architecture (TENA) provides an advanced set of interoperability software, interfaces, and connectivity for use in joint distributed testing and training. This tutorial will discuss how TENA works and why it is important to the test and training communities, with some comparison to other interoperability architectures. TENA provides testers and trainers software such as the TENA Middleware—a high-performance, real-time, low-latency communication infrastructure that is used by training range instrumentation software and tools during execution of a range training event. The standard TENA Object Models provide data definitions for common range entities and thus enables semantic interoperability among training range applications. The TENA tools, utilities, adapters, and gateways assist in creating and managing an integration of range resources.

In constructive simulation environments, the amount of data collected in each event can be large. But in a live-virtual-constructive test or training event, when data from each individual live entity is collected in addition to range data, telemetry data, and simulation data, the amount of data collected can be astronomical. The estimate for data collected from a 16-ship F-35 formation versus 16-ship aggressor aircraft formation, embedded in a larger LVC scenario, is over 50 terabytes for a two-hour event, about half of which is video. Analyzing this data efficiently, not to mention providing immediate after-action reviews to the participants, requires a new mechanism. TRMC has developed a Knowledge Management/Big Data Analysis architecture and implementation seamlessly connected to both the TENA architecture and other range communication and storage mechanisms to tackle this problem.

PRESENTER

EDWARD POWELL, PH.D., Ed Powell Consulting

TRACK 9: SIMULATION INTEROPERABILITY PART 2
1430 – 1600 • W305B

SECURE DISTRIBUTED SIMULATION TRAINING SYSTEMS ANYWHERE, WITH OMG DDS

22T28

Integrating global simulation training systems can be a formidable challenge. Legacy simulators often use different standards for data, voice, and video. While modern architectures require the use of cloud-based distributed assets. To top it off, security requirements now force integrators to become experts in information assurance.

Winning solutions will be ones who create synthetic training environments that can quickly be assembled and reconfigured from ready-made components. How can simulation systems integrators keep pace by limiting integration time to meet these requirements? Attend this tutorial to learn how the Object Management Group's Data Distribution Service (DDS) can ease integration, while

also delivering National Security Agency tested security for distributed training systems over any transport.

DDS is an open standard that provides interoperability through a connectivity framework that meets the stringent real-time requirements of global defense industries. DDS is currently used in over one thousand deployed defense systems, it seamlessly stitches together legacy defense simulations, while adding humans and hardware in the loop, to create new secure LVC environments that can share real, augmented, and virtual realities. These environments run over DDS, either in a single lab or across multiple sites and transports, unifying disparate data models, all while enabling physics-speed response times.

This tutorial introduces the DDS and DDS Security standards. You will learn how to use the DDS Security standard to securely interoperate with real-world systems that already communicate over DDS, to distributed LVC Simulations. The tutorial will further describe how to integrate DDS with existing simulation standards, simulation object modes, and data models of any kind, allowing for a large suite of 'qualities of service' to help fine-tune performance and scalability, while also providing robust security for individual entities and topics of simulation data.

Next the tutorial will introduce you to the Real-Time WAN Transport that extends DDS capabilities to enable secure, scalable, and high-performance communication over WANs, TDL, RF and public 5G networks. The Real-Time WAN Transport uses UDP as the underlying IP transport-layer protocol to better anticipate and adapt to the challenges of diverse network conditions, device mobility, and the dynamic nature of WAN system architectures. Finally, the tutorial will highlight recent LVC Simulation user experiences with DDS and offer an overview of deployed systems using DDS in systems integration labs, and with LVC training simulators today.

This tutorial is intended for all audiences, though some familiarity with the basic principles of distributed computing is recommended.

PRESENTERS

ROBERT PROCTOR, JR., Real-Time Innovations

JOHN BREITENBACH, Real-Time Innovations

TRACK 10: FROM C TO SHINING C
1430 – 1600 • W306A

TRANSFORM YOUR TRAINING BY MIGRATING CONTENT TO CMI5

22T41

The learning and training landscape is changing rapidly with newer technologies emerging. While SCORM (Sharable Content Object Reference Model) has been the de facto eLearning industry standard, SCORM has not been extensible enough to support these technologies and does not provide enough guidance on capturing robust learner performance data.

Making the transition from SCORM to the more flexible Experience Application Programming Interface (xAPI) standard is key to supporting the vision and goals for modernizing learning within the Department of Defense while meeting the distributed learning policy (DoDI 1322.26) related to learning analytics and interoperability. SCORM and xAPI can be implemented together, but the divide is wide.

The cmi5 specification was modified in 2016 to help bridge the gap and define a set of rules for how online courses are imported, launched, and tracked using an LMS and xAPI. While cmi5 presents a promising solution, adoption across the DoD has been slow, but now there are tools and templates that are freely available from ADL to help migrate legacy content to the improved cmi5 specification.

This tutorial will help attendees better understand how to utilize cmi5 and the freely available course templates from cmi5 CATAPULT to migrate, create and test their courseware to ensure they conform to the cmi5 specification. After an introduction to cmi5 and why eLearning standards are a necessary component of modern learning ecosystems, the tutorial will walk attendees through converting legacy SCORM content to cmi5 using the cmi5 course templates as well as describing the importance of testing in ADL's cmi5 Content Test Suite.

The cmi5 specification plays an important role in the DoD's learning modernization, facilitating progress in migrating from SCORM-based LMS-centric courseware to a distributed learning "ecosystem" that delivers diverse learning opportunities across federated platforms. With the cmi5 Conformance Test Suite and cmi5 example course templates, there are now ways to validate that content conforms to the cmi5 specification and migrate existing courseware, which will help increase adoption of the specification and move toward the DoD's Total Learning Architecture goals.

PRESENTER

BRIAN MILLER, Rustici Software

PRESENTER BIOGRAPHIES

JOANN ARCHER is a Senior Research Associate in the XR Division at Design Interactive, and has 11 years of experience in system engineering. Her work focuses on the design, development, and usability of AR training and job aid solutions, specifically ensuring that the solutions are optimized for their specific users, tasks, and context of use. She is currently leading multiple efforts to design and develop AR systems that train tactical combat casualty care tasks. She holds a Master's degree from the University of Central Florida in Engineering Management and a Bachelor's degree from the University of Florida in Industrial and Systems Engineering. Besides her work at Design Interactive, she has had a variety of work experience in operational and requirements development and management for NASA working in the Shuttle, Spacelab, and International Space Station programs.

MATT ARCHER has over 25 years of simulation and training experience, primarily military focused, with a proven track record for proposing, developing, and delivering quality software products. Matt did his graduate work with NASA (Kennedy Space Center), which was responsible for introducing simulation systems to orbiter processing. He then went on to 5 years with ECC as a software engineering working on cutting edge simulation systems, including F-16, Javelin, and CCTT. Matt was responsible for proposing and coding the PC-based graphics subsystem for the EST 2000, which is now the Army's pre-eminent simulated marksmanship trainer, with more than 200 systems fielded worldwide. During this time, Matt also focused on PC-based real-time flight simulation and graphics programming. For the past 10 years, Matt has been the Senior Vice President of Engineering and then the COO at Design Interactive. He has been responsible for establishing solid engineering design principles, coding standards, performing system design, and selecting appropriate technologies for over 30 projects. During his tenure, the engineering staff have grown from 6 to over 20, he has been responsible for implementing agile software development, installing a quality assurance department, and ensuring on-time delivery of software projects that include desktop, web, mobile, and augmented reality components. He stays on the cutting edge of augmented and virtual reality technology and has delivered systems to both military and commercial clients that emphasize biometrics, intelligent tutoring, and personalized training to help Design Interactive attain the goal of optimizing the human dimension.

MAJOR LARRY BACA is a graduate of New Mexico State University and holds a Master Degree from the University of Central Florida. He is an active duty Army Modeling and Simulation Officer with a background as both an Infantry and Signal Officer. He has leadership and staff experience at the Company, Battalion, and Division level. MAJ Baca completed two combat deployments to Afghanistan as well as a third peacekeeping mission in Kosovo. His current focus is on experimentation supporting Army Modernization as a project lead in the Modeling and Simulation Branch (MSB) at the Maneuver Battle Lab (MBL), Fort Benning, Georgia. Currently he supports mainly constructive experimentation both locally at the MBL and distributed through the Battle Lab Simulation Collaborative Environment (BLSCE). Larry is a certified Modeling and Simulation Professional (CMSP).

PEYTON BAILEY is a Research Associate II at Design Interactive, Inc. His research supports technology development that augment human performance through adaptive cognitive skills training, empirical evaluation of decision-support tools, and virtual reality (VR) hardware and content guidelines to mitigate cybersickness. Peyton holds two Bachelor of Science degrees studying Biology and Health & Societies, with a focus on physiology, and was an Embrey Engineering Fellows Scholar.

JAKE BORAH is the co-owner of Borah Enterprises LLC. He is a Senior Operational Research, Modeling and Simulation Analyst supporting the Air Force Operational Test and Evaluation Center, Detachment 2. Jake is a Charter Certified Modeling and Simulation Professional (CMSP). He has frequently supported U.S. and Canadian government sponsored military simulation projects because of his mastery of the M&S technology, and expertise in High Level Architecture federation development. Jake has a BS from the United States Air Force Academy and a Master of Aeronautical Science degree from Embry-Riddle Aeronautical University.

JOSEPH BORDERS, M.S., ShadowBox LLC, isa cognitive psychologist working with ShadowBox LLC. He studies the development of expertise and creates scenario-based training to bring novices up to speed faster. He is also working on his Ph.D. at Wright State University (Human Factors Psych).

SUZANNE BORDERS is the CEO & founder of BadVR, the world's first immersive data analytics platform. With her background in psychology, she previously led product and UX design at 2D data analytics companies including Remine, CREXi, and Osurv. A recipient of Magic Leap's Independent Creator's Program grant, and an SBIR Phase 1 grant from the National Science Foundation, Suzanne thrives at the intersection of product design, immersive technology, and data. In her spare time, she travels for inspiration (75 countries and counting), and is proud to be a published poet and former punk rocker. Her creative hero is Alejandro Jodorowsky, who has inspired Suzanne to take a completely unique and innovative approach to all of her work. She also has 19 tattoos, and is a big believer in the artistry of technology and the technicality of art.

JOHN BREITENBACH is a Regional Field Application Engineering Manager for Real-Time Innovations, Inc. (RTI). John has over 30 year's experience designing real-time, connected systems for industrial, medical, consumer, and military systems.

ADELICIA "ADDIE" CLIFFE is a partner at Crowell & Moring in its Government Contracts and International Trade practice groups, and she co-chairs Crowell's national security practice. Addie counsels defense contractors on a broad range of government contracts compliance issues, with a particular focus on cross-border issues such as domestic preferences, supply chain security requirements, export controls, Foreign Military Sales and Foreign Military Financing, and national security reviews by the Committee on Foreign Investment in the U.S.

ROSELYNN CONRADY is a Ph.D. candidate in Mechanical Engineering and Human Computer Interaction at Iowa State University and a National Science Foundation Graduate Research Fellow. Her research investigates how extended reality can be used to explore and mitigate human stress responses, especially in neurodivergent populations.

JAMES E. COOLAHAN, PH.D., is the Chief Technology Officer of Coolahan Associates, LLC, having retired from full-time employment at the Johns Hopkins University Applied Physics Laboratory (JHU/APL) in December 2012 after 40 years of service. He chaired the M&S Committee of the Systems Engineering Division of the National Defense Industrial Association from 2010 through 2016, and teaches courses in M&S for Systems Engineering in the JHU Engineering for Professionals M.S. program. He holds B.S. and M.S. degrees in aerospace engineering from the University of Notre Dame and the Catholic University of America, respectively, and M.S. and Ph.D. degrees in computer science from JHU and the University of Maryland, respectively.

DAMON CURRY has 30 years experience in the simulation industry specializing in distributed training systems, 3D visualization, and 3D terrain. He helped start several successful simulation industry companies and is presently Pitch Technologies' manager for business development in North America. Damon is co-inventor of a real-time image processing technique and a wireless video transmission method for virtual reality with one patent awarded and another patent pending. Prior to working in the simulation industry, he served 16 years with the U.S. Air Force, including software engineering on cruise missiles and avionics engineering on the F-16. He is a graduate of The Ohio State University with a Bachelor of Science in Electrical Engineering.

JOHN DALY is a senior engineer with Booz Allen Hamilton. He currently leads a team providing modeling and simulation technical and policy support to the Defense Modeling and Simulation Coordination Office. He has worked with OSD, Joint Staff, COCOM, Service, and DISA clients in the development of simulation systems for: training, acquisition, operational decision support, visualization of complex

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phenomena, testing, analysis, and operational simulation applications embedded in command and control systems.

CYNTHIA DUNN currently works for SAIC as the Modeling and Simulation Team Manager for the Modeling and Simulation Branch of the Maneuver Battle Lab (MBL), Fort Benning, GA. She supports constructive experimentation locally at MBL and distributed through the Battle Lab Collaborative Simulation Environment (BLCSE). Cindy holds a B.S. in Computer Science from Keene State College in New Hampshire. She is a graduate of the Defense Language Institute, a former Russian linguist with the U.S. Army, and is a Certified Modeling and Simulation Professional (CMSP).

MAJOR SEAN FRASER is a graduate of the McDaniel College and holds a Master's Degree from the Naval War College on Defense and Strategic Studies. He is an active duty Simulation Operations Officer in United States Army with a background as an Armor Officer. His past assignments include leadership positions in armored, infantry, motorized (Stryker), and sustainment type units. He has combat experience in Iraq and Afghanistan and additional deployments to the Middle-East and Europe supporting other enduring operations. Sean currently focuses on experimentation in support of Army modernization as the Project Leader for the Modeling and Simulation Branch (MSB) of the Maneuver Battle Lab (MBL) on Fort Benning, Georgia. He has participated in live, virtual, and constructive experimentation throughout his career as both a user and provider of M&S capabilities. Currently he supports experimentation locally at the MBL and distributed through the Battle Lab Simulation Collaborative Environment (BLSCE). Sean is a Certified Modeling and Simulation Professional (CMSP).

