AIRES

Artificial Intelligence
for
Robust Engineering & Science

January 22 – 24, 2020

Organizing Committee

General Chair:
David Womble
Program Director, Artificial Intelligence
Oak Ridge National Laboratory

Committee Members:
Jacob Hinkle
Research Scientist, Computational Sciences and Engineering
Oak Ridge National Laboratory

Frank Liu
Distinguished R&D Staff, Computational Sciences and Mathematics
Oak Ridge National Laboratory

Logistics Chair:
Christy Hembree
Project Support, Artificial Intelligence
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Justin Newcomer
Manager, Machine Intelligence
Sandia National Laboratories

Clayton Webster
Distinguished Professor, Department of Mathematics
University of Tennessee–Knoxville

OAK RIDGE National Laboratory

THE UNIVERSITY OF **TENNESSEE** KNOXVILLE

Sandia National Laboratories

Wednesday, January 22, 2020

7:30–8:00 a.m.	**Badging, Registration, and Breakfast**

8:00–8:45 a.m.	**Welcome and Introduction** *Jeff Nichols, Oak Ridge National Laboratory* *David Womble, Oak Ridge National Laboratory*

8:45–9:30 a.m.	**Keynote Presentation: Dave Brooks,** General Motors Company *AI for Automotive Engineering*

9:30–10:00 a.m.	**Group Photo and Break**

10:00–12:30 p.m.	**Session 1: Finding the right needles in noisy haystacks** *Session Chair: Frank Liu, Oak Ridge National Laboratory*

- **Session Introduction**
- **Speaker 1–1: Siva Rajamanickam,** Sandia National Laboratories
  Machine Learning in the presence of noise: Early experiments
- **Speaker 1–2: Peng Li,** University of California-Santa Barbara
  Data-Efficient Robust Anomaly Detection: A Machine Learning Approach
- **Speaker 1–3: Kody Law,** University of Manchester
  Data Centric (AI for) Science and Engineering in the UK
- **Speaker 1–4: Helen Li,** Duke University
  Machine Learning in Modern Water Inspection and Chip Design
- **Session Wrap Up**

12:30–1:30 p.m.	**Working Lunch with Breakout Discussions**

1:30–4:30 p.m.	**Session 2: Skip the search–from finding needles to understanding needles** *Session Chair: Justin Newcomer, Sandia National Laboratories*

- **Session Introduction**
- **Speaker 2–1: Laura McNamara,** Sandia National Laboratories
  Adoption Challenges in Artificial Intelligence and Machine Learning: why technology acceptance is so hard (and what we can do about it)
- **Speaker 2–2: Chuck Farrar,** Los Alamos National Laboratory
  Machine Learning Approaches to Structural Health Monitoring Data Normalization
- **Speaker 2–3: Eli Sherman,** Johns Hopkins University
  Formal Methods for Addressing Data Complications
- **Networking Break**
- **Speaker 2–4: Aurora Schmidt,** Johns Hopkins University Applied Physics Laboratory
  A Case Study in Safety Constraints to Machine Learning-Based Controllers
- **Session Wrap Up**

4:30–5:00 p.m.	**Day 1 Wrap Up**

5:00–7:00 p.m.	**Welcome Reception**

Thursday, January 23, 2020

7:30–8:15 a.m.	**Breakfast**

8:15–8:20 a.m.	**Day 2 Introduction**

8:20–11:10 a.m. | **Session 3: Running in the wild – forget the past and do it fast with online machine learning**
Session Chair: Clayton Webster, University of Tennessee–Knoxville

- **Session Introduction**
- **Speaker 3–1: Wilkins Aquino,** Duke University
  Model-Based Learning of Advection-Diffusion Transport using Mobile Robots
- **Speaker 3–2: Abhinav Saxena,** GE Research - AI & Learning Systems
  AI Spectrum for Predictive Maintenance
- **Networking Break**
- **Speaker 3–3: Nagi Rao,** Oak Ridge National Laboratory
  Practice of Machine Learning Theory: Case Studies from Nuclear Reactors and Computing Infrastructures
- **Speaker 3–4: Mingzhou Jin,** University of Tennessee - Knoxville
  Geometrical Defect Detection for Additive Manufacturing with Machine Learning Models
- **Session Wrap Up**

