Designing and Building Advanced Analytics for Cloud-based Applications

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Cloud computing has grown in popularity over the past several years and now controls a large portion of many of our current information systems across numerous domains of interest such as in national defense, bioinformatics, healthcare or energy industries. At an increasing rate, data in large enterprises is being sought after to perform advanced analytics to help solve problems for a multitude of users. However, many legacy computing systems are highly stovepiped and do not provide an adequate means for querying across an enterprise, even where cloud computing is being applied. Instead, multiple queries must be generated that only solve portions of the problem space to be analyzed. Semantics can help this problem by providing complex logical models (in the form of ontologies) that integrate data at the conceptual level. The graphs created provide a high level of inter-connectivity and provide a robust means to query advanced types of information. However, scalability has been a problem traditionally with these types of semantic systems because graph computing across hundreds to thousands of nodes and edges is difficult and often presents intractable computational problems. Cloud computing has helped solve the scalability problem through the use of vitualized machines, data indices, multi-node data threading, etc., but cloud computing in and of itself does not provide the type of complexity necessary for intelligent data integration.

This seminar will show that these problems can be addressed by building layered formal ontologies within cloud-based computational frameworks to allow for advanced kinds of analytics to be performed over a variety of domains of interest. We will briefly examine the following interconnected research areas:

- What are formal ontologies? How do they differ from basic data models? What is the role of metaphysics in designing them for large-scale applications?
- What types of cloud computing environments currently exist? What is the difference between these types of architectures and which ones are most useful for what applications (utility cloud, data cloud, public cloud, private cloud, etc.).
- What is the role of Reasoning in analytics? What is the difference between logic-based reasoning and mathematically-based analytics approaches? Can these 2 areas be synthesized into a common type of solution?
- What are some “best practices” for the development and execution of formal ontologies in cloud systems? Where have there been successes and failures?

BIO for Eric Little, PhD:

Eric Little is Adjunct Professor at the NYU Polytechnic School of Engineering, New York University and VP and Chief Scientist at Modus Operandi in Melbourne, FL. He received a Ph.D. in Philosophy and Cognitive Science in 2002 from the University at Buffalo, State University of New York. His Post-Doctoral Fellowship at the University at Buffalo's Department of Industrial Engineering (2002-2004) focused on developing ontologies for multisource information fusion applications. Dr. Little then spent several years (2004-2009) as Assistant Professor of Doctoral Studies in Health Policy & Education and Director of the Center for Ontology and Interdisciplinary Studies at D'Youville College in Buffalo, NY, during which time he also owned his own consulting company. He left academia in 2009 to work as Chief Knowledge Engineer at the Computer Task Group (CTG) and later as Director of Information Management at Orbis Technologies (2010). In 2014 he became Adjunct Professor at the NYU Polytechnic School of Engineering, New York University.

His areas of specialization are: ontology, semantics, knowledge management, cognitive science, philosophy of neuroscience, phenomenology and organizational theory. Dr. Little has designed and helped to implement formal ontologies for use in various applied domains including: biomedicine, medical device manufacturing, medical fraud, waste and abuse detection, pharmaceuticals, medical management, threat prediction/mitigation, disaster management, national defense/intelligence, steel production and petrochemicals. He has published in the areas of cognitive science, ontology, information fusion, and human factors engineering. He has delivered lectures on ontology, philosophy, biomedicine, and cognitive science at numerous locations in Germany, Canada, Italy, United Kingdom and throughout the U.S. His work has been supported by The U.S. Air Force Office of Scientific Research (AFOSR), Development and Research for the Defense of Canada (DRDC)-Valcartier, Lockheed-Martin Corp., MIT-Lincoln Laboratories, The National Institute of Standards (NIST), the National Center for Ontology Research (NCOR), The U.S. Army Research Labs (ARL), the Boeing Corporation, British Petroleum, Johnson & Johnson, Nucor Steel, the Defense Threat Reduction Agency (DTRA) and the Computer Task Group (CTG). He is currently a founding member of the International Association of Innovation Professionals (IAOIP) and National Center for Ontology Research (NCOR), as well as a member of: the National Center for Multisource Information Fusion (NCMIF), the federal government's Geospatial Ontology Community of Practice (GOCoP), and the Service Oriented Architecture for e-Government group. He has served on the scientific/review committees for various journals and international conferences.