Networks, Dynamics, Algorithms, and Learning

Roger Wattenhofer ✉ 🏠
ETH Zürich, Switzerland

—— **Abstract** ——————————————————————————————

Networks are notoriously difficult to understand, and adding dynamics does not help. Can the current wonder weapon of computation (yes, machine learning) come to the rescue? Unfortunately, learning with networks is generally not well understood. "Neural network networks" (better and less confusingly known as graph neural networks) can learn simple graph patterns, but they are a far cry from their impressive machine learning cousins in the image- or the game-domain. In my opinion, the most astonishing graph neural networks are in fact dealing with dynamic networks: They simulate sand (the granular material, not the symposium) quite naturally. In my talk, I will discuss and compare different computational objects and paradigms: networks, dynamics, algorithms, and learning. What are the differences? And what can they learn from each other? In the technical part of the talk, I will present DropGNN, our new algorithm-inspired approach for handling graph neural networks. But mostly I will vent about misunderstandings and mistakes, and I will propose open questions, and new research directions. DropGNN is joint work with Pál András Papp, Karolis Martinkus, and Lukas Faber, published at NeurIPS, December 2021.