BENJAMIN GOLDBERG, PH.D., is a Senior Scientist at the U.S. Army CCDC Soldier Center, Simulation and Training Technology Center (STTC) in Orlando, FL. His research in Modeling & Simulation focuses on deliberate competency development, adaptive experiential learning in simulation-based environments, and how to leverage AI tools and methods to create personalized learning experiences. Currently, he is the lead scientist on a research program developing adaptive training solutions in support of the Synthetic Training Environment. Dr. Goldberg is co-creator of the award winning Generalized Intelligent Framework for Tutoring (GIFT) and holds a Ph.D. from the University of Central Florida.

JIM GOODELL is an expert on learning technologies and data standards, and is Vice Chair of the IEEE Learning Technology Standards Committee. As Senior Analyst with Quality Information Partners (QIP) he leads standards development for the U.S. Department of Education sponsored Common Education Data Standards (ceds.ed.gov) and works with stakeholders from early learning, K12, postsecondary, and workforce organizations. He chairs the IEEE Adaptive instructional Systems (AIS) Standards Interoperability Subgroup. He serves on the IEEE IC Industry Consortium on Learning Engineering (ICICLE) Steering Committee, co-chaired the first ICICLE conference, and leads the ICICLE Competencies, Curriculum, and Credentials SIG. In 2016, he co-authored Student-Centered Learning: Functional Requirements for Integrated Systems to Optimize Learning.

JEAN-LOUIS GOUGEAT holds a Master's degree in Electronics and Communications and an Engineering degree in Telecommunications (1987). He has been a senior project manager at SOGITEC since 2001. He has 30 years of experience with R&D projects for the French MoD, and more specifically 25 years in simulation projects for training of military personnel, including company level training with Live simulation, Flight training with Virtual simulation and Command & Staff training with Constructive simulation. He is in charge of the development of Distributed Mission Operation (DMO) and Live Virtual Constructive (LVC) activities at Sogitec. In this area, he was project manager of the AXED project aiming at developing the DMO/LVC in the French Air Force. He has been involved in various international efforts within NATO, from the genesis of the NATO PATHFINDER programme to the on-going MSG-165 on Mission Training via Distributed Simulation among Alliance Air Forces. He is the Chairman of the Simulation Interoperability Standard Organisation (SISO) Product Development Group (PDG) on the Reuse and Interoperation of Environmental Data and Process (RIEDP).

KELLY HALE, PH.D., is a Principal Member of the Technical Staff at the Draper Laboratory, where she is transforming human systems integration through innovative, user-centered solutions to meet challenging customer needs. Previously, Kelly was SVP of Applied Research at Design Interactive, Inc. where she gained 15 years experience in human systems integration research and development across areas of augmented cognition, multimodal interaction, training sciences, and virtual and augmented reality environments. She received her B.S. in Kinesiology/Ergonomics Option from the University of Waterloo in Ontario, Canada, and her Masters and Ph.D. in Industrial Engineering, with a focus on Human Factors Engineering, from the University of Central Florida.

AMANDA HAWKINS currently serves as the Director of Innovation for Data Society. In this position she is responsible for the development and instruction of innovation courses and concepts to organizations globally. Prior to joining Data Society, she was the founder and CEO of Friendly Minds, an educational consulting company founded to help parents during COVID, and Ursus USA, an innovation and human centered design company driving innovation in bureaucracies. She retired from the U.S. Navy as a Commander in 2018. Before starting her businesses, Amanda served in various operational and staff roles in the U.S. Navy as a Naval Flight Officer. Her final operational tour was in command of a maritime and patrol reconnaissance aircraft squadron operating the P-8A Poseidon in Europe engaging in sea control and power projection alongside our allies and partners. Other operational tours include combat operations globally conducting maritime patrol aviation, intelligence and reconnaissance, and aircraft carrier operations as the assistant navigator. Staff tours culminated in her qualification as a Joint Qualified Officer after serving on the Joint Chiefs of Staff creating cyberspace requirements for the warfighter. She also served on the Chief of Naval Operations staff conducting Flag Officer detailing where she developed and implemented strategic career progression and succession planning for executive leaders. During her time in the Navy she participated in several combat and peacekeeping operations across the globe. She has received numerous personal and unit awards for her work including the 2018 Captain Joy Bright Hancock award for inspirational leadership.

JASON HESTER is a Strategist for Defense Business Development and Capture at Cisco Systems, Inc. He develops and implements strategies to support the U.S. Defense Department with effective technology implementations. Prior to joining Cisco, Jason served 25 years on active duty in the U.S. Army, as both an aviator and an IT professional. His numerous past assignments include Chief Information Officer of the U.S. Army War College, and Director of Plans for U.S. Army Network Enterprise Technology Command (NETCOM).

CLAIRE HUGHES is a Research Associate in the eXtended Reality Division at Design Interactive. Her focus is on emerging technology delivery to diverse stakeholders, including the Joint Program Committee, and the Army Futures Command. Her current work is centered around the design and delivery of XR training technologies across the Department of Defense, with a focus on driving user-centered design for scalable adoption of AR/VR/MR training and job aid solutions. These projects include efforts for the Joint Program Committee producing an AR training program for TCCC Curriculum and for Army Futures Command providing an XR training solution for the M1A2 Abrams Tank. She holds a Master of Science in Human Factors and Systems Engineering from Embry-Riddle Aeronautical University and a Bachelor of Science in Mathematics from Hillsdale College.

KEVIN F. HULME, PH.D., CMSP, received his Ph.D. from the Department of Mechanical and Aerospace Engineering at the University at Buffalo, specializing in multidisciplinary analysis and optimization of complex systems. Currently, he serves as the Program Manager for The Stephen Still Institute for Sustainable Transportation

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and Logistics at the University at Buffalo, and also serves as the Technical Director for its Motion Simulation Laboratory. Dr. Hulme's current areas of technical focus include: game-based approaches for applied modeling and simulation (M&S), human factors research in autonomous and connected vehicles (both ground and flight), simulation for advanced air mobility, experiential learning within next-generation engineering curriculum design, and Design for Additive Manufacturing. Dr. Hulme is a Certified Modeling and Simulation Professional (CMSP).

MOHAMMADREZA JALAEIAN, PH.D., is a Postdoctoral Research Associate at ShadowBox Training and MacroCognition LLC. He works on design and development of learning systems that accelerate expertise in professional domains and higher education. He researches in expertise, decision making, online/distributed simulators, perceptual-cognitive skills, and human-machine interaction. He has had responsibility for consult with business departments to support, develop, and deliver learning solutions, provide strategic support to clients and leaders in moderate situations, and consult in instructional design and project management.

RANDOLPH M. JONES, PH.D., Senior Artificial Intelligence Engineer and co-founder at SoarTech, is a leading developer of knowledge-rich intelligent agent software. He has been principal investigator for a variety of advanced R&D projects funded by ONR, ARI, DMSO, DARPA and other DOD agencies. He has previously held teaching and research positions at Colby College, the University of Michigan, the University of Pittsburgh, and Carnegie Mellon University. His areas of research include computational models of human learning and problem solving, executable psychological models, and full-spectrum intelligent behavior models. He earned a B.S. in Mathematics and Computer Science at UCLA, and M.S. (1987) and Ph.D. (1989) degrees from the Department of Information and Computer Science at the University of California, Irvine.

DANIELLE JULIAN, M.S., is a Research Scientist at AdventHealth's Nicholson Center. Her current research focuses on robotic surgery simulation and effective surgeon training. Her current projects include intelligent tutoring system, rapid prototyping of surgical education devices, and the evaluation of robotic simulation systems. She is a certified instructor for surgical robotics courses delivered to surgeons and OR staff members. Her background includes research in Human Factors and learning and training to enhance the higher-order cognitive skills of military personnel. She is currently a Ph.D. student in Modeling and Simulation at the University of Central Florida where she previously earned an M.S. in Modeling and Simulation, Graduate Simulation Certificate in Instructional Design, and a B.S. in Psychology.

FRANK J. KARLUK, MA, PMP, NRP has over 30 years' experience in the medical field in multiple areas to include advancing patient care on the battlefield, direct patient care in the hospital setting, instruction, and curriculum development. Twenty-one of these years were in service to the United States Army with various assignments that included combat operations in the Helmand Province of Afghanistan. During this deployment he served as the Non-Commissioned Officer in Charge of an Army MEDEVAC detachment that was tasked to directly support the Special Operations Command during high-risk kinetic operations involving active warfare, including lethal force. He and his unit were the first Army MEDEVAC unit to conduct in flight blood resuscitation and he is credited with being the first flight paramedic to perform an emergency escharotomy in flight under the remote direction of a trauma surgeon. He maintains active licensure and certifications and is currently a faculty member at The George Washington University. Mr. Karluk has been invited to speak at international conferences and has been a spokesperson within the Medical/ Chemical, Biological, Radiological, Nuclear, and high yield Explosives (CBRNE) community before the Joint Chiefs, and other high level governmental leadership post 9/11. Mr. Karluk holds a master's degree in Emergency and Disaster Management and graduated with high honors. He continues to share is experiences in the development of future medical simulation and training efforts and has been cited in multiple efforts that have expanded the abilities of a multidisciplinary practitioner community that includes medical providers both inside and outside the military. Most recently he managed the over $90M efforts within the Defense Health Agency, Medical Simulation portfolio, and designed and implemented curriculum within the U.S. Department of State.

ADAM KOHL, Virtual Reality Applications Center, is a Ph.D. Candidate at Iowa State University in Mechanical Engineering and Computer Engineering.

KURT LESSMANN is the co-founder and Chief Technology Officer of Trideum Corporation headquartered in Huntsville, AL. Trideum, an Honor Roll Member of Inc. 5000, focuses on several core competencies: Live, Virtual and Constructive (LVC) Interoperability, Test & Evaluation (T&E), Training Solutions, Cybersecurity and User Centered Design. Mr. Lessmann has supported the Modeling and Simulation (M&S) and LVC communities for the past 25 years where he has been involved in interoperability standards development and deployment for DIS, HLA and TENA. His primary focus has been applying M&S and LVC technologies to enhance weapons system test and evaluation effectiveness. He is currently focusing on developing solutions that provide an operationally realistic distributed LVC environments that support weapon system cybersecurity vulnerability assessments. He holds a Bachelor of Aerospace Engineering Degree from Auburn University, and lives in Huntsville, AL.

KENNETH G. LESUEUR, PH.D., serves as the chief technologist of the Modeling & Simulation Division at the U.S. Army Redstone Test Center (RTC). His work and research have been concentrated in HWIL testing, distributed testing, modeling and simulation, and high performance computing. He received his master's degree and doctorate in computer engineering at the University of Alabama in Huntsville.

JAD MEOUCHY is the CTO and co-founder of BadVR. Originally from Virginia, Jad holds dual B.S. degrees in Computer Engineering and Psychology from Virginia Tech, and attended the Thomas Jefferson High School for Science and Technology. Over 15 years, Jad has founded and exited multiple startups, and engaged his healthy passion for user-friendly product innovation and engineering architecture. He specializes in software architecture and development, data analytics, and AR/VR development. As the Principal Investigator for BadVR, he has led the development of proprietary algorithms and techniques for spatialization and visualization of data that has resulted in awarded patents.

BRIAN MILLER is known as one of the world's foremost xAPI thought leaders and a chief contributor to the cmi5 working group. He was the architect and principal engineer for ADL's cmi5 CATAPULT, a freely available, open source cmi5 content player and conformance test suite for use by Department of Defense stakeholders and eLearning technology vendors as a way to test and validate content for cmi5 conformance. He has over 20 years of professional and eLearning industry experience. In 2012, Brian joined Rustici Software and has worked on cmi5 CATAPULT, Project Tin Can, standards support, and open source libraries as well as leading the engineering team.

STEPHEN MILLER is a graduate of the U.S. Army Officer Candidate School and holds a Bachelor's Degree in Psychology from Campbell University, North Carolina. He is currently completing a Master of Business and Technology Degree from the University of Georgia's Terry College of Business. He is a retired Corps of Engineers officer from the United States Army. His assignments included service in various Airborne, Infantry, Armor, and Engineer units as an Infantryman and Combat Engineer. His most recent assignments include Brigade Engineer and Battalion Operations Officer in the 3rd Armor Brigade Combat Team/3rd Infantry Division. Steve currently serves as the Technical Project Manager for the Modeling and Simulation Branch (MSB) of the Maneuver Battle Lab (MBL), Fort Benning, Georgia. He has participated in virtual and constructive experimentation both locally at the MBL and distributed through the Battle Lab Collaborative Simulation Environment (BLCSE). Steve is certified in the U.S. Army Capability Development Course as well as CompTIA A+ CE/Security+ CE.

BJÖRN MÖLLER is the president and co-founder of Pitch Technologies, the leading supplier of tools for HLA and other simulation standards. He received an M.Sc. in

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computer science and technology after studying at Linkoping University and Imperial College, London. Mr. Moller has more than thirty years of experience in high-tech R&D companies, with an international profile in modeling and simulation. His experience includes positions in SISO and IEEE standards development groups such as vice chair for HLA, chair of the Real-time Platform Reference FOM and chair of the Space Reference FOM. Mr. Moller also served as secretary in the NATO MSG-080 group for Security in Collective Mission Training.

