

Structure of social relations, which pertains to patterns of associations between members of different social groups, classes or fields of social practices, is one of the main problems studied in sociology. In particular, it can be examined from the vantage point of processes that shape and affect it. One of the most fundamental processes of this kind is homophily, which refers to the universal pattern, observed across a multitude of social systems, that ties are formed primarily between similar social agents. However, despite its prevalence, homophily is unlikely to be a sole principle organizing social structure, because it is fundamentally unable to explain associations based on difference between features or resources of involved agents. Difference-based relations are crucial in the context of such essential social phenomena as division of labour or task-oriented collaboration. For instance, in the business context two companies may be more likely to cooperate if they occupy different market niches and can provide useful services to each other. Hence, it is important to extend sociological theories of social structure, so they can accommodate relations based on both similarity and difference.

The project addresses this issue by proposing that complementarity constitutes a fundamental process organizing relations based on difference and synergy. The complementarity principle states that social ties are most prevalent between agents of which features and/or resources combine in a desirable way. The main goal is to develop a theoretical and statistical framework for studying structure of social networks in terms of both homophily and complementarity. The framework will be based on an interplay between the analytic concepts of social networks and social space. Social space corresponds here to the macro level of social structure, defined in terms of distributions of social agents with respect to sociodemographic variables and other important features and resources. Usually, it can be observed and measured only indirectly based on social surveys. On the other hand a social network can be considered an observable realization of a more abstract social space, as it consists of direct measurements of relations between a particular set of agents. Therefore the core of the analytic part of the framework will be a statistical model of social networks that explains their structure in terms of positions in an unobserved (latent) social space. In this context it is natural to define homophily and complementarity in purely geometric and quantitative terms. As a result the model will allow to assess the extent to which particular relations, or any given social network in its entirety, are shaped by homophily or complementarity.

The statistical model will be used to conduct a large-scale comparative study of structure of different kinds of social networks. The focus will be on the extent to which structure of different types of networks can be explained as a product of homophily or complementarity. This will allow to determine prevalence of social relations based on these two principles. In particular, it will allow to decide whether complementarity should be considered as significant and universal as homophily or not. The study will be based on at least 100 different network datasets covering different types of social relations as well as different societies and geographical areas. They will be collected from public repositories of peer-reviewed and high-quality network datasets such as *KONECT* database and *Colorado Index of Complex Networks*.

The results of the comparative study will be used to formulate an outline of a sociological theory linking social structure to the principles of homophily and complementarity. It is expected that it will enrich sociological debates on social structure and provide researchers with proper theoretical and analytic tools for studying social relations as dependent on similarity and/or difference. In particular, the statistical model will enable other scholars to study problems similar to those addressed in this project and further develop the proposed theory.