

Discovery Informatics: Solving Intractable Biomedical Problems with Carl Kesselman



Carl Kesselman

Carl Kesselman is a Dean's Professor of the Epstein Department of Industrial and Systems Engineering, an Information Sciences Institute Fellow and Director of the Informatics Systems Research Division of the Information Sciences Institute and the Department of Preventive Medicine at the University of Southern California.

Carl's research in large-scale systems and his work in grid computing provided the computing platform used to discover the celebrated Higgs Boson particle. His papers have been cited over 64,000 times and he has received the British Computing Society's Ada Lovelace medal for individuals who have made an outstanding contribution to the understanding or advancement of computing.

Carl will lead the Center for Discovery Informatics at the USC Michelson Center for Convergent Biosciences. The Center will create transformative new methods and infrastructure for data-driven discovery with a focus on convergent bioscience. Carl explained that the goal of the Center for Discovery Informatics is to transform how knowledge is created, explored and translated into benefits for humankind.

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For Carl, convergence creates the opportunity to solve the most intractable biomedical problems of our time, and discovery informatics provides the foundation to do it. “In convergent bioscience, the ability to generate novel discoveries is now strongly dependent on our ability to find, organize, integrate and analyze increasingly large, complex and dynamic data,” Carl explained. He added that USC and the Michelson Center offer a unique opportunity for Discovery Informatics as a hub of the convergent biosciences. Carl explained that by definition convergent bioscience research spans disciplines and the data from those disciplines is heterogeneous, with multiple modalities including microscopy, mass spectrometry, flow cytometry, sequencing and other instrumentation. “We need to tie these disparate threads of convergent bioscience research together, otherwise we face the possibility of slower progress and missed discoveries,” Dr. Kesselman said.

He explained that recent studies have indicated that just managing and organizing data may consume the majority of a researcher's time (50-80%) and that scientists infrequently share data unless required to do so. Dr. Kesselman emphasized that “without discovery informatics we [scientists] are inefficient, we have low success rates in experimentation of 10%, we create irreproducible results (only 10% are reproduced effectively), and we miss opportunity for collaboration and transformative discovery.”

This is where discovery informatics provides an answer. Dr. Kesselman said that at the Michelson Center for Convergent Biosciences, discovery informatics will play an integral role by providing the fundamental abstractions, methods, tools and infrastructure to enable transformative, data-driven discovery in complex biological systems. The Center will create a broad-based, computer science and informatics research program that combines elements of data-driven science, grid and cloud computer, user-centered design, information visualization, data integration, web technologies and service-oriented architecture, big-data analysis and analytics, data management and high performance computing. “Essentially, the Center for Discovery Informatics will enable a far more efficient translation of knowledge-based science and engineering into novel medical treatments in areas of unmet need,” he said.

Dr. Kesselman explained, “We are going to create a unique asset in the Center for Discovery Informatics, it will create transformative bioscience, generate new approaches to research and create a unique research platform. Nobody else will have this tool, it is unique to the USC Michelson Center for Convergent Bioscience.”