TRISH MULLIGAN-RENAUD is owner and Chief Learning Officer for TTD Learning Solutions, a female owned business bringing back the lost art of design in Instructional Design and Learning Experience Design (LXD). Mrs. Mulligan-Renaud has over 25 years' experience in education, including 5 years as a Special Education Teacher at the elementary level. Over the last 20 years, Mrs. Mulligan-Renaud was an Instructional Systems Specialist (ISS) for the U.S. Army and U.S. Air Force, as well as working for the Advanced Distributed Learning (ADL) Co-Lab. Mrs. Mulligan-Renaud taught the Army's Common Faculty Development - Developer's Course (CFD-DC) and has significant experience in incorporating learning experience design practices for Initial Military Training (IMT) and Professional Military Education (PME) for both Enlisted Personnel and Military Officers, the Transportation Security Administration (TSA), and the U.S. Patent and Trademark Office (USPTO).

ROBERT MURRAY retired from Boeing with 33 years of flight simulation experience. Contract engineer for SimPhonics. A primary contributor and draft editor of the IEEE 1278.1 DIS standard.

EMILY NEWSOME is Assistant Manager and Research Associate with ShadowBox. She is interested in exploring how ShadowBox can improve critical thinking in both established and emerging areas, such as social work, sales, healthcare, and artificial intelligence.

S. K. "SUE" NUMRICH, PH.D., CMSP, began her career at the engineering level of modeling and simulation and moved gradually into parallel and distributed simulation. She led a panel for The Technical Cooperation Program (U.S., UK, CA, AUS, NZ) in distributed simulation and represented the U.S. on the NATO Studies, Analysis and Simulation (SAS) panel as the simulation expert. Sue served as the Director of Technology for the Defense Modeling and Simulation Office. Since 2005 she has been a research staff member at the Institute for Defense Analyses where she has worked with the use of military simulation, the incorporation of human activity and behavior into simulations, and the validation of a variety of simulations. She founded and was the first chair of the Tutorial Board. Sue authored four book chapters and over 50 technical papers and has had two academic appointments. A Fellow of the Acoustical Society of America, Sue was selected as the I/ITSEC 2018 Fellow.

MICHAEL J. O'CONNOR is Chief Technologist at Trideum Corporation. Mr. O'Connor has more than 25 years' experience in Modeling and Simulation (M&S). He has been a key participant in the development of distributed modeling and simulation standards, including IEEE 1278 and IEEE 1516. He has held many positions in the community, including Chairman of the SISO Standards Activities Committee, Chairman of the SISO Executive Committee, and Editor of the Gateway Filtering Language standard. He has served as the chair of the I/ITSEC Simulation Subcommittee and the I/ITSEC Training Subcommittee. He has led the development of multiple simulations using DIS, HLA, and TENA. Mr O'Connor has led the technical integration of several large multi-architecture distributed events. He holds a bachelor's degree in Computer Engineering from Auburn University, and a master of science in Computer Science from the University of Alabama in Huntsville. Mr. O'Connor is a CMSP.

MIKEL D. PETTY, PH.D., is the Senior Scientist for Modeling and Simulation in the Information Technology and Systems Center and an Associate Professor of Computer Science at the University of Alabama in Huntsville. He previously served as Director of UAH's Center for Modeling, Simulation, and Analysis for ten years. Prior to joining UAH, he was Chief Scientist at Old Dominion University's Virginia Modeling, Analysis, and Simulation Center and Assistant Director at the University of Central Florida's Institute for Simulation and Training. He received a Ph.D. in Computer Science from the University of Central Florida in 1997. Dr. Petty has worked in modeling and simulation research and development since 1990 in areas that include verification and validation methods, simulation interoperability and composability, human behavior modeling, multi-resolution simulation, and simulation software frameworks. He has published over 235 research articles, chapters, and papers and has been awarded over $17 million in research funding. He served on National Research Council and National Science Foundation committees on modeling and simulation, is a Certified Modeling and Simulation Professional, and is Editor-in-Chief of the scholarly journal SIMULATION: Transactions of the Society for Modeling and Simulation International. He has served as dissertation advisor to twelve graduated Ph.D. students in four different academic disciplines: Modeling and Simulation, Computer Science, Industrial and Systems Engineering, and Computer Engineering. His former students include the first two people to receive Ph.D.s in Modeling and Simulation at Old Dominion University and the first five people to receive Ph.D.s in Modeling and Simulation at UAH.

EDWARD T. POWELL, PH.D., was the lead architect for the Test and Training Enabling Architecture. After receiving his Ph.D. in Astrophysics from Princeton University, he worked for the Lawrence Livermore National Laboratory performing simulation-based analysis. He moved to SAIC (now Leidos) in 1994 and participated as lead architect in some of the most complex distributed simulation programs in DoD, including the Joint Precision Strike Demonstration (JPSD), the Synthetic Theater of War (STOW), the Joint Simulation System (JSIMS). He then worked in the intelligence community on architectures for integrating large-scale diverse ISR systems. He is currently working on integrating TENA with broader DoD-wide Knowledge Management and Big Data Analysis as well as Cyber Testing systems. Currently, he owns his own consulting company specializing in Simulation and Systems Architecture and Engineering.

VEL PRESTON, GS-15, is the Chief of Innovation and Design for CyberWorx, Department of the Air Force, where since 2017 she has grown an elite, human-centered, future-focused problem-solving practice uniquely capable of solving for complexity. Prior to CyberWorx, Ms. Preston spent 15 years in Silicon Valley teaming with everyone from engineers to executives to envision and build intuitive, useful, compelling, & productive experiences for people. With extensive experience in enterprise & consumer tech, startups, medical & more, Ms. Preston starts with defining the human needs at the core of complex problems, then blends user-centered design, systems thinking, futures, and business logic to unite teams in clear pathways to rapid, actionable ways ahead. Ms. Preston holds an M.S. in Human Factors Psychology with a specialty in Human-Computer Interaction, and a B.A. in Cognitive Psychology. She has designed and delivered the Innovation Design course to USAFA cadets, as well as courses in Statistics, Learning & Memory, Research Methods, Developmental Psychology, and more to students at the University of South Dakota. Ms. Preston believes that there is no single path to solving for complexity, and no single repeatable process to achieve an innovative mindset or solutions.

ROBERT PROCTOR, JR. is a Lead Field Application Engineer for Real-Time Innovations. He received his B.S. from Embry-Riddle Aeronautical University in Aerospace Studies and his M.S. from the University of South Florida in Engineering Management. Rob has over 24 years of experience in A&D Embedded SW development. Prior to his time as a Field Application Engineer, he developed and implemented real time embedded software at major Aerospace and Defense (A&D) Corporations. His roles have included developing software and system designs, mission-management and display processing systems. Rob is also involved with the SISO Layered Simulation Architecture (LSA) Study Group.

SAE SCHATZ, PH.D., is the Chief Product Officer and Cofounder of Bedrock Learning, Inc. From 2015 to 2022, she served as the director of the Advanced Distributed Learning (ADL) Initiative, a government program for research, development, and policy stewardship. Under her leadership, the program grew its impact across

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the US and international defense sectors, and she sparked the community's pursuit of the "future learning ecosystem." Before joining the civil service, Sae worked as an applied human–systems scientist in both business and academia, and she formerly held an assistant professorship with the University of Central Florida's Institute for Simulation and Training. Sae is a prolific writer and presenter as well as an accomplished graphic designer who often uses those skills to enhance books, presentations, and infographics.

JOHN SCHMITT, ShadowBox Training, LLC — B.S., Journalism, Northwestern University; U.S. Marine Infantry officer; Author: Warfighting (MCDP 1), Expeditionary Operations (MCDP 3), Planing (MCDP 5), Command & Control (MCDP 6), Capstone Concept for Joint Operations (CCJO, 2009 & 2012)

DYLAN SCHMORROW, PH.D., Chief Scientist at SoarTech, leads the advancement of research and technology tracks to build intelligent systems for defense, government, and commercial applications that emulate human decision making in order to make people more prepared, more informed, and more capable. He also serves as a Potomac Institute for Policy Studies Senior Fellow, Editor of the Theoretical Issues in Ergonomics Journal, and the Technical Advisor for the Applied Human Factors and Ergonomics Conference Series. He is one of the nation's leading experts on national security research, technology, and policy related to information technology, medical research and human performance applications. Past service includes OSD, DARPA, NAWC, NRL, ONR, Naval Postgraduate School, and Executive Assistant to the Chief of Naval Research. Dr. Schmorrow holds a Ph.D. in Experimental Psychology from Western Michigan University, as well as MS degrees in Psychology and Philosophy. He retired from the U.S. Navy as a Captain in 2013, after 20 years of service.

ROGER SMITH, PH.D., has over 30 years of experience creating solutions for the Department of Defense, Intelligence Community, and Healthcare. He is the CEO of in[3], a consulting company focused on the applications of new technologies. He was previously a Chief Technology Officer for AdventHealth System; CTO for the U.S. Army PEO for Simulation, Training, and Instrumentation (STRI); and VP and CTO for Titan Corp (an L3Harris company). He holds a Ph.D. in Computer Science, an M.S. in Statistics, and a B.S. in Applied Mathematics. He has published 3 professional textbooks on simulation, 18 book chapters, and over 100 journal and conference papers. His most recent book is "Thinking About Innovation". He has received service awards from the U.S. Army, NSA, Association for Computing Machinery, Society for Computer Simulation, and AFCEA.

KAY M. STANNEY, PH.D., is CEO and Founder of Design Interactive (DI), Inc., a woman-owned, small business focused on human-systems integration. She is recognized as a leader in eXtended Reality (XR, Virtual Reality, Augmented Reality, Mixed Reality) systems, especially as they relate to training, human performance, and cybersickness. In 2019, she was inducted into the National Academy of Engineering (NAE) for her contributions to human factors engineering through virtual reality technology and strategic leadership. Her research has influenced the design of current generation XR headsets, Universal Studios and Disney immersive experiences, Chevron immersive environments, Procter & Gamble training solutions, as well as numerous military XR systems. Stanney has been a pioneer in formalizing XR R&D by serving as editor of the Handbook of Virtual Environments: Design, Implementation, and Applications (1st edition, 2002, LEA; 2nd edition, 2014, CRC Press), co-founding/co-chairing the 1st International Conference on Virtual Reality, and co-founding the Virtual Environments Technical Group (VETG) within the Human Factors and Ergonomics Society. In recognition of these efforts, Dr. Stanney received the 2006 IEEE Virtual Reality Technical Achievement Award from the IEEE Computer Society, an award designed to honor individuals for their seminal technical achievement in virtual and augmented reality.

ANDREW D. STEWART is a National Security and Government Senior Strategist for Cybersecurity at Cisco Systems, Inc. He has been with Cisco for the last 3 years after retiring from almost 30 years in the U.S. Navy where he last served as the Chief of Cyber Operations for Fleet Cyber Command/U.S. TENTH Fleet. He also served as the Commanding Officer and Program Manager of the Navy Cyber Warfare Development Group (NCWDG). He is a graduate of the Sellinger School of Business, Loyola University Maryland and the Cybersecurity and Policy Executive Program from the Harvard Kennedy School. He is also a graduate from the Naval Postgraduate School Monterey, CA, the United States Naval Academy, the National Defense University, and the Naval War College.

TOM YANOSCHIK is a graduate of the United States Military Academy and holds a Masters Degree from the University of Texas at Austin. He is a retired Artilleryman from United States Army. His assignments included service in cannon artillery and multiple launched rocket system units and as a Fire Support Officer in the 3rd Ranger Battalion. Tom currently serves as the SAIC Site Manager for the Modeling and Simulation Branch (MSB) of the Maneuver Battle Lab (MBL), Fort Benning, Georgia. He has participated in virtual and constructive experimentation both locally at the MBL and distributed through the Battle Lab Simulation Collaborative Environment (BLSCE). Tom is a certified Program Management Professional (PgMP), Project Management Professional (PMP) and Modeling and Simulation Professional (CMSP).

SIMONE M. YOUNGBLOOD is a member of the Johns Hopkins Applied Physic Laboratory's Principal Professional Staff. Leveraging an extensive background in simulation development and credibility assessment, Simone Youngblood has served as the DoD VV&A focal point for the past 25 years. Ms. Youngblood was the editor of the DoD VV&A Recommended Practices Guide and chaired the development of several VV&A related standards including: IEEE Standard 1278.4, IEEE Standard 1516.4 and MIL-STD 3022. Ms. Youngblood has served as the V&V and/or Accreditation agent for numerous M&S efforts that span a broad organizational spectrum to include: PEO IWS 1, the Defense Threat Reduction Agency (DTRA), the Domestic Nuclear Detection Office (DNDO), the U.S. Naval Air Systems Command, and the U.S. Army Medical Research and Material Command. Ms. Youngblood has a B.A. in mathematics as well as B.S. and M.S. degrees in computer science.

