SCHOOL OF INFORMATICS AND COMPUTING

Informatics Colloquium Series

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Friday, April 14, 2017
1:30 pm
Lindley Hall, Rm. 102

Scaling in physics, biology, cities and beyond

Abstract: In this talk, I will give a quick summary of scaling theory in general, and its application in physics, biology and social science. Then, I will elaborate urban scaling and its relation to the universality and self-similarity lurking in the urban systems. The universality and self-similarity of various urban phenomena seem both trivial and non-trivial. On one hand, the dynamics of cities are so complex that it seems impossible to explain them in a simple way.

Urban characteristics, geographic factors and historical paths are so entangled that even a well-designed plan often results in unintended consequences. This high level of complexity contradicts the universality and self-similarity that we observe in almost every property of cities (population distribution, crime rate, productivity and even economic diversity) because they imply the underlying dynamics are reducible to a simple form. On the other hand, universality is a natural, and even trivial, consequence derived from a common set of functionalities of cities. People share reasons to move to cities: more interaction, greater opportunity, higher productivity and better infrastructure. These basic dynamics of urbanization are manifested as a strong signal of universality and self-similarity under a single scaling law.

Biography: Senior Research Fellow, Mathematical Institute, University of Oxford; James Martin Fellow, The Institute for New Economic Thinking at the Oxford Martin School

How do we, humans, understand the world: categorize and accumulate our knowledge, and thereby innovate idea, culture, and technologies? Is there any universal mechanism that governs such innovation process that eventually generates both social and economic wealth across different societies? A common conceptualization of innovation in both the biological and socio-economic domains sees it as an adaptive process of recombinant search over a space of configurational possibilities. I develop a mathematical framework for recombinant search in the space of configurational possibilities supported strongly by empirical data. The better we understand the mechanism of innovation the better we understand the mechanism of wealth creation.

Research goals: Develop a mathematical framework for economic growth through innovation and tacit knowledge accumulation based strongly on empirical data; Understand universality in the way human categorizes the world, accumulates the knowledge, and innovate new technologies.

Fields: PhD and BA in Statistical Physics at Korea Advanced Institute of Science and Technology; The mathematical Institute at University of Oxford; The Institute for New Economic Thinking; applied mathematics, physics, network theory, urban scaling theory, urban economics, urban geography, knowledge spillover, linguistics, lexical semantics, innovation, science of science, economic growth theory.

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