Adam Paweł Kubiak

“Jerzy Neyman’s Conception of Scientific Inference and Its Relation to Bayesianism”

summary

The subject of our thesis was located within the thematic scope of the methodology and philosophy of natural and social sciences—the theory of scientific inference, the theory of foundations of statistics and the probabilistic theory of cognition.

The main goal was to explore Jerzy Neyman’s frequentist concept in terms of the basic differences in relation to Bayesianism—regarding the epistemic context—that are widely considered to be elements that make Neymanian theory a worse proposal for a scientific research tool than Bayesian theory. These alleged basic negative differences are: lack of explicit and proper use of prior knowledge, lack of epistemic reliability, conceptual influence of non-cognitive values on outcomes and lack of epistemic interpretation of a particular outcome. Pointing at these four deficiencies reoccurs in manifold forms throughout a large part of the existing criticism of frequentist statisticl paradigm. An especially important aspect of the inconsistency of frequentism with the idea of ampliative inductive inference in science is the lack of proper use of prior information in the inference template. Another important aspect is that frequentism is suspected to be epistemically void because of it being strongly affected by non-cognitive values and biases.

The main thesis of our investigations was that Neyman’s frequentist statistical paradigm is not a worse tool for conducting scientific research than the Bayesian paradigm. We found the statement to be justified by the following results demonstrated by us: (1) various types of knowledge, pre-existing the research, regarding the examined aspect of reality as well as the socio-economic aspects that accompany the research, are used by Neyman in an unambiguous, correct way that increases the epistemic reliability of his method, (2) Neyman's testing method is always epistemically reliable and, appropriately used, can be epistemically reliable at the desired level, (3) the influence of non-cognitive values directly introduced to the inferential patterns of Neyman's methods of estimation and testing is a favorable solution due to the increase in the epistemic reliability of the method, (4) the absence of an epistemic interpretation for a single result in Neyman’s statistical scheme does not have to be considered a disadvantage of the method as a tool for conducting scientific research.

Our additional achievement was a complete and comprehensive reconstruction of Neyman’s methodological and philosophical concepts, which takes into account all the most important elements of his theory, including the theory of observation and experiment designs.