NextManufacturing
Carnegie Mellon University

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1:30 – 2:30 pm

Scott Hall 6142

Additive Manufacturing & Machine Learning at CMU

A.D. (Tony) Rollett
Professor, Materials Science and Engineering
Faculty Co-Director, NextManufacturing Center

Machine Learning (ML) is proving to be pervasively useful. Why? To first order, it is because so many problems lack first principles approaches. ML is particularly useful in materials engineering because of the central theme of microstructure-property relationships. Computer Vision (CV) is key because many of the images are too complex for traditional quantification. One has to allow the computer to find the information in the (image) data. Examples include:

- Analysis of recrystallization in printed alloy 718
- Classifying powders, linking to flow
- Diagnosing the reliability of powder spreading (in LPBF);
- Analyzing surface roughness for stress hot spots
- Sorting fatigue fracture surfaces, aka fractography

The classification of metal powders represents an early instance of superhuman capability because success was obtained in classifying different types of powders far beyond the ability of humans (even experts). To respond to the need for people trained in computational materials science, data analytics and machine learning as practiced in materials science & engineering, CMU-MSE is starting a Masters program in Computational Materials Science in the fall of 2020. To support this, and other Masters programs such as the MS in Additive Manufacturing, Rollett will teach a new course "Data Analytics for Materials Science" in the spring of 2020.

BIOGRAPHY

Prof. Rollett has been a Professor of Materials Science & Engineering at Carnegie Mellon University since 1995 and before that was with the Los Alamos National Laboratory. His research focuses on microstructural evolution and microstructure-property relationships in 3D, using both experiments and simulations. Interests include 3D printing of metals, materials for energy conversion systems, strength of materials, constitutive relations, microstructure, texture, anisotropy, grain growth, recrystallization, formability and stereology. Relevant techniques highlight spectral methods in micro-mechanics, Dynamic X-ray Radiography and High Energy Diffraction Microscopy. Important recent results include definition of process windows in 3D printing through characterization of porosity, 3D comparisons of experiment and simulation for plastic deformation in metals, the appearance of new grains during grain growth, and grain size stabilization.