Approaching Probabilistic Truths, in Comparison with Approaching Deterministic Truths

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Organisers: Theo Kuipers (University of Groningen) and Ilkka Niiniluoto (University of Helsinki)

The symposium 'Approaching Probabilistic Truths, in Comparison with Approaching Deterministic Truths' (APT) was held on August 6th, 2019, at the 16th International Congress of Logic, Methodology and Philosophy of Science and Technology (CLMPST 2019) organised in Prague. It was initially proposed by Theo Kuipers and then co-organised and co-chaired also by Ilkka Niiniluoto. According to the original plan as it still appears on the official program of the conference, six talks should have been presented at the APT symposium, in presentation order: by Ilkka Niiniluoto (University of Helsinki), by Gustavo Cevolani (IMT School for Advanced Studies Lucca) and Roberto Festa (University of Trieste), by Gerhard Schurz (University of Düsseldorf), by Theo Kuipers (University of Groningen), by Igor Douven (Pantheon-Sorbonne University), and by Graham Oddie (University of Colorado Boulder). However, two speakers (Kuipers and Oddie) could not participate for personal reasons; thus, only five presentations were given, with Niiniluoto giving both his own talk and an overview of Kuipers'.

The goal of the APT symposium was to explore the issue of probabilistic truth approximation from the viewpoint of current theories of 'truthlikeness' (or verisimilitude), and related approaches. The notion of truthlikeness was originally introduced by Karl Popper to make sense of the widespread idea that science, and human knowledge more generally, aim to approach the truth about the world. According to Popper, and many realist philosophers of science after him, scientific theories are always conjectural and corrigible, but later theories may still be 'closer to the truth' than earlier ones; thus, scientific progress consists of approaching truth or increasing verisimilitude. In the last decades, truthlikeness theorists developed different accounts of truth approximation, dealing both with the 'logical' problem (i.e., defining when a theory is closer than another to the given truth), and the 'epistemic' problem of verisimilitude (i.e., evaluating claims of truth approximation in the light of empirical evidence and non-empirical features of relevant theories, even when the truth is unknown). The main results of this thriving research program, both philosophical and technical, are summarised in such works as Niiniluoto (1987, 1998, 1999, 2018), Kuipers (1987, 2000, 2019), Oddie (1987, 2016), and Zwart (2001).

Traditionally, almost all such accounts assumed that 'the truth' to be approached is 'deterministic', i.e., the descriptive or factual truth about some domain of reality or the 'nomic' truth about what is physically or biologically possible. The APT symposium aimed at exploring the prospects of relaxing such an assumption, i.e., of extending the theory of truth approximation to the case where the truth is 'probabilistic'. Here, the target to be approached may be a collection of statistical facts, or the objective probability distribution of some process, or a fully probabilistic law. Given the widespread use of probabilistic and statistical methods in all branches of both theoretical and applied science, it seems clear that adequate theories of truth approximation should also be able to deal with the problem of approaching probabilistic truths. To this purpose, one needs to tackle again, on a new level, both the logical and the epistemic problems: the task becomes to find appropriate measures for the closeness of theories to probabilistic truths, and to evaluate claims about such distances on the basis of empirical evidence.

The speakers at the symposium addressed one or both of such problems, laying down the foundations for a theory of probabilistic truth approximation. A quick overview of the talks will give an idea of the main topics discussed.

The first session of the APT symposium featured three presentations, given by Niiniluoto, Cevolani, and Schurz. In his talk on 'Approaching Probabilistic Laws', Niiniluoto suggested addressing the problem of probabilistic truth approximation as a problem of probabilistic 'legisimilitude', i.e., to treat 'the truth' as defined by some relevant probabilistic law. By applying his favorite similarity approach to verisimilitude, he showed how to employ mathematical measures of the distance between probability distributions (like the Kullback-Leibler divergence) to address both the logical and the epistemic problem of truthlikeness in a probabilistic context, discussing both pros and cons of this approach. In the second talk 'Approaching Deterministic and Probabilistic Truth: A Unified Account', Cevolani showed how to extend the 'basic feature' approach to measuring truthlikeness (Cevolani & Festa, 2020) to cover both deterministic and probabilistic truth approximation; and compared the resulting unified account to other accounts of truthlikeness, revealing interesting differences and similarities. The third talk by Schurz, 'Approaching Objective Probabilities by Meta-Inductive Probability Aggregation', dealt with the logical and the epistemic problems from the point of view of his relevant consequence approach to truthlikeness (initially developed with Paul Weingartner). Schurz linked the issue of probabilistic truthlikeness both with the discussion of different 'scoring rules' used in various settings, and with the formal learning theory as developed within his recent work on optimal meta-induction (Schurz, 2019).

