Universal Pattern of Voting Behavior

Martin Rosvall

Umeå Univeristy, Sweden, martin.rosvall@physics.umu.se

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Science is a highly organized and parallel human endeavor to find patterns in nature; the process of communicating research findings is as essential to progress as is the act of conducting the research in the first place. Thus, science is not merely a set of ideas but also the flow of these ideas through a multipartite and highly differentiated social system. Citation patterns among journals allow us to glimpse this flow and provide the trace of communication between scientists. To highlight important fields and their relationships, to uncover differences and changes, to simplify and make the system comprehensible - we need good maps of science.

In a series of papers, we have presented a method known as the map equation. The method takes advantage of a duality in information theory between the problem of compressing a data set, and the problem of detecting and extracting significant patterns or structures within those data. This general duality is explored in the branch of statistics known as MDL, or minimum description length statistics. We can apply these principles to the problem at hand: finding the structures within a network that are significant with respect to how information or resources flow through that network.

In recent work, we have generalized this method to operate on the flow itself; for example, the pathways researchers take when they navigate scholarly literature. The method identifies structures with relatively long flow persistence times, or areas in which researchers navigate for a relatively long time, and the method therefore naturally identifies research fields. With the new approach, we can identify highly overlapping fields. In my presentation, I will review our approach to mapping flow of ideas through science and give an outlook on future work.