ROOM	SESSION/CHAIR	1400	1430	1500
W 307 A	**SIM 1: Lighting Up Cyber Across the Network** Chair: Ray Compton	22117 A Cyber Attack Forecasting System	22408 Simulated Cyber Analyst for Network Vulnerability Assessment	22299 The Software-Based Cyber-Physical Interface for ICS/SCADA: Delivering High Quality Cyber Training, Testing, and Mission Rehearsal Using Gaming Interfaces
W 307 B	**ECIT 1: Cloudy then Raining Bits and Bytes** Chair: Simon Skinner	22450 Hardware Optimization for Immersive Simulation & Photogrammetric Environment Generation	22438 Reducing Image Generator Footprint with Virtualization	22380 Building a Cloud-Native Toolset for Flexible, Continuous, Automated Simulation-Based Testing
W 307 C	**TR 1: Sharing the Global Training Ecosystem** Chair: Perry McDowell	22252 Development of a Searchable, Web-Based Repository for Sharing AR/VR Training Assets	22297 Cloud Full of Predators: Virtualizing RPAs for Constructed Training Exercises	22313 DoD Learning Enclave: Realizing the Defense-wide Learning Ecosystem
W 307 D	**HPAE 1: Combining Realities to Improve Performance** Chair: Jeffrey Raver	22376 The Effect of Environment Immersivity on Perspective-Taking Task Performance	22253 Mixed Reality and the Multi-Capable Aircraft Maintainer	22110 Resident or Virtual: The Impact of Foundational Education Modality on Army Instructor Job Performance Outcomes
W 308 A	**ED 1: Change at High Speed: Re-Modeling Learning in the Air Force** Chair: Sandra Velez	22256 The Future of U.S. Air Force Public Affairs Media Training Using Real-Play Immersive Technology	22265 A Multi-method Learning Framework for Multi-capable Airmen	22284 Modernizing High-end Flight Training for the Contested Fight
W 308 B	**ECIT 2: Unsupervised ML: Should We Trust the Machines?** Chair: Jeremy Lanman, Ph.D.	22127 Machine Learning at the Edge: UAV Automatic Takeoff and Landing	22173 The AI Director: From Document to Documentary	22184 Correlated Histogram Clustering

ROOM	SESSION/CHAIR	1600	1630	1700
W 307 A	**SIM 2: We're Only Humans** Chair: Gordon Gattie, Ph.D.	22174 Human Mobility 2049 – It's Time to "ACTT" (Aeronautical Conceptualization for Tomorrow's Transportation)	22331 Human Fatigue Modeling in Wargaming Simulations	22287 Human Behavior Models for Adaptive Training in Mixed Human-Agent Training Environments
W 307 B	**ECIT 3: Bootcamp for AIs** Chair: Marcus Boyd	22243 Trends in Machine Learning for Adaptive Automated Forces	22469 Peering through the Fog of War	22351 High-Level Orders for Intelligent Agents to Rapidly Generate a Realistic Battlespace
W 307 C	**TR 2: All Train, No Pain: The Future of Medical Simulation** Chair: Mark Parsons	22142 Virtual Advancement of Learning for Operational Readiness: Implementation and Transition of a VR Medical Simulation Capability for TCCC Responders	22182 A Vision for the Future of Military Medical Simulation	22308 Identifying Unique Physiological Indicators of Virtual Reality Sickness
W 307 D	**HPAE 2: Gaming: The Human** Chair: Benjamin Goldberg, Ph.D.	22398 Accessing the States of Enhanced Cognition in a Gaming Context	22410 Inferring Player and Team Models in a Minecraft Search-and-Rescue Task	22407 Exploring the Ability to Employ Virtual Entities Outdoors at Ranges Beyond 20 Meters
W 308 A	**ED 2: Solving Thorny Problems in Distributed Health Care** Chair: William Pike, Ph.D.	22228 Can You Standardize Military Health System Training and Education Data Collection While Allowing the Services to Control how Training is Administered and Conducted?	22342 Challenging the Status Quo in Nursing Education: Digital Transformation with Virtual Reality	
W 308 B	**PSMA 1: Technological Enhancement for Readiness — Finding the Balance** Chair: Robert Epstein	22123 Effectively Integrating Technology into Wargames	22283 Strategic Planning for Aircrew Readiness: How MS&T Must Be Balanced with Live-Fly Experiences to Support Future Mission Goals	

PAPERS

ROOM	SESSION/CHAIR	0830	0900	0930
W 307 A	**SIM 3: Intelligent Agents Make Smarter Models** Chair: Mark Covey	22234 Using Agent-Based Modeling and Simulation to Evaluate Collision Avoidance in UAS Swarms	22367 Multi-agent Reinforcement Learning with a Scout Mission Scenario in RIDE	22409 Autonomous Generation of Intelligent Patterns of Life
W 307 B	**ECIT 4: Interfacing with End Users: Use Cases in Practice** Chair: LCDR Michael Natali, Ph.D., USN	22304 An Approach and Three-Dimension Taxonomy for Adaptive User Interfaces	22378 Perspectives for the Future: Considerations for UAM Aircraft Information Requirements	22475 AI Enabled Maneuver Identification via the Maneuver ID Challenge
W 307 C	**TR 3: VR Training for the Wild Blue Yonder** Chair: Liz Gehr, Ph.D.	22116 Emulation of a Flying Boom Operator: The Dynamic Effects	22195 Quantitative Analysis of Virtual-Reality Device Effectiveness for Cockpit Procedures Training	22231 Pilot Training Transformation: Early Results and Lessons Learned
W 307 D	**HPAE 3: A Performance Problem: Look at the Data** Chair: Andrew Koch	22371 A Smart Approach for After Action Review Visualization and Analysis	22126 Designing HMI for Mission Assessment of Human-Machine Teaming	22289 Tackling the Human Performance Data Problem: A Case for Standardization
W 308 A	**ED 3: Data Driven Transformations** Chair: Aaron Presnall, Ph.D.	22133 Machine Learning for Automated Generation of Multiple Choice Test Items	22251 Redefining Journeyman and Master Craftsman Competency Models	22467 Implementation and Importance of Science of Learning Best Practices within Learning Organizations

ROOM	SESSION/CHAIR	1030	1100	1130
W 300–THEATRE	**Best Paper Session 1** Chair: Jennifer Winner	22190 Building a World With Deepfake Content – Who Needs Real Data?	22157 Semantic Fidelity Reckoning: Toward Normalized Simulation Interoperability in Digital Engineering	22461 Enhancing the Total Learning Architecture for Experiential Learning
W 307 A	**SIM 4: You Can't Handle the Ground Truth** Chair: Tim Woodard	22306 Adversarial Scene Generation for Virtual Validation of Off-Road Autonomous Vehicles	22273 Creating Common Ground: The Impact of Terrain on Distributed Mission Operations	22345 Using One World Terrain in Live Training Exercises
W 307 C	**TR 4: Getting Better All the Time: Strategies for Improving Individual Training** Chair: Jimmy Moore	22102 Machine Learning Aids Targeted Guidance to Trainee's Decision Making Performance	22460 Individualized Training – The Missing Link of True Training Effectiveness & Capability Sustainment	22437 Operational Assessment of a CV-22 Virtual Maintenance Training Solution
W 307 D	**HPAE 4: Gray's Autonomy** **Chair: Robert Wallace**	22328 Multimodal, Adaptable, and Dynamic Human Autonomy Team Relationships	22232 Automation and Augmentation on Human Performance in eVTOL Flight	22269 Modeling Operator Performance Considering Autonomy Level in Partially Autonomous Vehicles
W 308 A	**ED 4: Don't Be Lame Get Your Head in the Game** Chair: Marryam Chaudhry	22271 Influence of Physicality on Neuroplasticity and Cognitive Gains in Virtual Environments	22277 Can Priming Learners Prior to Learning Lead to Higher Learning Gain?	

ROOM	SESSION/CHAIR	1400	1430	1500
W 300–THEATRE	**Best Paper Session 2** Chair: Steve Godby	22218 How, When, and What to Adapt: Effective Adaptive Training through Game-Based Development Technology	22325 VR Training System for Rehabilitation and Compensatory Analysis after Stroke	22258 Automated Assessment of Team Performance Using Multimodal Bayesian Learning Analytics
W 307 A	**SIM 5: Say Digital Twins: I Dare You** Chair: Nathan Jones	22180 Geospatial Data Pipelines for Urban Digital Twin Applications	22242 An Immersive Content Creation Pipeline for Information Age Training	22166 Drone Control to Major Tom: Anomaly Detection and Digital Twins
W 307 B	**ECIT 5: Analysis Against Deep Threats and Adversarial Attacks** Chair: Monique Brisson	22203 Probabilistic Analysis for Structuring an Effective Defense against Adversarial Attacks	22230 The Use of AI/ML to Replicate Threat Behavior for Nonlinear Simulation	
W 307 C	**TR 5: Transforming Military Training through Immersive Technologies** Chair: Marwane Bahbaz	22164 Augmented Reality for Marine Fire Support Team Training	22285 Transforming Team Training: the Influence of Virtual Environment Features	22280 Blending AR and VR to Increase Situational Awareness during Training
W 307 D	**SIM 6: Simulation for Transforming Training** Chair: Toni Hawkins-Scribner, Ph.D.	22257 Streamlining Point Cloud Post-Processing Using Principal Component Variance, Distribution Evaluation, and Other Statistical Metrics	22137 Estimating Relative Combat Effectiveness Using Simulations	22189 Context-aware and Perceptually Realistic Synthetic Wrapping for Military Training and Exercises

ROOM	SESSION/CHAIR	1600	1630	1700
W 307 A	**SIM 7: Fueling Future Simulation** Chair: Huntley Bodden	22316 Modeling Fuel Replenishment Logistics and Impacts of Alternative Synthetic Fuels	22233 Driving Vehicle Maintenance Decisions using Predictive and Prognostic Maintenance Technology	22485 Sensor Fuzed Munition Modeling Framework
W 307 B	**ECIT 6: Improving Capabilities through AI** Chair: Ashley Howell	22394 Application of Artificial Intelligence for Dynamic Military Information Prioritization	22466 Designing a Rapid Adaptive Content Registry (RACR) for Adaptive Learning	22468 An Empirical Evaluation of the PERvasive Learning System (PERLS): Perceptions of Impact
W 307 D	**HPAE 5: Medical Mayhem and Meta Cognition** Chair: Paul Andrzejewski	22431 Adaptability for Human Performance Excellence: Updating the Conceptual Model of Expertise for the Modern Work Environment	22171 Eye Motion Tracking for Desktop-Based Medical Image Interpretation Training	22338 EEG Features for Assessing Skill Levels During Laparoscopic Surgical Training
W 308 A	**ECIT 7: XR: Improving the Way We Train** Chair: Evan Oster	22229 Translating AR/VR Research into Useable Information for Non-researchers	22281 Novel Method For Modular Integration of Tactile Input Devices into Portable AR/VR Training Systems	22357 Improve Aircraft Maintenance Sortie Production Rates with Mixed Reality and Artificial Intelligence Assistance in Maintenance Processes
W 308 B	**PSMA 2: Fragile Data, Fragile Behavior** Chair: Nick Giannias	22114 Step One: Install Plumbing – Criticality of Data Management for AI/ML	22124 State Antifragility: An Agent-Based Modeling Approach to Understanding State Behavior	

ROOM	SESSION/CHAIR	0830	0900	0930
W 307 A	**SIM 8: I, Too, Like to Live Dangerously** Chair: Jennifer Murphy, Ph.D.	22302 Cybernetic Distortion: Training in an Uncanny Virtual World	22405 Anomalous Responses to Highly Immersive Virtual Reality Displays	
W 307 B	**ECIT 9: Patterns of Life: Too Human for AI?** Chair: Tyson Kackley	22111 Detecting Patterns of Life Using Deep Learning	22235 Large-Scale Pattern of Life Simulation for Real Time Applications	22372 Achieving Intelligent Behavior in Multi-Domain Electromagnetic Warfare Environments Through Neural Network-Informed Search and Self-Play
W 307 C	**TR 6: NextGen Training** Chair: Mike Thorpe	22412 Directed Self-Regulated Learning Via Learning System Support	22427 Training Alchemy – Effectively Converting Traditional Training Content to Gold	22434 Game Jams – A New Form of Rapid Prototyping
W 307 D	**HPAE 6: Training Agents Into Allies** Chair: Abhishek Verma	22323 Human-Autonomy Teaming in Immersive Environments	22240 Virtual Reality Testbed for Multi-Human Multi-Agent Adaptive Teamwork and Training	22175 Social Media Synthesis Using AI for Decision Support
W 308 A	**ECIT 8: Potpourri** Chair: Erica Dretzka	22106 Recommendation System in an Integrated Digital Training Environment for Aircraft Maintenance	22381 Enhancing Warfighter Training and Performance using Motion Tape Elastic Fabric Sensors	
W 308 B	**PSMA 3: Training: Accelerate, Optimize, Transform** Chair: Paul Butler	22188 Enabling a Sharing Economy to Accelerate Change in Immersive Training	22213 Optimizing Simulators Logistics & Product Support	22340 Realizing Training Transformation through Feature Based Product Line Engineering

ROOM	SESSION/CHAIR	1030	1100	1130
W 307 A	**SIM 9: Modern Computing** Chair: Justin Tygart	22403 Real-time Simulation Executive Architecture and Subsystem Containerization	22448 Leveraging Parallel Processing to Accelerate Large-Scale Simulations on GPUs	22293 Dr. Strangemodel: Assessing Model Based Systems Engineering (MBSE) in the U.S Air Force Simulator Common Architecture Requirements and Standards (SCARS) Initiative – the Way Forward
W 307 B	**ECIT 10: The Three C's: Collaboration, Communication, and Cloud** Chair: Deri Draper-Amason, Ph.D.	22436 Improving Measurement of Trust Dynamics in Human-Agent Teams	Enhancing Wargaming Fidelity with Communication Modeling Services	Automated 3D Terrain Generation at Global Scale Based on Satellite Imagery and Cloud Computing
W 307 C	**TR 7: The Tipping Point: Learning Synergy** Chair: Nir Keren, Ph.D.	22324 Don't Judge a Book by its coVR: Learning and Training in Virtual Reality; the Effects of Two Levels of Immersion	22379 What's My Status? – Best Practices for Self-Led Debriefs	22459 Multimedia and Immersive Training Materials Influence Impressions of Learning but Not Learning Outcomes
W 307 D	**SIM 10: Test and Assess from Land, Sea, and Air** Chair: Jonathan Schlueter	22147 Simulation-based Approach to Synthesizing Maritime Interaction Scenarios for Testing Autonomy	22207 Development and Validation of a Rapid Threat Assessment Simulation	22449 LOD and Texture Mapping for Real-Time Radar Ground Map Simulation
W 308 B	**PSMA 4: It's about the Data — and the Standards Too!** Chair: David Roberts	22130 Exploiting Competence Data to Support Military HR System Management	22141 Analyzing the Motivation for Adaptive Instructional System (AIS) Standards	22202 Technology is the Easy Part: Transforming Business Processes for Interoperability

ROOM	SESSION/CHAIR	1330	1400	1430
W 307 A	**SIM 11: Blending Training Environments** Chair: Mike Fagundes	22161 Integration of Live and Synthetic Environments for Improved Cyberspace Training	22215 Simulation for Security Force Assistance Climate Adaptation Training	22361 A Federated Multimodal Simulation Environment for Studying Interactions between Different Modes of Travel
W 307 B	**ECIT 11: Enhanced Warfighting Through Automated Rendering, Assessment and Data Fusion** Chair: Beth Pettitt, Ph.D.	22282 Innovation, It's in VR: How the Spanish Military Health School is Revolutionizing Workforce Training with VR Immersive Rooms	22292 Automating Video After Action Reviews for Military Medical Training Exercises	22330 ORB-Recon: Live 3D Reconstruction from Wearable Video
W 307 C	**TR 8: Digital Threading the Needle** Chair: Scott Schutzmeister	22138 Data-Driven Behavioral Modelling of an Air Defence System	22201 The Simulation Fidelity (SiFi) Scale: A Task Centric Approach to Defining Fidelity Requirements for Research and Acquisition	22239 Using Digital Twins in Maintenance Operations and Training

BEST PAPERS

BP 1 WEDNESDAY, 30 NOVEMBER • 1030 • W300-THEATRE

BEST PAPER SESSION 1

Session Chair: Jennifer Winner, USAF
Session Deputy: Duke Tucker, Pinnacle Solutions

22190 Building a World With Deepfake Content – Who Needs Real Data?
Graham Long, Thales

22157 Semantic Fidelity Reckoning: Toward Normalized Simulation Interoperability in Digital Engineering
Ric Roca, Daniel Winton, The Aerospace Corporation

22461 Enhancing the Total Learning Architecture for Experiential Learning
Mike Hernandez, Robby Robson, Ph.D., Timothy Welch, Fritz Ray, Eduworks Corporation; Benjamin Goldberg, Ph.D., U.S. Army DEVCOM SC STTC; Kevin Owens, Applied Research Laboratories: The University of Texas at Austin; Shelly Blake-Plock, Yet Analytics, Inc.

