

## Ranking sequences of continents and countries in affiliations of scientific papers authors

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Collaboration between scientists seems to be an important issue in the scientific world. The question is, however, what kind of cooperation are we talking about. Does it only concern colleagues from the same institution, country, or is it wider and includes people from very different research centers? To answer this question, we have selected a collection of nearly 30 million publications and are analyzing it in terms of international and intercontinental scientific cooperation.

Our analysis is based on mapping the authors to the countries and continents, where the institutions indicated in the affiliations of particular articles are located. This allows us to obtain ranks reflecting the frequency distribution of the probability of occurrence of specific sequences describing which countries/continents people publishing together come from.

The obtained results indicate that in the most common case (~64%) the authors are associated with institutions located in one, then in two (~19.5%), then in three (~6%) countries. In the first case, the first three places in the ranking are occupied by the United States, China and Germany, respectively, so we are dealing here with countries from three different continents. When we look at the ranking of continents, the most common case is cooperation between countries from the same continent (~73.37%), the second most common case is cooperation between two continents (~18.14%), and the third most common case three continents (~4.67%). In this case, the dominant role of Europe is observed.

The detailed analysis of sequences of continents and countries in the authors affiliations by means of inverse participation ratio reveals complex probability distribution of this quantity. However, the obtained rank-frequency distribution of this index is not dissimilar to power law with exponents close to -1.36, and -0.96, for high and low ranks, respectively.