In the second session of the APT symposium, only two talks were presented, since Oddie was unable to give his presentation 'Credal Accuracy in an Indeterministic Universe'. In the first talk, read by Niiniluoto, Kuipers discussed the problem of 'Inductively Approaching a Probabilistic Truth and a Deterministic truth, the latter in comparison with Approaching it in a Qualitative Sense'. Building on his revised theory of nomic truth approximation (Kuipers, 2019), Kuipers discussed both deterministic and probabilistic legisimilitude from the perspective of the theory of inductive probabilities developed in the Carnap-Hintikka tradition, modelling the latter as convergence to the true probabilistic distribution in a multinomial context (the typical example being random sampling with replacement in an urn with colored balls). Finally, in his talk 'Optimizing Group Learning of Probabilistic Truths', Douven discussed truth approximation in a social setting. In particular, he studied the evolution of the collective opinion of a set of (not necessarily human) agents who update their beliefs in a version of the well-known Hegselmann-Krause model, exploring how effectively different updating methods can track the underlying truth.

The APT symposium was very successful and promoted a lively debate among the attendees on how best to tackle the issue of probabilistic truth approximation. Proposals based on existing theories of truthlikeness were compared with different approaches, and new ideas for further exploration of this topic emerged during the discussion. Given that many open problems were left on the table, and foreseeing an interest in contributing from other scholars not attending the symposium in Prague, the organisers decided to promote an open call for papers in order to reach a wider audience and collect new proposals from the community. In the end, an agreement was reached with editor-in-chief Wiebe van der Hoek for publishing a Topical Collection in the *Synthese* journal, titled 'Approaching Probabilistic Truths', and edited by Niiniluoto, Cevolani, and Kuipers. At the moment, ten papers have been published 'online first' in the collection after the usual review process.[24] These include both the six papers originally scheduled at the Prague symposium, and four other papers contributed via the call, as listed below:

1. *Ilkka Niiniluoto,* **'Approaching Probabilistic Laws'**
2. *Alfonso García-Lapeña,* **'Truthlikeness for Probabilistic Laws'**
3. *Gustavo Cevolani and Roberto Festa,* **'Approaching Deterministic and Probabilistic Truth: A Unified Account'**

[24] See the topical collection "Approaching Probabilistic Truths" of the journal *Synthese*, published in volume 199 (2021; pages 4195–4216, 6009–6037, 8001–8028, 8281–8298, 9041–9087, 9359–9389, 9391–9410, 10499–10519, 11465–11489, and 11729–11764) and volume 200 (2022; article 113).

4. *Gerhard Schurz,* **'Probabilistic Truthlikeness, Content Elements, and Meta Inductive Probability Optimization'**
5. *Theo Kuipers,* **'Approaching Probabilistic and Deterministic Nomic Truths in an Inductive Probabilistic Way'**
6. *Alexandru Baltag, Soroush Rafiee Rad, and Sonja Smets,* **'Tracking Probabilistic Truths: A Logic for Statistical Learning'**
7. *Graham Oddie,* **'Propositional and Credal Accuracy in an Indeterministic World'**
8. *Igor Douven,* **'Scoring, Truthlikeness and Value'**
9. *David Atkinson and Jeanne Peijnenburg, '***Probabilistic Truth Approximation and Fixed Points'**
10. *Leander Vignero and Sylvia Wenmackers,* **'Degree of Riskiness, Falsifiability, and Truthlikeness: A Neo-Popperian Account Applicable to Probabilistic Theories'**

Overall, the APT Topical Collection provides the first systematic exploration of probabilistic truth approximation, bringing together approaches, methods and perspectives from philosophy of science, formal epistemology, and other related disciplines. We are confident that these preliminary results, the multiplicity of analytical methods employed, and the diversity of the topics discussed during the symposium and in the published papers will be instrumental in promoting further developments and new ideas on the issue of probabilistic truth approximation.

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Association for the Philosophy of Mathematical Practice (APMP) symposium

Organisers: Andrew Arana (Université de Lorraine) Silvia De Toffoli (Princeton University)

The philosophy of mathematics has experienced a significant resurgence of activity during the last 20 years, much of it falling under the widely used label 'philosophy of mathematical practice'. This is a general term for a gamut of philosophical approaches that can also include interdisciplinary work. In order to give focus to this new research community, in 2009 the Association for the Philosophy of Mathematical Practice (APMP) was founded—for more information, see: http://philmathpractice.org.

APMP members promote a broad, outward-looking approach to the philosophy of mathematics, which engages with mathematics in practice, including issues in history of mathematics, the applications of mathematics, cognitive science, etc. The APMP aims to become a common forum that will stimulate research in philosophy of mathematics related to mathematical activity, past and present. It also aims to reach out to the wider community of philosophers of science and stimulate renewed attention to the very significant, and philosophically challenging, interactions between mathematics and science. Therefore, a symposium organised on behalf of the APMP fits well with the aims of this Congress.

To organise this symposium, we asked the members of APMP to submit proposals for taking part in this meeting, and we made an appropriate selection of submission so as to shape a one-day program. The aim of the meeting is to manifest the presence and activity of APMP within the larger community of philosophers of science and logicians. We sought contributions that put into focus different aspects of the philosophy of mathematical practice—both in term of topics and methods—and in grouping them together we aimed at promoting dialogue between them. In order to reach this, we opted for the format of twelve presentations that showcase the diversity of philosophical work done under the umbrella of APMP.