BP 2 WEDNESDAY, 30 NOVEMBER • 1400 • W300-THEATRE

BEST PAPER SESSION 2

Session Chair: Steve Godby, USAF
Session Deputy: Brian Overy, Aechelon Technology, Inc.

22218 How, When, and What to Adapt: Effective Adaptive Training through Game-Based Development Technology
Summer Rebensky, Samantha Perry, Aptima, Inc.; Wink Bennett, Ph.D., Air Force Research Laboratory (711 HPW/RHW)

22325 VR Training System for Rehabilitation and Compensatory Analysis after Stroke
Gabriel Cyrino, Najara Zago, Roberta Aramaki, Lísias Camargo, Alexandre Cardoso, Edgard Lamounier, Alcimar Soares, Federal University of Uberlândia

22258 Automated Assessment of Team Performance Using Multimodal Bayesian Learning Analytics
Caleb Vatral, Gautam Biswas, Naveeduddin Mohammed, Institute for Software Integrated Systems – Vanderbilt University; Benjamin Goldberg, Ph.D., U.S. Army DEVCOM SC STTC

EDUCATION

ED 1 TUESDAY, 29 NOVEMBER • 1400 • W308A

CHANGE AT HIGH SPEED: RE-MODELING LEARNING IN THE AIR FORCE

Session Chair: Sandra Velez, Arorae Corporation
Session Deputy: Josh Looper, AFLCMC/WLZT

22256 The Future of U.S. Air Force Public Affairs Media Training Using Real-Play Immersive Technology
Lori Hodge, U.S. Air Force; Andrew S. Clayton, Air University

22265 A Multi-Method Learning Framework for Multi-Capable Airmen
Richard B. Ayers, Booz Allen Hamilton

22284 Modernizing High-End Flight Training for the Contested Fight
JJ Walcutt, Ph.D., Jay Spohn, SAIC; Thomas Harley, USAF

ED 2 TUESDAY, 29 NOVEMBER • 1600 • W308A

SOLVING THORNY PROBLEMS IN DISTRIBUTED HEALTH CARE

Session Chair: William Pike, Ph.D., U.S. Army DEVCOM SC STTC
Session Deputy: Tim Cooley, Dynamx Consulting

22228 Can you Standardize Military Health System Training and Education Data Collection While Allowing the Services to Control how Training is Administered and Conducted?
Erin Baker, Amanda van Lamsweerde, NAWCTSD

22342 Challenging the Status Quo in Nursing Education: Digital Transformation with Virtual Reality.
Juliet Kolde, Jeffrey Olsen, Nightingale College; Jack Pottle, Molly Schleicher, Oxford Medical Simulation

ED 3 WEDNESDAY, 30 NOVEMBER • 0830 • W308A

DATA DRIVEN TRANSFORMATIONS

Session Chair: Aaron Presnall, Ph.D., Jefferson Institute
Session Deputy: Steve Monson, The Boeing Company

22133 Machine Learning for Automated Generation of Multiple Choice Test Items
Sowmya Ramachandran, Jeremy Ludwig, Stottler Henke Associates

22251 Redefining Journeyman and Master Craftsman Competency Models
Ted Dennis, TED text LLC; Deri Draper-Amason, Ph.D., Katherine Smith, Jessica Johnson, Virginia Modeling, Analysis & Simulation Center – Old Dominion University

22467 Implementation and Importance of Science of Learning Best Practices within Learning Organizations
Robert Siegle, Scotty Craig, Arizona State University; Noah Schroeder, Wright State University

ED 4 WEDNESDAY, 30 NOVEMBER • 1030 • W308A

DON'T BE LAME GET YOUR HEAD IN THE GAME

Session Chair: Marryam Chaudhry, XR2LEAD
Session Deputy: Randy Billard, Virtual Marine

22271 Influence of Physicality on Neuroplasticity and Cognitive Gains in Virtual Environments
Leslie Van Peteghem, Edwards AFB; Andrew S. Clayton, Air University

22277 Can Priming Learners Prior to Learning Lead to Higher Learning Gain?
Tavion Yrjo, Nir Keren, Ph.D., Angela Leek, Peter Evans, Andrew Lawson, Iowa State University

EMERGING CONCEPTS & INNOVATIVE TECHNOLOGIES

ECIT 1 TUESDAY, 29 NOVEMBER • 1400 • W307B

CLOUDY THEN RAINING BITS AND BYTES

Session Chair: Simon Skinner, Thales Training and Simulation
Session Deputy: Neil Stagner, Marine Corps Systems Command

22450 Hardware Optimization for Immersive Simulation & Photogrammetric Environment Generation
Jonathan Hawes, Karl Rosenberger, RAVE Computer

22438 Reducing Image Generator Footprint with Virtualization
Matt Moy, RAVE Computer

22380 Building a Cloud-Native Toolset for Flexible, Continuous, Automated Simulation-Based Testing
Jeremy Loomis, Alex Matthews, NextGenFederal Systems

ECIT 2 TUESDAY, 29 NOVEMBER • 1400 • W308B

UNSUPERVISED ML: SHOULD WE TRUST THE MACHINES?

Session Chair: Jeremy Lanman, Ph.D., U.S. Army PEO STRI
Session Deputy: Shannon Craig, MAK Technologies

22127 Machine Learning at the Edge: UAV Automatic Takeoff and Landing
Anastacia MacAllister, Ph.D., Rey Nicolas, General Atomics; Alicja Kwasniewska, SIMAai

22173 The AI Director: From Document to Documentary
David Noever, Joseph Regian, PeopleTec, Inc.

22184 Correlated Histogram Clustering
Randal Allen, Ph.D., Brice Brosig, Lone Star Analysis

ECIT 3 TUESDAY, 29 NOVEMBER • 1600 • W307B

BOOTCAMP FOR AIS

Session Chair: Marcus Boyd, CAE USA
Session Deputy: Eugene Pursel, USSTRATCOM

22243 Trends in Machine Learning for Adaptive Automated Forces
Austin Starken, United States Army; Sean Mondesire, Bruce Caulkins, Annie Wu, University of Central Florida

22469 Peering through the Fog of War
Deanna Franceschini, Cole Engineering Services, Inc.; Song Park, Anne Logie, Manuel Vindiola, Priya Narayanan, DEVCOM Army Research Lab

22351 High-Level Orders for Intelligent Agents to Rapidly Generate a Realistic Battlespace
Brian Mills, Robert Ducharme, CAE USA Defense and Security

ECIT 4 WEDNESDAY, 30 NOVEMBER • 0830 • W307B

INTERFACING WITH END USERS: USE CASES IN PRACTICE

Session Chair: LCDR Michael Natali, Ph.D., USN, NAWCTSD
Session Deputy: John Killilea, Ph.D., NAWCTSD

22304 An Approach and Three-Dimension Taxonomy for Adaptive User Interfaces
Spencer Kohn, Athena Johnson, Robert Jacobs, Perceptronics Solutions; Ewart de Visser, De Visser Research, LLC;

22378 Perspectives for the Future: Considerations for UAM Aircraft Information Requirements
Maria Chaparro Osman, Maureen Namukasa, Kendall Carmody, Bhoomin Chauhan, Gervauhgn Berkel, Meredith Carroll, Ph.D., Florida Institute of Technology

22475 AI Enabled Maneuver Identification via the Maneuver ID Challenge
Jeremy Kepner, MIT Lincoln Laboratory Supercomputing Center Kaira Samuel, Yan Wu, Morgan Schaefer, MIT; Kyle "Gouge" McAlpin, MIT USAF AI Accelerator; Matthew LaRosa, Devin Wasilefsky, USAFA; Brandon Swenson, USAF; Dan Zhao, NYU

ECIT 5 WEDNESDAY, 30 NOVEMBER • 1400 • W307B

ANALYSIS AGAINST DEEP THREATS AND ADVERSARIAL ATTACKS

Session Chair: Monique Brisson, AFRL
Session Deputy: Eugene Pursel, USSTRATCOM

22203 Probabilistic Analysis for Structuring an Effective Defense against Adversarial Attacks
Nickolas Vlahopoulos, University of Michigan; Syed Mohammad, Ph.D., DHS Science and Technology Directorate; Geng Zhang, Sungmin Lee, Michigan Engineering Services

22230 The Use of AI/ML to Replicate Threat Behavior for Nonlinear Simulation
Charles Etheredge, William Marx, Kyle Russell, Timothy Hill, Daron Drown, Intuitive Research and Technology

ECIT 6 WEDNESDAY, 30 NOVEMBER • 1600 • W307B

IMPROVING CAPABILITIES THROUGH AI

Session Chair: Ashley Howell, ADL Initiative
Session Deputy: Wesley Fine, Momentum Aviation Group (MAG), Inc.

22394 Application of Artificial Intelligence for Dynamic Military Information Prioritization
Jennifer M. Riley, Ph.D., Timothy Whalen, Audrey Zlatkin, Design Interactive, Inc.

22466 Designing a Rapid Adaptive Content Registry (RACR) for Adaptive Learning
Benjamin Nye, Ph.D., Aditya Jain, Dilan Ramirez, Daniel Auerbach, Mark Core, Ph.D., William Swartout, Ph.D., University of Southern California, Institute for Creative Technologies

22468 An Empirical Evaluation of the PERvasive Learning System (PERLS): Perceptions of Impact
Scotty Craig, Wendy Barnard, Arizona State University; Dawn Riddle, Ph.D., Laura Milham, Ph.D., Karen Gordon, Advanced Distributed Learning Initiative

ECIT 7 WEDNESDAY, 30 NOVEMBER • 1600 • W308A

XR: IMPROVING THE WAY WE TRAIN

Session Chair: Evan Oster, Aptima, Inc.
Session Deputy: Johnny Powers, LMCO

22229 Translating AR/VR Research into Useable Information for Non-researchers
James Belanich, Ph.D., Frank Moses, Ph.D., Emily Fedele, Institute for Defense Analyses; Brian Flowers, Susannah Hoch, Aptima, Inc.; Wink Bennett, Ph.D., Air Force Research Laboratory (711 HPW/RHW)

22281 Novel Method for Modular Integration of Tactile Input Devices into Portable AR/VR Training Systems
Jad Meouchy, Suzanne Borders, BadVR

22357 Improve Aircraft Maintenance Sortie Production Rates with Mixed Reality and Artificial Intelligence Assistance in Maintenance Processes
Dane Stevenson, USAF

ECIT 8 THURSDAY, 1 DECEMBER • 0830 • W308A

POTPOURRI

Session Chair: Erica Dretzka, OSD
Session Deputy: Monique Brisson, AFRL

22106 Recommendation System in an Integrated Digital Training Environment for Aircraft Maintenance
Dirk Thijssen, Rik Bosma, Netherlands Aerospace Center (NLR)

22381 Enhancing Warfighter Training and Performance using Motion Tape Elastic Fabric Sensors
Kenneth Loh, Ph.D., Shih-Chao Huang, Yun-An Lin, UC San Diego

ECIT 9 THURSDAY, 1 DECEMBER • 0830 • W307B

PATTERNS OF LIFE: TOO HUMAN FOR AI?

Session Chair: Tara Kilcullen, ZYGOS Consulting
Session Deputy: Tyson Kackley, MCSC DC, SEAL, M&S Division

22111 Detecting Patterns of Life Using Deep Learning
Javier Garza, Patrick Rupp Lockheed Martin, Anastacia MacAllister, Ph.D., General Atomics Aeronautical Systems, Inc.

