Minitrack Introduction: Decision Analytics, Machine Learning, and Field Experimentation for Defense and Emergency Response

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1. Minitrack topic

Defense and emergency first responders must make rapid, consequential decisions and machine learning (ML) can aid analytics to support these decisions. Machine learning offers enormous promise, yet the need for better datasets, improved insight from fragmented and limited data and opportunities to learn in more challenging settings remain a significant challenge. Field experimentation offers the potential to meet these needs. Field experimentation produces unique datasets of high fidelity that are needed for subsequent machine learning and artificial or augmented intelligence applications. Field experiments also offer excellent settings to further calibrate machine learning through its interplay with a "live" setting. These experiments involve teams of participants from academia, industry, and government agencies, as well as others in the field of first response at the global, federal, state, and local levels. They can allow researchers to produce data for machine learning, and to help the machines learn through iterative interaction with complex scenarios. This minitrack explores the interplay between machine learning, field experimentation, and optimization analytics, through studies that are exploratory, theoretical, or experimental, in such critical areas as Defense and Emergency Response.

2. Salient research issues in this space

- Requirements for design and implementation of machine learning in complex, collaborative network environments
- AI/ML and knowledge centric forecasting methods for improved decision making within Defense Acquisition
- Decision Analytics and ML for Organizational Knowledge Management
- AI/ML model transparency and evaluation in collaborative networks
- AI/ML for Command and Control
- Field Experimentation in Telehealth and Telemedicine
- Field experimentation for IoT applications
- Case studies illuminating any of the topics above

3. Papers in this minitrack

In the first paper, Dilmaghani and Turco present the results of a pilot study of how data mining might improve responsiveness and readiness in the high-volume communication environment of a large emergency response organization. Because first responders in emergency environments often do not follow exact communication protocols, ML/AI The authors compare three standard algorithms and assess and discuss the performance of each algorithm in classifying a high-volume of messages to identify those messages that should meet an important but not formally stated outcome threshold.

In the second paper, Nistor, Pham, and Pickl share the results of their study applying a genetic algorithm (GA) optimization model to address the casualty processing scheduling problem (CPSP). Noting that mass casualty response requires a typical sequence of tasks – locating, rescuing, and stabilizing victims, then relocating them for medical triage and appropriate treatment, all with the goal of minimizing the number of casualties. The authors propose a GA approach to the casualty processing scheduling problem, and through two simulation experiments, suggest that the GA approach is feasible for populations of 500 or fewer, and that maximizing survivors is the preferable objective over minimizing the required processing time to develop the solution.

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