Mathematics, Statistics, and Computer Science    **@ UIC**

## Statistics and Data Science Seminar

*Understanding Dynamical Patterns in Complex Substitutive Systems*

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**Abstract:** Diffusion processes are central to human interactions. One common prediction of the current modeling frameworks is that initial spreading dynamics follow exponential growth. Here we find that, for subjects ranging from mobile handsets to automobiles and from smartphone apps to scientific fields, early growth patterns follow a power law with non-integer exponents. We test the hypothesis that mechanisms specific to substitution dynamics may play a role, by analyzing unique data tracing 3.6 million individuals substituting different mobile handsets. We uncover three generic ingredients governing substitutions, allowing us to develop a minimal substitution model, which not only explains the power-law growth, but also collapses diverse growth trajectories of individual constituents into a single curve. These results offer a mechanistic understanding of power-law early growth patterns emerging from various domains and demonstrate that substitution dynamics are governed by robust self-organizing principles that go beyond the particulars of individual systems.

This talk is based on my recent Nature Human Behaviour paper (attached with the email). If we have enough time, I would also like to share a couple of follow-ups of the paper or a couple of related projects we are working on recently.

| Wednesday, November 6 at 4:00 PM in 636 SEO |
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