22235 Large-Scale Pattern of Life Simulation for Real Time Applications
Nick Giannias, Evan Harris, CAE; Stijn Herfst, uCrowds; Roland Geraerts, Utrecht University; Alistair Thorpe; Aidan Hobson Sayers, Hadean Supercomputing

22372 Achieving Intelligent Behavior in Multi-Domain Electromagnetic Warfare Environments Through Neural Network-Informed Search and Self-Play
Michael Ganger, Gerardo Leal, General Dynamics

ECIT 10 THURSDAY, 1 DECEMBER • 1030 • W307B

THE THREE C'S: COLLABORATION, COMMUNICATION, AND CLOUD

Session Chair: Deri Draper-Amason, Ph.D., Virginia Modeling, Analysis & Simulation Center – Old Dominion University
Session Deputy: Mike Lokuta, CAE

22436 Improving Measurement of Trust Dynamics in Human-Agent Teams
Cherrise Ficke, Kendall Carmody, Daniel Nguyen, Isabella Piasecki, Arianna Addis, Mohammed Akib, Amanda Thayer, Ph.D., Jessica Wildman, Meredith Carroll, Ph.D., Florida Institute of Technology

22353 Enhancing Wargaming Fidelity with Communication Modeling Services
Ha Duong, Keysight Technologies; Jeffrey Weaver, SCALABLE Network Technologies

22454 Automated 3D Terrain Generation at Global Scale Based on Satellite Imagery and Cloud Computing
Arno Hollosi, Thomas Menzel-Berger, Hannes Walter, Daniel Lahm, Blackshark.ai GmbH

ECIT 11 THURSDAY, 1 DECEMBER • 1330 • W307B

ENHANCED WARFIGHTING THROUGH AUTOMATED RENDERING, ASSESSMENT AND DATA FUSION

Session Chair: Beth Pettitt, Ph.D., U.S. Army CCDC SC STTC
Session Deputy: Luis Velazquez, Marine Corps Systems Command

22282 Innovation, It's in VR: How the Spanish Military Health School is Revolutionizing Workforce Training with VR Immersive Rooms
David Moreno, Maria Madarieta, Virtualware; Valentín Gonzalez Alonso, Antonio del Real Colomo, EMISAN Spanish Military Health School

22292 Automating Video After Action Reviews for Military Medical Training Exercises
Nicholas Walczak, Brian VanVoorst, Elias Noyes, Raytheon BBN Technologies; Mark Mazzeo, Jack Norfleet, Ph.D., U.S. Army DEVCOM SC STTC

22330 ORB-Recon: Live 3D Reconstruction from Wearable Video
David Ramirez, General Dynamics Mission Systems

HUMAN PERFORMANCE, ANALYSIS AND ENGINEERING

HPAE 1 TUESDAY, 29 NOVEMBER • 1400 • W307D

COMBINING REALITIES TO IMPROVE PERFORMANCE

Session Chair: Jeffrey Raver, SAIC
Session Deputy: Tyler Gates, Brightline Interactive

22376 The Effect of Environment Immersivity on Perspective-Taking Task Performance
Michael Kozhevnikov, Norfolk State University; Maria Kozhevnikov, Harvard Medical School

22253 Mixed Reality and the Multi-Capable Aircraft Maintainer
Thomas O'Brien, United States Air Force

22110 Resident or Virtual: The Impact of Foundational Education Modality on Army Instructor Job Performance Outcomes
Christina Parker, USAACE (U.S. Army Aviation Center of Excellence) Leonard Momeny, WOCC (Warrant Officer Career College); Davin Knolton, ACCMA (Army Civilian Career Management Activity

HPAE 2 TUESDAY, 29 NOVEMBER • 1600 • W307D

GAMING: THE HUMAN

Session Chair: Benjamin Goldberg, Ph.D., U.S. Army DEVCOM SC STTC
Session Deputy: Samantha Dubrow, Ph.D., The MITRE Corporation

22398 Accessing the States of Enhanced Cognition in a Gaming Context
Maria Kozhevnikov, Harvard Medical School

22410 Inferring Player and Team Models in a Minecraft Search-and-Rescue Task
David Pynadath, Volkan Ustun, USC Institute for Creative Technologies; Nikolos Gurney; Stacy Marsella; Hala Mostafa, Raytheon Technologies Research Center; Pedro Sequeira; Peggy Wu

22407 Exploring the Ability to Employ Virtual Entities Outdoors at Ranges Beyond 20 Meters
John Morris, United States Army; Perry McDowell, MOVES Institute; Quinn Kennedy, Clay Greunke, Naval Postgraduate School; Kevin Hernandez, Michael Maulbeck, Virtual Reality Rehab

HPAE 3 WEDNESDAY, 30 NOVEMBER • 0830 • W307D

A PERFORMANCE PROBLEM: LOOK AT THE DATA

Session Chair: Andrew Koch, NAWCAD
Session Deputy: Klainie Nedoroscik, Dignitas

22371 A Smart Approach for After Action Review Visualization and Analysis
Christopher Young, Lockheed Martin Rotary and Mission Systems; Richard Schaffer, Lockheed Martin; Jennifer Phillips, Ph.D., Allison Hancock, Ph.D., Marc Pfahler, Cognitive Performance Group; Marcus Mainz, Luke Cardelli, Breck Perry, Covan Group, LLC; Gwen Campbell, Ph.D., Audrey Zlatkin, Costas Koufogazos, Design Interactive, Inc.

22126 Designing HMI for Mission Assessment of Human-Machine Teaming
Amy Dideriksen, Ph.D., Collins Aerospace; Adriana Avakian, TheIncLab; Thomas Schnell, Ph.D., University of Iowa Operator Performance Lab

22289 Tackling the Human Performance Data Problem: A Case for Standardization
Alexxa Bessey, Luke Waggenspack, Brian Schreiber, Aptima, Inc.; Wink Bennett, Ph.D., Air Force Research Laboratory (711 HPW/RHW)

HPAE 4 WEDNESDAY, 30 NOVEMBER • 1030 • W307D

GRAY'S AUTONOMY

Session Chair: Robert Wallace, 29 Training System Squadron
Session Deputy: Sean Carey, USAF/AMC/A3TD

22328 Multimodal, Adaptable, and Dynamic Human Autonomy Team Relationships
Daniel Barber, Lauren Reinerman-Jones, Ryan Wohleber, Jeremiah Folsom-Kovarik, Soar Technology, Inc.

22232 Automation and Augmentation on Human Performance in eVTOL Flight
Samantha Emerson, Cait Rizzardo, Kent Halverson, Aptima, Inc.; Maria Chaparro Osman, Florida Institute of Technology; Steve Ellis, Andrew Anderson, Don Haley, AETC Det 62

22269 Performance Considering Autonomy Level in Partially Autonomous Vehicles
Jessie E. Cossitt, Ph.D., Viraj R. Patel, Daniel W. Carruth, Ph.D., Victor J. Paul, Cindy L. Bethel, Ph.D., Mississippi State University

HPAE 5 WEDNESDAY, 30 NOVEMBER • 1600 • W307D

MEDICAL MAYHEM AND META COGNITION

Session Chair: Paul Andrzejewski, HigherEchelon, Inc.
Session Deputy: Susan Harkrider, Director, Modeling and Simulation Division, Night Vision & Electronic Sensors Directorate (NVESD)

22431 Adaptability for Human Performance Excellence: Updating the Conceptual Model of Expertise for the Modern Work Environment
Coreen Harada, Ashley Inbody, Andrea Ray, SAIC

22171 Eye Motion Tracking for Desktop-Based Medical Image Interpretation Training
Chanler Cantor, Matthew Schultz, William Marx, Intuitive Research and Technology Corporation; Junjian Huang, Andrew Smith, University of Alabama at Birmingham

22338 EEG Features for Assessing Skill Levels During Laparoscopic Surgical Training
Takahiro Manabe, Yaoyu Fu, Anirban Dutta, University at Buffalo SUNY Pushpinder Walia; Xavier Intes; Suvranu De; Lora Cavuoto

HPAE 6 THURSDAY, 1 DECEMBER • 0830 • W307D

TRAINING AGENTS INTO ALLIES

Session Chair: Abhishek Verma, Airbus
Session Deputy: Tiffany Peterson, Arorae Corporation

22323 Human-Autonomy Teaming in Immersive Environments
Haochen Wu, Bogdan Epureanu, The University of Michigan, Ann Arbor; Charne Folks; Jonathon Smereka; A. Emrah Bayrak

22240 Virtual Reality Testbed for Multi-Human Multi-Agent Adaptive Teamwork and Training
Joseph Salisbury, Ross Bobb, Virgil Barnard, William Casebeer, Ph.D., David Huberdeau, Riverside Research Institute

22175 **Social Media Synthesis using AI for Decision Support**
Evan Harris, Maher Chaouachi, Martin Durocher, Alex Emirov, Nick Giannias, Jaspreet Kaur, Rakesh Tiwari, CAE

POLICY, STANDARDS, MANAGEMENT AND ACQUISITION

PSMA 1 TUESDAY, 29 NOVEMBER • 1600 • W308B

TECHNOLOGICAL ENHANCEMENT FOR READINESS - FINDING THE BALANCE

Session Chair: Robert Epstein, Leidos
Session Deputy: Syed Mohammad, Ph.D., DHS Science and Technology Directorate

22123 **Effectively Integrating Technology into Wargames**
Jennifer McArdle, CMSP, Eric Hilmer, Improbable

22283 **Strategic Planning for Aircrew Readiness: How MS&T Must be Balanced with Live-fly Experiences to Support Future Mission Goals**
JJ Walcutt, Ph.D., Clay Percle, William Mott, Merrick Green, SAIC; Thomas Harley, USAF; Jay Spohn, SAIC

PSMA 2 WEDNESDAY, 30 NOVEMBER • 1600 • W308B

FRAGILE DATA, FRAGILE BEHAVIOR

Session Chair: Nick Giannias, CAE
Session Deputy: Gregory Kratzig, Ph.D., Royal Canadian Mounted Police

22114 **Step One: Install Plumbing – Criticality of Data Management for AI/ML**
Anastacia MacAllister, Ph.D., General Atomics; Daniel Javorsek, Ph.D., USAF AFOTEC DET 6/CC; Louis Dube, USAF AFOTEC DET 6/SD; Patrick Rupp, Lockheed Martin

22124 **State Antifragility: An Agent-Based Modeling Approach to Understanding State Behavior**
Rebecca Law, Ph.D., Research Innovations, Inc.

PSMA 3 THURSDAY, 1 DECEMBER • 0830 • W308B

TRAINING: ACCELERATE, OPTIMIZE, TRANSFORM

Session Chair: Paul Butler, The MITRE Corporation
Session Deputy: Marco Lassus, U.S. Air Force Simulators Division

22188 **Enabling a Sharing Economy to Accelerate Change in Immersive Training**
Krissa Watry, Christina Padron, Victoria Claypoole, Ph.D., Stephen Hopp, Dynepic, Inc.; Margaret Merkle, AFLCMC/WNS

22213 **Optimizing Simulators Logistics & Product Support**
Richard Swain, Joseph Gerling, Christal Green, Christopher Covert, Michael Baldwin, Tonita Davis, U.S. Air Force Simulators Division

22340 **Realizing Training Transformation through Feature Based Product Line Engineering**
Brett Tainter, Boeing; Randy Pitz, BigLever Software

PSMA 4 THURSDAY, 1 DECEMBER • 1030 • W308B

IT'S ABOUT THE DATA - AND THE STANDARDS TOO!

Session Chair: David Roberts, Transform Affinity
Session Deputy: Kevin Gupton, Applied Research Laboratories: The University of Texas at Austin

22130 **Exploiting Competence Data to Support Military HR System Management**
Commander Robert Floyd, Royal Navy

22141 **Analyzing the Motivation for Adaptive Instructional System (AIS) Standards**
Robert Sottilare, Ph.D., Soar Technology, Inc.

22202 **Technology is the Easy Part: Transforming Business Processes for Interoperability**
Ashley Howell, Andy Johnson, The Advanced Distributed Learning Initiative (SETA Contractor); Lockwood Hills; Anne Marie Dinardo, The Advanced Distributed Learning Initiative (SETA Contractor); SimIS; Sae Schatz, Ph.D., Former ADL Director; Lora Muchmore, Department of Defense Chief Information Officer (DoD CIO)

SIMULATION

SIM 1 TUESDAY, 29 NOVEMBER • 1400 • W307A

LIGHTING UP CYBER ACROSS THE NETWORK

Session Chair: Ray Compton, LMI
Session Deputy: Miranda Frost, LogiCore Corporation

22117 **A Cyber Attack Forecasting System**
C Savell, GCAS Incorporated; Ambrose Kam, Lockheed Martin; Brett Tucker, Nataliya Shevchenko, Carnegie Mellon University - Software Engineering Institute – CERT Division

22408 **Simulated Cyber Analyst for Network Vulnerability Assessment**
Ning Wang, University of Southern California; Eric Holder, U.S. Army Research Laboratory

22299 **The Software-Based Cyber-Physical Interface for ICS/SCADA: Delivering High Quality Cyber Training, Testing, and Mission Rehearsal using Gaming Interfaces**
Scott Thompson, Rembrandt Bukowski, CACI, Inc.

SIM 2 TUESDAY, 29 NOVEMBER • 1600 • W307A

WE'RE ONLY HUMANS

Session Chair: Gordon Gattie, Ph.D., NAVSEA
Session Deputy: Thomas Kehr, Ph.D., CESI

22174 **Human Mobility 2049 – It's Time to "ACTT" (Aeronautical Conceptualization for Tomorrow's Transportation)**
Kevin Hulme, Ph.D., CMSP, The Stephen Still Institute for Sustainable Transportation and Logistics (SSISTL)

22331 **Human Fatigue Modeling in Wargaming Simulations**
Megan Morris, AFRL; Bella Veksler, Tier1 Performance Solutions; Birken Noesen, Cubic; Jessica Tuttle, University of Dayton Research Institute; Bruce Carpenter, RCG; Phitina Tran, Glenn Gunzelmann, Ph.D., AFRL

22287 **Human Behavior Models for Adaptive Training in Mixed Human-Agent Training Environments**
Joost van Oijen, Royal Netherlands Aerospace Centre

SIM 3 WEDNESDAY, 30 NOVEMBER • 0830 • W307A

INTELLIGENT AGENTS MAKE SMARTER MODELS

Session Chair: Mark Covey, Krush Acquisitions
Session Deputy: Jennifer Riley, Ph.D., Design Interactive, Inc.

