SOE 4: Focus Session: Science of Science

Time: Monday 13:30–15:45 Location: H44

Invited Talk SOE 4.1 Mon 13:30 H44

Following the actors: individual and collective behavior in epistemic landscapes — •Andrea Scharnhorst — The Virtual Knowledge Studio for the Humanities and Social Sciences, Royal Netherlands Academy of Arts and Sciences (KNAW), Cruquiusweg 31, 1019AT Amsterdam, The Netherlands

Models of science can take very different forms from conceptual models based on historical and ethnographic observations to mathematical descriptions of measurable phenomena. In these models, scholars and science itself become 'research objects'. [1]

All decades have seen their 'models of science'. At the interface between mathematics, physics and a "science of science" we see traces of stochastic models, epidemic models, system dynamics models and complex network models applied to scholarly activity.

Referring to more recent encounters between information science and complexity research this paper present a specific model of (re)-searchers in "epistemic landscapes" based on insights from evolutionary theories.

Departing from this specific model we show how models can be linked to data gathering, to qualitative observations, and to new ways of visualization beyond the narrow cycle of validation and prediction.

[1] Boerner, Katy, and Andrea Scharnhorst. 2009. Editorial: Visual conceptualizations and models of science. Journal of Informetrics: 'Science of Science: Conceptualizations and Models of Science' (special issue) 3 (3): 161-172.

Invited Talk SOE 4.2 Mon 14:00 H44

Tracking science in real-time from large-scale usage data. — •Johan Bollen — Indiana University, Bloomington, USA

Science is of significant importance to our society, but we understand very little of the processes that lead to scientific innovation. In this presentation I will provide an overview of our work on large-scale usage data as an early indicator of scientific activity. The MESUR project has in the past 2 years collected a large-scale collection of the usage data recorded by some of the world's most significant publishers, aggregators and institutional consortia. The resulting data set has been analyzed to reveal the structural properties of scientific activity in real-time. I will highlight some of our recent work on producing detailed maps of science that reveal how scientists navigate between online scholarly resources. The results indicate that it may be possible to detect or predict the emergence of innovation from temporal changes in the structure of scientific activity. This work underpints efforts to arrive at a more accurate, pro-active evaluation of scientific impact.

15 min. break

Invited Talk SOE 4.3 Mon 14:45 H44

Mapping change in science — •Martin Rosvall[1] and Carl Bergstrom[2] — [1]Umeå University, Sweden — [2]University of Washington, USA

Change is a fundamental ingredient of interaction patterns in biology, technology, the economy, and science itself: Interactions within and between organisms change; transportation patterns by air, land, and sea all change; the global financial flow changes; and the frontiers of scientific research change. Networks and clustering methods have become important tools to comprehend instances of these large-scale structures, but without methods to distinguish between real trends and noisy data, these approaches are not useful for studying how networks change. Only if we can assign significance to the partitioning of single networks can we distinguish meaningful structural changes from random fluctuations. Here we show that bootstrap resampling accompanied by significance clustering provides a solution to this problem. To connect changing structures with the changing function of networks, we highlight and summarize the significant structural changes with alluvial diagrams and realize de Solla Price's vision of mapping change in science: studying the citation pattern between about 7000 scientific journals over the past decade, we find that neuroscience has transformed from an interdisciplinary specialty to a mature and standalone discipline.

Invited Talk SOE 4.4 Mon 15:15 H44

Statistical physics of citation behavior — •Santo Fortunato — ISI Foundation, Torino, Italy

Citation behavior has been subject of intense investigations over the last years. The availability of detailed databases and of modern computers enables one to perform careful statistical analyses of citation data and their patterns. One of the results of these investigations is the fact that pure citation scores are not reliable to provide fair rankings between papers and/or scientists, for several reasons. One of these reasons is the role played by the specific scientific discipline of a paper/author. Here I show that the citation patterns of papers of different disciplines are actually identical, provided the citation scores are properly normalized. This provides a criterion for an objective comparison of papers and scientists belonging to different disciplines. Another improvement may come from a self-consistent weighing of citations, based on the role of scientists in the spreading of reputation to their peers, alike to Google's PageRank process.