Data-driven discovery for enhancing large-scale manufacturing assembly and cancer care operations

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Abstract: Large-scale, real-world operations, such as in manufacturing and healthcare, generate huge volumes of data on a continuous basis, commonly referred to as big data. Such data can be harnessed to discover valuable insights into the operations leading to enhanced efficiency and robustness. However, this discovery process is challenging due to the dynamic nature of the data, heterogeneity of the data sources, and quality issues during data acquisition and warehousing. In this seminar, I will present some foundational work in addressing these challenges using two use cases, one on material flow in an aircraft engine assembly and the other on treatment recommendations in breast cancer. For the first use case, a hybrid statistical method, which combines stepwise regression with generalized multivariate gamma distribution fitting, is developed to accurately predict the supplier delivery times of engine parts from historical transactional data on parts purchase orders. For the second use case, a new data storage and management method, called associative memory, is applied in conjunction with statistical hypothesis testing on patient electronic health records and tumor registry data to identify correlations between patient factors and administered procedures and drugs. Both the methods yield significant discoveries that can provide the basis for actual operational modifications in the future.

Bio: *Ashis Banerjee* is an Assistant Professor with joint appointment in Industrial & Systems Engineering and Mechanical Engineering at the University of Washington (UW). Prior to joining UW, he was a Research Scientist at General Electric Global Research, and a Postdoctoral Associate at Massachusetts Institute of Technology. He obtained his Ph.D. and M.S. from the University of Maryland, College Park, and B.Tech. from the Indian Institute of Technology, Kharagpur. He has received several honors including the 2012 Most Cited Paper Award from the Computer-Aided Design journal, the 2009 Best Dissertation Award from the Department of Mechanical Engineering, and the 2009 George Harhalakis Outstanding Systems Engineering Graduate Student Award from the Institute for Systems Research at the University of Maryland. His research interests include cyber physical systems, digital manufacturing, dynamic system simulation, mathematical modeling, mobile robot planning and control, predictive analytics, and smart healthcare.