22234 **Using Agent-Based Modeling and Simulation to Evaluate Collision Avoidance in UAS Swarms**
Luis Osegueda, Mustafa Akbas, Embry-Riddle Aeronautical University

22367 Multi-agent Reinforcement Learning with a Scout Mission Scenario in RIDE
Volkan Ustun, Rajay Kumar, Lixing Liu, USC Institute for Creative Technologies; Nicholas Patitsas, 22nd Marine Expeditionary Unit

22409 Autonomous Generation of Intelligent Patterns of Life
David Pynadath, Ali Jalal-Kamali, USC Institute for Creative Technologies

SIM 4 WEDNESDAY, 30 NOVEMBER • 1030 • W307A

YOU CAN'T HANDLE THE GROUND TRUTH

Session Chair: Tim Woodard, NVIDIA
Session Deputy: Eric Jarabak, PM TRASYS

22306 Adversarial Scene Generation for Virtual Validation of Off-Road Autonomous Vehicles
Ted Sender, Ram Vasudevan, Bogdan Epureanu, University of Michigan; Mark Brudnak, Ground Vehicle Systems Center; Reid Steiger, Ford Motor Company

22273 Creating Common Ground: The Impact of Terrain on Distributed Mission Operations
Emilie Reitz, Joint Staff, J6; Kevin Seavey, JS J6 Joint Fires Integration Division; Marcus Young, USSOCOM AFSOC SOJ2/J3 TE-S; Leonas Venckus, U.S. Special Operations Command, J3 Operations Directorate, Training and Education Division/Mission Preparation Section; Justin Wright, Huntington Ingalls Industries

22345 Using One World Terrain in Live Training Exercises
Marwane Bahbaz, Tagg LeDuc, U.S. Army PEO STRI; Julie Kent, The MITRE Corporation; Clayton Burford, Gage Jenners, Keith Nielsen, Simulation & Training Technology Center (STTC)

SIM 5 WEDNESDAY, 30 NOVEMBER • 1400 • W307A

SAY DIGITAL TWINS: I DARE YOU

Session Chair: Nathan Jones, Problem Solutions, LLC
Session Deputy: Sara Dechmerowski, Design Interactive, Inc.

22180 Geospatial Data Pipelines for Urban Digital Twin Applications
Joanna Hobbins, Nick Giannias, CAE; Melisa Kopan; Simon Merrick; Ralph Coleman; Sean Lilley, Shehzan Mohammed, Cesium

22242 An Immersive Content Creation Pipeline for Information Age Training
Deepak Haste; Sudipto Ghoshal, Qualtech Systems, Inc.; Valarie Yerdon, Maartje Hidalgo, Jeffrey Beaubien, Ph.D., Aptima, Inc.; Jason Wong, Naval Information Warfare Center Pacific

22166 Drone Control to Major Tom: Anomaly Detection and Digital Twins
Eeshaan Verma, Thales UK

SIM 6 WEDNESDAY, 30 NOVEMBER • 1400 • W307D

SIMULATION FOR TRANSFORMING TRAINING

Session Chair: Toni Hawkins-Scribner, Ph.D., Air University/Squadron Officer School
Session Deputy: Jacob Miracle, DAF CMSO

22257 Streamlining Point Cloud Post-Processing Using Principal Component Variance, Distribution Evaluation, and Other Statistical Metrics
Michael Holm, Jack Miller, Eliot Winer, Ph.D., Iowa State University; Adam Kohl, Virtual Reality Applications Center

22137 Estimating Relative Combat Effectiveness Using Simulations
Per-Idar Evensen, Marius Halsør, Dan Helge Bentsen, Norwegian Defence Research Establishment (FFI)

22189 Context-aware and Perceptually Realistic Synthetic Wrapping for Military Training and Exercises
Olaf Visker, Annemarie Burger, Anne Merel Sternheim, Ruben Smelik, Remco van der Meer, TNO

SIM 7 WEDNESDAY, 30 NOVEMBER • 1600 • W307A

FUELING FUTURE SIMULATION

Session Chair: Huntley Bodden, Marine Corps Logistics Command (MARCORLOGCOM)
Session Deputy: Tammie Smiley, Trideum Corporation

22316 Modeling Fuel Replenishment Logistics and Impacts of Alternative Synthetic Fuels
Brant Horio, Stephanie Brown, Lucas McCabe, Simon Whittle, Michael Anderson, Chris Johnson, Stuart Funk, LMI

22233 Driving Vehicle Maintenance Decisions Using Predictive and Prognostic Maintenance Technology
Diana Perera, Kyle Whirlow, Timothy Whalen, Claire Hughes, James Cooper, Design Interactive, Inc.

22485 Sensor Fuzed Munition Modeling Framework
Cesar Sosa, Antonio Aguirre, U.S. Army – Picatinny Arsenal

SIM 8 THURSDAY, 01 DECEMBER • 0830 • W307A

I, TOO, LIKE TO LIVE DANGEROUSLY

Session Chair: Jennifer Murphy, Ph.D., Quantum Improvements Consulting
Session Deputy: Samuel Halverson, L3Harris Technologies

22302 Cybernetic Distortion: Training in an Uncanny Virtual World
Brian Flowers, Summer Rebensky, Ph.D., Michael Keeney, Jeffrey Beaubien, Ph.D., Aptima, Inc.

22405 Anomalous Responses to Highly Immersive Virtual Reality Displays
Angus Rupert, Ph.D., Embry-Riddle Aeronautical University; John Brill, Ph.D., AFRL

SIM 9 THURSDAY, 1 DECEMBER • 1030 • W307A

MODERN COMPUTING

Session Chair: Justin Tygart, PM TRASYS
Session Deputy: Petra Robinson, NAVSEA HQ

22403 Real-time Simulation Executive Architecture and Subsystem Containerization
Zack Kirkendoll, CymSTAR

22448 Leveraging Parallel Processing to Accelerate Large-Scale Simulations on GPUs
Brad Suchoski, Heidi Gurung, Steve Stage, Sid Baccam, IEM

22293 Dr. Strangemodel: Assessing Model Based Systems Engineering (MBSE) in the U.S. Air Force Simulator Common Architecture Requirements and Standards (SCARS) Initiative – the Way Forward
William Riggs, Science Applications International Corporation; George Ayers, AFLCMC/WNS; Joseph Doak, Austin Abraham, Tangram Flex, Inc.

SIM 10 THURSDAY, 1 DECEMBER • 1030 • W307D

TEST AND ASSESS FROM LAND, SEA, AND AIR

Session Chair: Jonathan Schlueter, Schlumberger
Session Deputy: Jeff Ruediger, Overmatch, Inc.

22147 Simulation-based Approach to Synthesizing Maritime Interaction Scenarios for Testing Autonomy
Benjamin Hargis, Yiannis Papelis, Old Dominion University

22207 Development and Validation of a Rapid Threat Assessment Simulation
Nickolas Vlahopoulos, University of Michigan; Syed Mohammad, Ph.D., DHS Science and Technology Directorate; Sungmin Lee, Geng Zhang, Michigan Engineering Services

22449 LOD and Texture Mapping for Real-Time Radar Ground Map Simulation
Radu Visina, Jameson Bergin, David Kirk, Information Systems Laboratories; Peter Skangos, ISL, Inc.

SIM 11 THURSDAY, 1 DECEMBER • 1330 • W307A

BLENDING TRAINING ENVIRONMENTS

Session Chair: Mike Fagundes, DEVCOM Aviation and Missile Center / USINDOPACOM J321
Session Deputy: Miranda Frost, LogiCore Corporation

22161 Integration of Live and Synthetic Environments for Improved Cyberspace Training
James Geddes, Michael Boyce, Ph.D., U.S. Army DEVCOM SC STTC; Omar Hasan, Jeffrey Welch, Dignitas Technologies, LLC

22215 Simulation for Security Force Assistance Climate Adaptation Training
Neil Sleevi, U.S. Army Security Force Assistance Proponent Howard Lee, Threattec, LLC; Melvin Cape, TRADOC G-2, Modeling and Simulation Office (M&SO) and Operational Environment Laboratory (OEL)

22361 A Federated Multimodal Simulation Environment for Studying Interactions between Different Modes of Travel
Jacklin Stonewall, Michael Dorneich, Eliot Winer, Ph.D., Jack Miller, Vijay Kalivarapu, Stephen Gilbert, Anuj Sharma, Iowa State University; Adam Kohl, Virtual Reality Applications Center

TRAINING

TR 1 TUESDAY, 29 NOVEMBER • 1400 • W307C

SHARING THE GLOBAL TRAINING ECOSYSTEM

Session Chair: Perry McDowell, MOVES Institute
Session Deputy: Koren Odermann, Cubic Mission and Performance Solutions

22252 Development of a Searchable, Web-Based Repository for Sharing AR/VR Training Assets
Jeffrey Beaubien, Ph.D., Aptima, Inc.; Wink Bennett, Ph.D., Air Force Research Laboratory (711 HPW/RHW); Richard B. Ayers, Booz Allen Hamilton; Rick Keithley, CymStar; Kevin Audrain, USAF ACC TRSS/INNOV; James Belanich, Ph.D., Institute for Defense Analyses

22297 Cloud Full of Predators: Virtualizing RPAs for Constructed Training Exercises
Lillian Campbell-Wynn, Ph.D., AFAMS; Margaret Merkle, AFLCMC/WNS

22313 DoD Learning Enclave: Realizing the Defense-wide Learning Ecosystem
Brent Smith, Advanced Distributed Learning (ADL) Initiative, Sae Schatz, Ph.D., Former ADL Director

TR 2 TUESDAY, 29 NOVEMBER • 1600 • W307C

ALL TRAIN, NO PAIN: THE FUTURE OF MEDICAL SIMULATION

Session Chair: Mark Parsons, SAIC
Session Deputy: Brian Vogt, SAIC

22142 Virtual Advancement of Learning for Operational Readiness: Implementation and Transition of a VR Medical Simulation Capability for TCCC Responders
Karthik Sarma, Michael Barrie, John Dorsch, Talia Weiss, Jason Ribeira, Jennifer Polson, Srihari Namperumal, Ryan Ribeira, SimX, Inc.

22182 A Vision for the Future of Military Medical Simulation
Matthew Hackett, Ph.D., Beth Pettitt, Ph.D., Jack Norfleet, Ph.D., U.S. Army CCDC SC STTC; Paul Kwon, U.S. Army PEO STRI, Clinical Advisor; Sterling Brodniak

22308 Identifying Unique Physiological Indicators of Virtual Reality Sickness
Olivia Fox Cotton, Kevin Durkee, Justin Morgan, Sarah Meyer, Sheila Galbreath, Aptima, Inc.; Brennan Cox, Ph.D., Naval Medical Research Unit Dayton; Gabriella Severe-Valsaint, Ada Mishler, LCDR Michael Natali, Ph.D., USN, NAWCTSD; Leanne Hirshfield, G S Rajshekar Reddy, Cara Spencer, Gavin Zimmerman, University of Colorado Boulder

22116 Emulation of a Flying Boom Operator: The Dynamic Effects
Hung Tran, CAE USA

TR 3 WEDNESDAY, 30 NOVEMBER • 0830 • W307C

VR TRAINING FOR THE WILD BLUE YONDER

Session Chair: Liz Gehr, Ph.D., The Boeing Company
Session Deputy: Brian Vogt, SAIC

22195 Quantitative Analysis of Virtual-Reality Device Effectiveness for Cockpit Procedures Training
Mark Budgeon, USAF/307th Operations Support Squadron, Brandon Wolf, USAF/307th Operations Support Squadron; Margaret Merkle, AFLCMC/WNS; Donna Senft, AFGSC/ST

22231 Pilot Training Transformation: Early Results and Lessons Learned
Samantha Emerson, Kent Halverson, Cait Rizzardo, Ramisha Knight, Julia Brown, Audrey Reinert, Aptima, Inc.; Mark Hoelscher, Tracy Schmidt, Lisa Tripp, Air Education and Training Command, United States Air Force; David Mills, The Perduco Group

TR 4 WEDNESDAY,30 NOVEMBER • 1030 • W307C

GETTING BETTER ALL THE TIME: STRATEGIES FOR IMPROVING INDIVIDUAL TRAINING

Session Chair: Jimmy Moore, PeopleTec
Session Deputy: Gernai Bledsoe, AFLCMC/WNS

22102 Machine Learning Aids Targeted Guidance to Trainee's Decision Making Performance
Quinn Kennedy, Peter Nesbitt, Naval Postgraduate School

22460 Individualized Training – The Missing Link of True Training Effectiveness & Capability Sustainment
Jenna Tuck, 4C Strategies

22437 Operational Assessment of a CV-22 Virtual Maintenance Training Solution
Beth Hartzler, CAE USA; Wink Bennett, Ph.D., Air Force Research Laboratory (711 HPW/RHW)

TR 5 WEDNESDAY, 30 NOVEMBER • 1600 • W307C

TRANSFORMING MILITARY TRAINING THROUGH IMMERSIVE TECHNOLOGIES

Session Chair: Marwane Bahbaz, U.S. Army PEO STRI
Session Deputy: Christina Perera, Army Modeling and Simulation Office

22164 Augmented Reality for Marine Fire Support Team Training
Colin Sullivan, Parker Fisher, Richard Schaffer, Sean Cullen, Lockheed Martin Corporation; Supun Samarasekera, Kevin Kaighn, Taragay Oskiper, Rakesh Kumar, SRI International

22285 Transforming Team Training: The Influence of Virtual Environment Features
Beata-Noemi Balint, Helen Dudfield, QinetiQ; Brett Stevens, University of Portsmouth

22280 Blending AR and VR to Increase Situational Awareness during Training
Austin Garcia, Eliot Winer, Ph.D., Iowa State University

TR 6 THURSDAY, 1 DECEMBER • 0830 • W307C

NEXTGEN TRAINING

Session Chair: Mike Thorpe, SERCO, Inc.
Session Deputy: Susan Myers, Accenture Federal Services

22412 Directed Self-Regulated Learning via Learning System Support
Jennifer Fowlkes-Ratliff, Lockwood

22427 Training Alchemy – Effectively Converting Traditional Training Content to Gold
Cait Rizzardo, Summer Rebensky, Brian Flowers, Jonathan Reynolds, Peter Neubauer, Kent Halverson, Aptima, Inc.

