Knowledge Relatedness in Research Portfolio Diversification

Giorgio Tripodi[1], Fabio Saracco[2], Francesca Chiaromonte[3], and Fabrizio Lillo[4]

[1]Scuola Normale Superiore, Pisa, Italy, [2]IMT, Lucca, Italy, [3]Scuola Superiore Sant'Anna, Pisa, Italy, [4]University of Bologna, Bologna, Italy

As the amount of knowledge necessary to reach the scientific frontier increases, for scientists to stay innovative and productive it is crucial to manage their research endeavors wisely. In [1] the authors develop a random walk model intended to recover the macroscopic pattern describing how innovators change their research interests: in this framework scientists move within a *knowledge space*, visiting at each step a different branch of their discipline. In the present paper, we tackle the problem of quantifying the effect of knowledge relatedness in research portfolio diversification and extract the (statistically) significant signal from the exploration strategies of various scholars. Reconstructing the publication histories of 197682 physicists, we employ a simple, network-based, approach to study research portfolio organization strategies. We use two bipartite networks - PACS-Articles and PACS-Authors - to respectively compute a measure of similarity among sub-fields and identify patterns of exploration. Then, provided a test of randomness in scientists' strategies, we quantify the extent to which scholars diversify their research activities across related topics [2]. Such methodology is easily extendable to other disciplines, thus useful from a comparative and policy perspective. This work provides a starting point to fully analyze diversification strategies in scientific and technological domains.

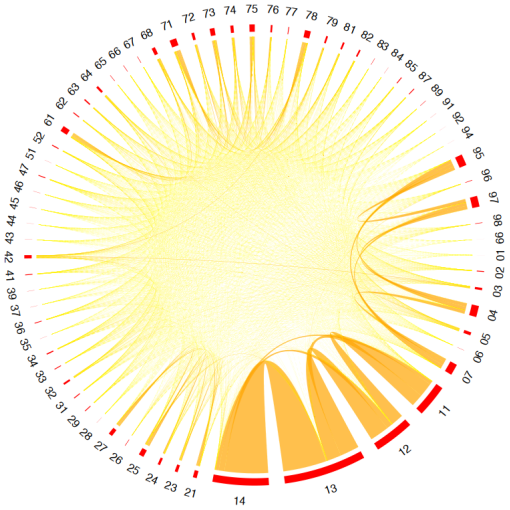

Figure 1: **Co-occurrence Network.** The plot shows the projection on PACS of the bipartite (PACS-Articles) network from which we derive a measure of similarity among physics sub-fields.

References

[1] Jia, T. and Wang, D. and Szymanski, B. K. (2017). Quantifying patterns of research-interest evolution. *Nature Human Behaviour*, 1(4):0078.

[2] Breschi, S., Lissoni, F. and Malerba, F. (2003). Knowledge-relatedness in firm technological diversification. *Research Policy*, 32(1):69-87.