UNCERTAINTY PRINCIPLES IN SOCIAL SCIENCES

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Abstract. In several fields of social sciences, anectotical evidence is collected that measuring a property of a population sample couples back to the behavior of the sample and changes its property.

Introduction

If one tries to measure something in a field in social sciences, the fact of the measurement itself couples back to the behavior of the sampled population, and the measurement becomes more and more meaningless. In this paper we collect specific evidence of this fact which ranges from the anectotical to specific descriptions.

The preliminary paper [Kashyap(2014)] titled *The Uncertainty Principle of the Social Sciences* postulates the Uncertainty Principle as follows: *Any generalization in the social sciences cannot be both popular and continue to yield accurate predictions, or in other words, the more popular a particular generalization in the social sciences, the less accurate will be the predictions it yields.* This paper then continues in a verbose way to define social interaction without becoming ever specific.

An invitation to a panel discussion at the DMV/ÖMG meeting (Jahrestagung) in Salzburg 2017 prompted me to start writing this article.

Examples of uncertainty

The impact factor in scientific publications. The ISI impact factor of a journal A is: the number of citations in a select set of journals (including A) to articles which appeared in journal A in the last 2 years including the running year. Journal editors in chief can game this system: publish many articles in the January issue, and few in the December issue so that these can be scanned for citations for longer time. For a description of some blatant misuses of the impact factor by a journal published by Elsevier see [Arnold(2009)], and for a somewhat deeper analysis see [Arnold and Fowler(2011)]. These misuses create doubt that the impact factor is an indication of the quality and reliability of the journal as a scientific communication device.

Recently, results are judged more and more by the impact factor of the journal in which they appear. The recent proof of the Gaussian correlation inequality (GCI), conjectured in the 1950s, was almost overlooked; see [Wolchover(2017)]. The

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author, Thomas Royen, did not know or care about the importance of publishing in high impact journals. An aside: The article [Buranyi(2017)] in The Guardian describes how Robert Maxwell started the price rise of scientific journals in the 50's with Pergamon Press.

A recent dissertation [Ruppert(2017)] investigates in depht the influence of rankings of universities.

A (dystopian) possibility. Young mathematicians could be ranked linearly by using a combination of the rank of the university giving the degree, the impact factors of the journals where they published, the rank of the supervisor of their thesis, their citations weighted by their own rank, similarly to the Google ranking of websites. This would give an ordered ranking list of mathematicians similarly to the lists of tennis players, or the ELO list of chess players. Comparing with the view of political elections, or with test results in schools, one cannot avoid to be feeling afraid, that sometimes the ultimate aim of the work of a scientist could be only to increase his ranking, and no more to understand nature.

What can we do. Since it is not possible to avoid bibliometric data, I see the following possibilities. Try to make the the ranking space high dimensional: Create different incompatible rankings (for algebra, analysis, ...) for journals. Rank rankings, e.g., by collecting their misrankings.

Political elections. Let us assume that an election tries to measure opinions in the population about how they wish to be governed. If a large part of the population just wants to express anger by voting for extremist outsiders, the outcome can be counter-productive for this part of the population. Elections can also be gamed by parties in several ways: By not fulfilling election promises. By combining conflicting proposal in the same platform. So eventually, elections measure the outcome of elections, and politics starts from these election results. See [Maskin and Sen(2017)] for more arguments.

The Google way of ranking websites in answers to queries. At its core, the ranking procedure ranks a website by counting how many other sites (weighted by their own ranks) contain links to this website. One can state with some conviction that the quality of answers to Google queries went down, since the procedure will be gamed by websites which establish other sites pointing to them. The preponderance of advertisements in answers to queries is an indication to this fact.

Testing for success in education. The saying that one learns for life and not for school is not entirely true. School exams test for the ability to succeed in school exams — this is an invariant statement. But the existence of school exams itself changes the relevance of their results for life outside of school.

References

[Arnold(2009)] Douglas N. Arnold. Integrity under attack: The state of scholarly publishing. *SIAM News*, 42(10):1–4, 2009.

[Arnold and Fowler(2011)] Douglas N. Arnold and Kristine K. Fowler. Nefarious numbers. *Notices Amer. Math. Soc.*, 58(3):434–437, 2011. ISSN 0002-9920.

[Buranyi(2017)] Stephen Buranyi. Is the staggeringly profitable business of scientific publishing bad for science? *The Guardian, 27 June 2017*, 2017. https://www.theguardian.com/science/2017/jun/27/profitable-business-scientific-publishing-bad-for-science.

[Kashyap(2014)] Ravi Kashyap. The uncertainty principle of the social sciences. *SSRN*, 2014. http://dx.doi.org/10.2139/ssrn.2424350.

[Maskin and Sen(2017)] Eric Maskin and Amartya Sen. A better way to choose presidents. *New York Review of Books, June 8, 2017 Issue*, 2017. http://www.nybooks.com/articles/2017/06/08/a-better-way-to-choose-presidents/.

[Ruppert(2017)] Alfred Ruppert. *Vermessung und Quantifizierung im Hochschulsektor*. Springer VS, Wiesbaden, 2017. doi: 10.1007/978-3-658-16381-5.

[Wolchover(2017)] Natalie Wolchover. A long-sought proof, found and almost lost. *Quantamagazine, March 28, 2017*, 2017. https://www.quantamagazine.org/statistician-proves-gaussian-correlation-inequality-20170328/.

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