

Matthew J. Scalia

Human-AI Systems Scientist | Agentic AI Design & Evaluation | Complex Systems Modeling

516-761-8558 • matthew.scalia2@gmail.com • linkedin.com/in/matthew-j-scalia • www.matthewscalia.com

SUMMARY

Human-AI systems scientist and applied psychologist specializing in agentic AI design, real-time interaction monitoring, and adaptive human-AI coordination. Designs and evaluates AI agents by modeling trust, coordination, and performance as dynamic system states rather than isolated variables. Develops real-time measurement frameworks for integration into agentic architectures to detect misalignment, workload shifts, and coordination breakdown before failure occurs. Leads cross-functional research translating experimental and field testing into deployable evaluation and monitoring systems for enterprise AI environments.

SELECT PROFESSIONAL EXPERIENCE

Center for Human, AI, and Robot Teaming (CHART): Human Systems Researcher (Ph.D. Research Assistant) Aug. 2022 – Present

- Drives research priorities across four concurrent projects, translating systems insight into actionable design and performance
- Contributes to \$100K – \$4.1M projects over 6 months – 4 years, consistently delivering milestones on time and within budget
- Develops non-normative innovation models across civil-defense sectors using interviews and network-based thematic analysis and engineered TITAN, a Python-based interactive network modeling tool packaged as a standalone Windows executable
- Conducts field studies to collect multimodal biobehavioral and performance data to develop real-time measurement systems
- Designs and analyzes experiments on trust, coordination, and performance in human-AI teams and multiteam systems
- Leads cross-functional project meetings across government, industry, and academic stakeholders
- Recruited, trained, and supervised 44+ graduate and undergraduate researchers to ensure rigor and on-time deliverables

Oak Ridge Institute for Science and Education: Applied Research Fellow (Human-AI Systems) May 2024 – July 2024

- Embedded with the Team Enhancement, Assessment, and Measurement Lab at the Air Force Research Laboratory
- Contributed to development of an AI agent for collaborative search and decision-making tasks in human-AI teams, designed to predict when teammates require assistance and recommend coordination adjustments to improve search performance
- Defined coordination strategies and performance metrics to inform adaptive agent behavior
- Applied dynamical systems modeling to characterize coordination dynamics in human-AI teams to inform agent design
- Conducted semantic analysis and NLP preprocessing to select and tokenize training data, improving predictive model accuracy
- Collaborated with engineers responsible for model training and system implementation

HUMAN-AI SYSTEMS ARCHITECTURE

Trust and Distrust Influence Monitoring Framework for Human-AI Systems Jan. 2022 – Oct. 2025

- Developed an information-theoretic trust and distrust metric by computing average mutual information between joint human-AI interaction states and overall system state across vehicle, control, and communication layers over time
- Designed a 24-sensor system-state encoding architecture and applied Interactive hybrid Cognitive Task Analysis to decompose human-AI task interactions into measurable monitoring variables, generating interaction-layer monitoring signals
- Engineered a moving-window computational pipeline generating time-evolving influence signals capable of detecting trust and distrust spread during task execution
- Demonstrated that influence dynamics predict team trust, team trustworthiness, and affective trust across trust and distrust conditions, communicative and behavioral spreaders, and human vs. AI agent types
- Architected the metric as an embeddable interaction-layer monitoring component for agentic AI systems to support adaptive coordination and breakdown detection

TECHNICAL EXPERTISE

Statistics & Modeling: Dynamical systems modeling; information-theoretic analysis; multilevel and longitudinal modeling; structural equation modeling; real-time signal analysis; network modeling; multimodal data integration

Human-AI Systems: Human-AI teaming; agentic system evaluation; interaction-layer monitoring frameworks; coordination modeling; trust calibration metrics; hybrid Cognitive Task Analysis

Programming & Data: Python; R; MATLAB; MPlus; SPSS; NetworkX; Dash; Plotly; Jupyter; SQL

Research & Evaluation: Experimental and field study design; survey-based trust measurement; behavioral and communication data analysis; multimodal data collection (EEG, fNIRS, EKG, eye-tracking); UX research; usability testing; thematic analysis

Security Clearances: U.S. Secret and Confidential Clearances (inactive)

EDUCATION

Ph.D. Human Systems Engineering (Expected May 2026)

Ph.D. Certificate Complex Adaptive Systems Science – Arizona State University

M.S. Engineering Psychology – Georgia Institute of Technology

B.S. Psychology; Behavioral Neuroscience Minor – The Ohio State University

PUBLICATIONS

Peer-reviewed research on human-AI trust dynamics, performance, and interaction modeling (HFES, IEEE, ACM, Human Factors)