Data Science Seminar Series

Cognitive Discovery: Accelerating Technical R&D with AI

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Cognitive Discovery is an overarching framework that uses AI to achieve scientific knowledge extraction and representation, to intelligently design and guide simulations, in order to drastically accelerate the pace of scientific discovery. Cognitive Discovery targets to accelerate scientific workflows in technical disciplines and provide a new generation of tools. The workflows follow the cycle: a) Massive literature review in order to understand the problem at hand. Literature refers to all aspects such as mathematical modelling, solution methods, actual computer models and HPC deployment. b) Enrichment of literature data with experimental data and formation of hypotheses. c) Running simulations to test hypotheses and generate new knowledge in order to close any knowledge gaps. All three phases suffer today major disruptions. Simply put: the volume of new literature is exploding (e.g. roughly 450K new publications in materials science are published every year, tens of thousands of papers in numerical and HPC methods need to be reviewed). IoT advances as well as advances in measuring all aspects of HPC systems create an explosion of data. High fidelity models lead to massive configuration spaces the complexity of which clearly outpaces our capability to scale and efficiently run modern HPC systems. We will showcase how AI can help dramatically improve this setting and lead to a massive acceleration for scientific discovery.

Dr. Costas Bekas, Head of Quantitative Development, joined Citadel Securities in Dec. 2019, and is responsible for large scale computations and algorithms. Prior to that he was a Distinguished Researcher & Manager IBM Research - Zurich, responsible for foundational research in AI spanning areas that include ML/DL, knowledge extraction and representation, new computing paradigms for AI, with applications in Healthcare & Life Sciences, materials discovery and robotics. Costas studied at the pioneering Computer Engineering & Informatics Department of the University of Patras in Greece. He received B. Eng., Msc and PhD diplomas in 1998, 2001 and 2003 respectively with Prof. E. Gallopoulos. In 2003-2005, he worked as a postdoctoral associate with Professor Yousef Saad at the Computer Science & Engineering Department, University of Minnesota, USA. Dr. Bekas's main focus is in Cogntitive Systems and their impact in industry,science and business. His research agenda spans Machine & Deep Learning, large scale analytics, HPC and very large scale distributed systems. Dr. Bekas is a recipient of the ACM Gordon Bell Prize (2013, 2015), and the PRACE Award (2012).