BRIGHAM AND WOMEN'S HOSPITAL

HARVARD MEDICAL SCHOOL

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Channing Division of Network Medicine

Channing Methods Seminar
Nov 21, 2023, 11AM (ET)
MCP 5th-floor large conference room
https://us02web.zoom.us/j/579497999?pwd=cHNIWHMzWUIFUUVJTG1EeVJmY05aQT09
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Passcode: 844168

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Community detection in biological networks: problems, solutions and help from AI

Detecting communities in biological networks is critical to identify groups of strongly interacting units like proteins, genes, metabolites. Current techniques adopted to solve this problem have important limitations and miss features which might lead to more reliable outcomes. Here I will highlight two main shortcomings: the inability to detect clusters at different scales and the lack of procedures to assess the significance of the clusters. The former can be addressed by using consensus clustering, by assembling partitions obtained at different scales. Significance can be assessed by estimating p-values for the quality of the partitions with respect to a set of randomizations of the input network. I will also show that the correspondence between network structure and annotations is not guaranteed, and how one can efficiently integrate them to produce better clustering results. Finally I will show that neural graph embeddings have the ability to separate communities and facilitate their identification.

Santo Fortunato is a Professor at Luddy School of Informatics, Computing, and Engineering of Indiana University. Previously he was professor of complex systems at the Department of Computer Science of Aalto University, Finland. Prof. Fortunato got his PhD in Theoretical Particle Physics at the University of Bielefeld In Germany. His focus areas are network science, especially community detection in graphs, computational social science and science of science. His research has been published in leading journals, including Nature, Science, Nature Physics, PNAS, Physical Review Letters, Physical Review X, Reviews of Modern Physics, Physics Reports and has collected over 44,000 citations (Google Scholar). His single-author article Community detection in graphs (Physics Reports 486, 75-174, 2010) is one of the best known and most cited papers in network science. Fortunato received the Young Scientist Award for Socio- and Econophysics 2011, a prize given by the German Physical Society, for his outstanding contributions to the physics of social systems. He is Fellow of the Network Science Society (2022) and of the American Physical Society (2022). He is the Founding Chair of the International Conference of Computational Social Science (IC2S2), which he first organized in Helsinki in June 2015. He was Chair of Networks 2021, the largest ever event on network science, a historical merger of the NetSci and Sunbelt conferences. He is author of the book A First Course in Network Science, by Cambridge University Press (2020), the most accessible textbook on the new science of networks.