11:10–12:00 p.m. | **Session 4: Flash Speaker Presentations**
Session Chairs: Danny Dunlavy & David Stracuzzi, Sandia National Laboratories

- **Session Introduction**
- **Speaker 4–1: Michelle Quirk,** DOE/NNSA
  AI–Complete Problems
- **Speaker 4–2: Warren Davis,** Sandia National Laboratories
  In-Situ Anomaly Detection for Intelligent Data Capture in HPC Simulations
- **Speaker 4–3: Iris Bahar,** Brown University
  A Simulation Framework for Capturing Thermal Noise-Induced Failures in Low-Voltage CMOS SRAM

12:00–1:00 p.m. | **Working Lunch Presentation: Dave Keim, Oak Ridge National Laboratory**
The History of ORNL

1:00–4:45 p.m. | **Session 4: Flash Speaker Presentations, continued**

- **Speaker 4–4: Shawn Sheng,** National Renewable Energy Laboratory
  SCADA Data Modeling for Wind Turbine Gearbox Failure Detection using ML and Big Data Technologies
- **Speaker 4–5: Robert Patton,** Oak Ridge National Laboratory
  Artificial Intelligence for Autonomous Vehicles
- **Speaker 4–6: Ahmedullah Aziz,** University of Tennessee–Knoxville
  Reliability Concerns in Emerging Neuromorphic Hardware
- **Speaker 4–7: Emily Donahue,** Sandia National Laboratories
  Identifying Defects in CT Scans without Labelled Data
- **Speaker 4–8: David Mascarenas,** National Security Engineering Center
  Video-Based, High Resolution, High Sensitivity Structural Health Monitoring

Session 4: Flash Speaker Presentations, continued

- **Speaker 4–9: Steve Sun,** Columbia University
  Non-cooperative Game for Learning from Non-Euclidean Microstructural Data for Computational Solid Mechanics
- **Networking Break**
- **Speaker 4–10: John Lindberg,** Electric Power Research Institute
  Data Science in the Nuclear Industry
- **Speaker 4–11: Minsik Cho,** IBM
  SNOW: Subscribing to Knowledge via Channel Pooling for Transfer & Lifelong/Continual Learning
- **Speaker 4–12: Draguna Vrabie,** Pacific Northwest National Laboratory
  Learning and Deception – Robust Control
- **Speaker 4–13: Vivek Sarkar,** Georgia Institute of Technology
  Using AI to Improve Robustness and Productivity of Engineering & Science Software
- **Speaker 4–14: Rick Archibald,** Oak Ridge National Laboratory
  Machine Learning for Scientific Data
- **Speaker 4–15: Geoffrey Fox,** Indiana University
  Deep Learning Enhanced Simulation
- **Speaker 4–16: Mariam Kiran,** Lawrence Berkeley National Laboratory
  Using AI to ESnet, the High-Performance Science Network

4:45–5:00 p.m.	**Day 2 Wrap Up**

Friday, January 24, 2020

7:30–8:15 a.m.	**Breakfast**

8:15–8:20 a.m.	**Day 3 Introduction**

8:20–12:10 p.m.	**Session 5: Now what? Integrating predictive prognostics into the development and operations of robust systems** *Session Chair: Jacob Hinkle, Oak Ridge National Laboratory*

- **Session Introduction**
- **Speaker 5–1: Sandra Biedron,** University of New Mexico; Element Aero
  Facilities as Intelligent Systems – today and future wish list
- **Speaker 5–2: Pradeep Ramuhalli,** Oak Ridge National Laboratory
  Challenges and Solutions for Prognostic Health Management (PHM) in Nuclear Energy
- **Networking Break**
- **Speaker 5–3: Jim Tallman,** General Electric/GE Research
  Exploiting AI for Design Process Improvements at Enterprise Scale
- **Speaker 5–4: Kyriakos Vamvoudakis,** Georgia Institute of Technology
  Robust and Secure Reinforcement Learning for Prediction and Control
- **Speaker 5–5: Monte Lunacek,** National Renewable Energy Laboratory
  A Data Driven Operational Model for Traffic at Dallas Fort-Worth Airport
- **Session Wrap Up**

12:10–1:00 p.m.	**Working Lunch with Breakout Discussions**

1:00–2:00 p.m.	**Wrap Up and Next Steps**