Opportunity Title: Materials Process Modeling with Machine-Learning
Opportunity Reference Code: ARL-R-WMRD-300093

Organization DEVCOM Army Research Laboratory

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Description **About the Research**

This project will encompass modeling of quantitative parts performance relationships utilizing state-of-the-art machine-learning (ML) technologies and tools. In traditional design, process optimization and part optimization are performed independently, ignoring the inherent dependence of materials and part properties on processing conditions. In this project, ML models will be used to extract cross-property and inverse functions in a holistic framework of the scientific design and production process.

Candidates well-versed in the application and/or development of probabilistic graph models, dimensionality reduction and featurization, or neural networks for materials science or process modeling are being sought. Experience with (computational) materials science or engineering is appreciated, but not necessary. Experience with software engineering is also highly respected.

Keywords: materials science, machine-learning, process modeling, artificial neural networks, dimensionality reduction, probabilistic graphical models, software engineering, data science

ARL Advisor: B. Christopher Rinderspacher

ARL Advisor Email: berend.c.rinderspacher.civ@mail.mil

About WMRD

The goals of the Weapons and Materials Research Directorate (WMRD) are to enhance the lethality and survivability of weapons systems, and to meet the soldier's technology needs for advanced weaponry and protection. Research is pursued in energetic materials dynamics, propulsion/flight physics, projectile warhead mechanics, terminal effects phenomena, armor/survivability technologies, environmental chemistry, and advanced materials (energetic, metals, ceramics, polymers, composite/hybrids, and mechanics) for armor, armament, missiles, ground vehicles, helicopters, and individual soldier applications necessary for maintaining and ensuring supremacy in future land warfare.

About ARL-RAP

The Army Research Laboratory Research Associateship Program (ARL-RAP) is designed to significantly increase the involvement of creative and highly trained scientists and engineers from academia and industry in scientific and technical areas of interest and relevance to the Army. Scientists and Engineers at the CCDC Army Research Laboratory (ARL) help shape and execute the Army's program for meeting the challenge of developing technologies that will support Army forces in meeting future operational needs by pursuing scientific research and technological developments in diverse fields such as: applied mathematics, atmospheric characterization, simulation and human modeling, digital/optical signal

processing, nanotechnology, material science and technology, multifunctional technology, combustion processes, propulsion and flight physics, communication and networking, and computational and information sciences.

A complete application includes:

- **Curriculum Vitae or Resume**
- **Three References Forms**
  - An email with a link to the reference form will be available in Zintellect to the applicant upon completion of the on-line application. Please send this email to persons you have selected to complete a reference.
  - References should be from persons familiar with your educational and professional qualifications (include your thesis or dissertation advisor, if applicable)
- **Transcripts**
  - Transcript verifying receipt of degree must be submitted with the application. Student/unofficial copy is acceptable

If selected by an advisor the participant will also be required to write a **research proposal** to submit to the ARL-RAP review panel for :

- Research topic should relate to a specific opportunity at ARL (see Research Areas)
- The objective of the research topic should be clear and have a defined outcome
- Explain the direction you plan to pursue
- Include expected period for completing the study
- Include a brief background such as preparation and motivation for the research
- References of published efforts may be used to improve the proposal

A link to upload the proposal will be provided to the applicant once the advisor has made their selection.

Questions about this opportunity? Please email ARLFellowship@orau.org

Eligibility Requirements

- **Citizenship:** U.S. Citizen Only
- **Degree:** Bachelor's Degree, Master's Degree, or Doctoral Degree.
- **Academic Level(s):** Any academic level.
- **Discipline(s):**
  - **Chemistry and Materials Sciences** (1)
  - **Computer, Information, and Data Sciences** (13)
  - **Engineering** (5)
  - **Mathematics and Statistics** (10)
  - **Physics** (16)
- **Age:** Must be 18 years of age