Materials Science & Engineering Seminar Series

Carnegie Mellon University
Materials Science & Engineering

presents

Data Mining in Metallurgy via Correlation Analysis

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ABSTRACT:
The Materials Genome argues for the use of data science to accelerate materials development. Although there has been much discussion of "big data", the reality is that materials development will mostly be done with normal, i.e. small data sets. Nevertheless data science has many tools to offer us that can help us analyze and understand our data sets, especially when the number of parameters is more than, say, three (think of the number of columns in a spreadsheet). Seeking correlations between variables is a formal way of asking whether, say, yield stress depends on fraction recrystallized. Finding combinations of variables that can be linked to another variable is another natural analysis, which in traditional metallurgy appears in the form of equations that link, say, martensite start temperature to a combination of composition variables. Such analyses can be performed with the help of standard, open source statistical analysis tools such as Canonical Correlation Analysis and Principal Component Analysis. A convenient framework for such analyses is the open source R package. Students are invited to install R on their laptops and come prepared to step through the examples that will be demonstrated in this seminar. Students are further encouraged to bring (email would also work) spreadsheets with their own data that can be analyzed on the spot.

BIOGRAPHY:
Prof. Rollett has been a Professor of Materials Science & Engineering at Carnegie Mellon University (CMU) since 1995 and was the Department Head 1995-2000. Prior to CMU he worked for the University of California at the Los Alamos National Laboratory (1979-1995). He spent ten years in management with five years as a Group Leader (and then Deputy Division Director) at Los Alamos, followed by five years as Department Head at CMU (1995-2000). The main focus of his research is on the measurement and computational prediction of microstructural evolution especially in three dimensions. His interests include strength of materials, constitutive relations, microstructure, texture, anisotropy, grain growth, recrystallization, formability and stereology.

He was the Chair of the International Conference on Texture (ICOTOM-15), which was held on campus at CMU June 2008 and is a member of its International Scientific Committee. From 2001-2013 he was the Chair of the International Committee of the conference on Grain Growth and Recrystallization that is held every three years; the next meeting will be in Pittsburgh in 2016. He was a co-Chair of the 13th International Conference on Aluminum and its Applications, which was held on campus at CMU in June 2012. He is a co-author of the texture analysis package popLA, and the polycrystal plasticity code, LApp; he is also a contributor to the Dream.3D software package and the well-known textbook Texture & Anisotropy edited by Kocks, Tomé and Wenk.

Doherty Hall 2315, 11:30AM
Friday, January 22, 2016