22434 Game Jams – A New Form of Rapid Prototyping
Mike Bianchini, Dignitas Technologies; Chad Hoover, FENIX Digital Studios; Austin Pinzon

TR 7 THURSDAY, 01 DECEMBER • 1030 • W307C

THE TIPPING POINT: LEARNING SYNERGY

Session Chair: Nir Keren, Ph.D., Iowa State University
Session Deputy: Wendy Johnson, Ph.D., AETC/A5X

22324 Don't Judge a Book by Its CoVR: Learning and Training in Virtual Reality; The Effects of Two Levels of Immersion
Kendall Carmody, Meredith Carroll, Ph.D., Florida Institute of Technology

22379 What's My Status? – Best Practices for Self-Led Debriefs
Elaine Choy, Embry-Riddle Aeronautical University; Emily Anania, Ph.D., Beth Atkinson, NAWCTSD; Ryan Wohleber, Ph.D., Brian Stensrud, Ph.D., Kay Michel, Ph.D., Soar Technology, Inc.

22459 Multimedia and Immersive Training Materials Influence Impressions of Learning but Not Learning Outcomes
Benjamin Clegg, Alex Karduna, Ethan Holen, Jason Garcia, Matthew Rhodes, Francisco Ortega, Colorado State University

TR 8 THURSDAY, 1 DECEMBER • 1330 • W307C

DIGITAL THREADING THE NEEDLE

Session Chair: Scott Schutzmeister, Institute for Defense Analysis
Session Deputy: Mike Merritt, NAWCTSD

22138 Data-Driven Behavioral Modelling of an Air Defence System
Annemarie Burger, Maarten Schadd, Nico de Reus, TNO

22201 The Simulation Fidelity (SiFi) Scale: A Task Centric Approach to Defining Fidelity Requirements for Research and Acquisition
Dylan Bush, Christopher Lamb, Andrew Braun, Georgia Tech Research Institute

22239 Using Digital Twins in Maintenance Operations and Training
Deepak Haste; Sudipto Ghoshal, Qualtech Systems, Inc.; Jeffrey Beaubien, Ph.D.;Valarie Yerdon, Maartje Hidalgo, Aptima, Inc.; Jason Wong, Naval Information Warfare Center Pacific

FRIDAY, 2 DECEMBER 2022 — PROFESSIONAL DEVELOPMENT WORKSHOPS

LOCATION:	Orange County Convention Center, West Concourse, note room assignments below.
DATE:	Friday, 2 December
TIMES:	0700 – 0800 Continental Breakfast and Registration 0800 – 1200 All Sessions
WHO MAY ATTEND?	All registrants of I/ITSEC are welcome to attend, and I/ITSEC badge is required for entry.
FEES:	There is no fee for I/ITSEC Conference Registrants/Exhibitors – I/ITSEC badge required for entry.
CEU/CLP:	Paid I/ITSEC Conference registrants are eligible to receive CEU/CLP credits. If not a paid attendee, a $45 fee will be charged only if you wish to receive the CEU credits.
REGISTRATION:	Registration for individual workshops is not required. Workshops fill on a first-come, first-serve basis. Please arrive early for topics that interest you the most — **seating is limited**. If you wish to receive CEU credits, be sure to request CEUs during your conference registration. You may update your registration to include CEUs at any time at **http://www.iitsec.org/attend/registration-fees**
LUNCH:	On own

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For more information about available programs and services, please visit us at www.ce.ucf.edu

Workshop Schedule:

0700	**Continental Breakfast and Registration**
0800 – 1200	**All Sessions** • Harnessing the Power of Data Analytics to Optimize Training • Live-Virtual-Constructive (LVC) Interoperability Techniques • Distributed LVC Event Process • Using Object Management Group's Data Distribution Service (OMG DDS) for Distributed Training simulators • Serious Game Design Work Shop • Introduction to Mathematical Modeling for Analysts and Educators • Certified Modeling and Simulation Professional 3.0 • VR Trainee Attention and Cognitive Load Assessment Using Headset Integrated Eye Tracking and Biophysiological Sensors

PDW 1 • ROOM W307A

HARNESSING THE POWER OF DATA ANALYTICS TO OPTIMIZE TRAINING

Presenters: Liz Gehr, Ph.D., Barbara Buck, Ph.D., Laurie Dunagan, Ranjan Paul, Ph.D.

Data analytics offers a principled approach to examining data and making it a valuable resource for understanding complex interactions and improving operations. The training community has unique needs and obstacles when attempting to implement a standard data analytics approach. New technology and emerging standards such as xAPI enable the collection of data from a variety of training sources, including student records, training devices, student performance during training, and student daily activities. The collection, preparation, integration, and understanding of this wealth of data present many obstacles as well as opportunities. This workshop will provide an overview of common and emerging data analytics methods as they relate to training data, as well as how they can be applied to enable and support a learning ecosystem, including competency based learning and adaptive learning. Although this is not a class on how to use Artificial Intelligence (AI) or xAPI, we will touch on how these topics relate to data analytics. One main focus will be the challenges associated with applying standard data analytics methods in a military training environment. Other topics covered will include how to prepare, transform, and store data for analysis, opportunities in data visualization, the role of learning analytics in competency-based learning, and privacy issues.

PDW 2 • ROOM W307B

LIVE-VIRTUAL-CONSTRUCTIVE (LVC) INTEROPERABILITY TECHNIQUES

Presenters: Randy Saunders, Edward Powell, Ph.D.

This workshop will provide an overview of the systems engineering issues with regard to integrating disparate military simulations for analysis, training, testing, and other purposes. We will discuss the three major interoperability techniques, the Distributed Interactive Simulation (DIS), the High Level Architecture (HLA) for Modeling and Simulation, and the Test and Training Enabling Architecture (TENA), including descriptions of their architectures and some of their use cases. Recent and planned evolution of each architecture will be explained. A discussion of how these architectures are actually used in the real world and the process for integrating disparate systems in a multi-architecture environment will be discussed. The format of the workshop will be part lecture and part informal discussion/question answer. Participants are encouraged to raise specific topics any time during the workshop.

PDW 3 • ROOM W307C

DISTRIBUTED LVC EVENT PROCESS

Presenters: Roy Zinser, Kenneth LeSueur, Ph.D., Brett Boren, Michael O'Connor

Integration and execution of distributed Live, Virtual, Constructive (LVC) events consume substantial time and resources. While the underlying distributed LVC technologies are mature, the methods for planning and integrating events are not. The IEEE Std 1730-2010 Distributed Simulation Engineering and Execution Process (DSEEP) standard defines a process model for developing an event. DSEEP defines a set of seven steps divided into activities. The DSEEP process model provides representative inputs and outputs for each activity. However, the user still must instantiate the DSEEP process model and develop artifact templates. The development of a robust instantiation of the DSEEP process model is a substantial effort. The goal of the DSEEP model is to produce a verified distributed LVC environment to conduct the event. While distributed LVC environments can be created without using a well-defined process, not using a one adds risks to the event. The first risk is that the integration fails, and it may be difficult to discover the reason. The second risk is that the unverified environment produces invalid results that might not be apparent until the results are used. Based on years of distributed LVC event experience, the authors have created an instantiation of the DSEEP process model. This workshop will describe the complete nine step instantiated process and provide examples of the artifacts created by its execution. Lessons learned from executing the instantiated process and how they have been incorporated will be provided. This workshop will provide the detailed inputs, tasks, outputs, and examples for each activity in the step. The process presented includes issues related to distributed LVC environments using multiple distributed simulation architectures, live entities, and cyber.

PDW 4 • ROOM W307D

USING OBJECT MANAGEMENT GROUP'S DATA DISTRIBUTION SERVICE (OMG DDS) FOR DISTRIBUTED TRAINING SIMULATORS

Presenters: Robert Proctor, Jr., Dan King, John Breitenbach

Are you building the next generation of distributed simulation systems?

Open Architectures (OA) improve system affordability by reducing integration, maintenance and upgrade costs, while promoting reuse and competition. With its interoperability, portability, loose coupling and real-time Quality of Service (QoS), the Object Management Group's (OMG) Data Distribution Service (DDS) standard is the preeminent foundation for distributed mission-critical OA systems. OMG DDS allows defense contractors to maintain an open and competitive acquisition capability and ensure that systems integrators focus their innovation efforts on program objectives.

This Professional Development Workshop will focus on the genesis of the DDS Standard and the capabilities it provides to developers who are building distributed systems. Attendees will view demonstrations of the technology to explain the behaviors and benefits of DDS for real-time mission-critical OA systems. The second half of the seminar will be a hands-on session walking users through the creation of their first DDS application. This will include developing an application from scratch and showing publish/subscribe of topics dynamically on a Local Area Network. We will also explore how Quality of Service (QOS) settings affect how data is transmitted between endpoints.

PDW 5 • ROOM W308A

SERIOUS GAME DESIGN WORKSHOP

Presenter: Radhakishan Shetty, Vance Souders

During this workshop, participants will be introduced to key concepts, steps, and processes involved in designing a game for learning. Through hands-on activities and working together in groups, participants will work through the initial phases of the design process. Participants will identify training requirements and learning objectives, creating an effective story, determining instructional and gaming strategies, designing key game mechanics, and choosing the appropriate delivery technology.

PDW 6 • ROOM W308B

INTRODUCTION TO MATHEMATICAL MODELING FOR ANALYSTS AND EDUCATORS

Presenters: Amanda Beecher, Ph.D., Victor Piercey, Ph.D., J.D., Michelle Isenhour, Ph.D., Kathleen Snook, Ed.D.

For more than 40 years the Consortium for Mathematics and Its Applications (COMAP), a non-profit education organization, has been an advocate for the integration of applied problem-solving and modeling in mathematics classrooms. COMAP's overall mission is to improve mathematics education for students of all ages, and its programs and resources support the development and preparation of both our current and our future STEM and M&S workforce. As an industry leader in the publication of curricular and professional development materials for educators and modeling professionals, COMAP recognizes that professional organizations need analysts who understand mathematical modeling processes and can model, simulate, and solve tough problems. COMAP strives to prepare analysts with the requisite skills, abilities, and knowledge to do so, and develop educators similarly to integrate modeling into the classrooms of these future analysts. To this end, COMAP has recently initiated program development and outreach activities aimed at the industry analyst and education communities. COMAP has been engaged with I/ITSEC through the STEM Pavilion and America's Students and Teachers for several years. At I/ITSEC 2021, COMAP organized seven virtual modeling workshops and webinars for teachers and students. COMAP is excited to offer this in-person workshop at I/ITSEC 2022.

During the workshop, we will discuss the concept of a modeling mindset in applying mathematical skills to solve open-ended problems using quantitative and qualitative modeling techniques. Workshop leaders will introduce and discusses mathematical modeling processes analysts use in solving problems. Topics include defining and restating the problem, determining required data and resources, pre-model analysis, model selection and application, evaluation of model and results, and analysis and communication of results. Participants

will engage in applying these processes to real-world example problems. This workshop is relevant for entry level/junior industry analysts, as well as school and undergraduate level educators.

PDW 7 • W308C

CERTIFIED MODELING AND SIMULATION PROFESSIONAL 3.0

Presenter: Ivar Oswalt

The Certified Modeling and Simulation Profession (CMSP) certification program has been reinvented and reintroduced to the M&S community as CMSP 3.0. The certification's application process has been streamlined, the examination updated, and an approach to ensure readily available reference material developed, amongst many other additional improvements. This proposal is to conduct a CMSP 3.0 Professional Development Workshop. This four-hour session will describe the requirements needed to achieve this valuable certification. It will cover the application and examination processes including education, work experience, and reference requirements; application processes; how the exam is administered and scored; and the role of continuing education in certificate renewal. It will also provide timely insights into preparing for and achieving this certification. In addition, it will describe the certification levels offered, discuss sample exam questions, and include several relevant simulation videos. Finally, the workshop concludes with an enjoyable interactive game-show style contest to summarize the material covered, complete with prizes, as well as a round-table discussion on the certification's future.

PDW 8 • W308D

VR TRAINEE ATTENTION AND COGNITIVE LOAD ASSESSMENT USING HEADSET INTEGRATED EYE TRACKING AND BIOPHYSIOLOGICAL SENSORS

Presenters: Matthias Pusch, Andrew Beall, Ph.D., Sado Rabaudi, Todd Hartwig

We invite I/ITSEC researchers and developers to join a forum to discover how state-of-the-art HMDs are capable of measuring the attention and cognitive load of users through eye tracking and other biophysiological measurements. Several HMDs now have robust eye tracking built in, and exciting new products such as the new Omnicept offering by HP have a battery of measurements that provides a meaningful real-time estimate of cognitive load. During the workshop, all participants will have the opportunity to test out HMD hardware options, and participate in a data collection VR experience that will expose them to a few environments in which their attention and cognitive load measurements will be recorded. Then, using several different open source tools, everyone will be able to quickly dive in and analyze their own, and others, data to extract a few key metrics. Finally, we will give a review of how to construct a VR scenario that connects to these devices and displays various environments and collects the data. For this we will survey tools such as Unity and the Python based Vizard VR engine.