Intensive Course for Philosophy Graduate Students: Computer Simulations and Numerical Experiments in Philosophy of Science

May 7-12, 2018.

University of Belgrade, Serbia

One of the newer approaches in the philosophy of science is the application of different methods of computer analysis. The aim of this course for philosophy graduate students is to offer expert introduction to the fundamentals of such methods, including the use of relevant software, and to demonstrate their relevance to a variety of philosophical studies of science.

The course modules:

1. Lecturer: Kevin Zollman (Department of Philosophy, Carnegie Mellon University)

   This module will focus on two interrelated issues. First, will be some of the nuts and bolts of writing and programming simulations. The NetLogo simulation platform will be used to teach some basic techniques of simulation. Focus will be on how to develop, analyze, and present simulation results. Second, will be how simulations can be used to analyze philosophically interesting questions. Examples will be provided from social and political philosophy, philosophy of language, and philosophy of science.

2. Lecturer: Dunja Šešelja (Faculty of Philosophy, Ruhr University, Bochum; Ghent University)

   In this module we will analyze and discuss the epistemic function of agent-based models (ABMs) of scientific inquiry, developed in the field of social epistemology and philosophy of science. Which questions can these ABMs adequately address, under which conditions, and what are their limitations? Do they provide explanations and/or predictions, or are they rather heuristic tools for formulating explanatory hypotheses? In view of these questions, we will take a look at a concrete example of such a model, namely, an argumentative agent-based model of scientific inquiry (Borg et al. 2017). The aim of this model, programmed in NetLogo, is to examine how different social networks impact the efficiency of scientists in acquiring knowledge. After presenting the main features of the model, we will discuss the results of the simulations and the relevance of these results for actual scientific inquiry.

References:

Borg A., Frey D., Šešelja D. and Straßer C. (2017). An argumentative agent-based model of scientific inquiry. Proceedings of the Special Track on Applications of Argumentation at the 30th International Conference on Industrial, Engineering & Other Applications of Applied Intelligent Systems (IEA/AIE), Springer-Verlag, forthcoming.

3. Lecturer: Milan Ćirković (Astronomical Observatory, Belgrade; Department of Philosophy, University of Belgrade; Future of Humanity Institute, Oxford)

   Computer simulations as guidelines to epistemology of numerical experimentation:

   Great expansion of the domain of cosmological numerical simulations (in particular N-body simulations and various hydrodynamical codes) in recent years has brought an entirely new light on both the physical processes of structure formation underlying all observed physics in the universe, but on the nature and structure of information stemming from such large-scale numerical experiments. It is arguable that this development represents the most important methodological breakthrough since Galileo's invention of the telescope and its usage to refute the Aristotelian geocentric cosmology. The „third kingdom" of numerical experiments (beside empirical and classical theoretical research) in cosmology has not only obtained some of the best case studies, but also rather new and unexpected philosophical application, ranging from abstract metaphysics (e.g., the simulation hypothesis of Bostrom) to philosophy of science (e.g., the problem of precise quantification of complexity) to epistemology (e.g., the epistemic status of counterfactuals).
   In this course module we shall present ways of using cosmological simulations as prototypes and case studies of the key new trends in epistemology of computational science. As large-scale numerical simulations are becoming (i) more sophisticated in terms of the scope of simulated phenomena, (ii) more detailed in terms of increased resolution and improved averaging procedures, and (iii) drastically cheaper, it is to be expected that both the breadth and depth of their results will dramatically increase. The whole new and unexpected areas of application are opened up as well. Recent example of using cosmological simulations to search for habitable zones in galaxies similar to the Milky Way will be examined in some detail. In addition, some speculations concerning the future of such simulations will be given, with an emphasis on the possibility of resolving some of the long-standing philosophical chestnuts, like the correct approach to measuring complexity, the contingent nature of conjectures in historical sciences, or quantifying the observation-selection effects in the anthropic reasoning.

Organizers:

Department of Philosophy, University of Belgrade

The Center for Studies of Bioethics

Astronomical Observatory of Belgrade

Coordinator: Slobodan Perović (Department of Philosophy, University of Belgrade)

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Students (name, affiliation, mentor, dissertation topic/interest):

1. **Deborah Haar**, Department of Philosophy, University of Chicago, Illinois. Nick Huggett (Probability, models, simulations)
2. **Nico Formanek**, High Performance Computing Centre, Stuttgart. Andreas Kaminski (The transformation of science by computer simulation)
3. **Dina Babushkina**, Dept. of Economics and Political Studies, University of Helsinki, Olli Loukola (Moral Self, desire, and motivation by ideals)
4. **Anton Doncev**, Dept. of Philosophy and Sociology, New Bulgarian University. Lilia Gurova (Probabilistic Approaches to Confirmation in Natural and Social Sciences)
5. **Thomas Durlacher**, Unit for research in identity, politics and societies, University of Luxemburg. Frank Hoffman (Simulating Historical change: A philosophical perspective)
6. **Julian Hauser**, Dept. of Philosophy, University of Edinburgh. Mark Sprevak (Self, and modern information technology)
7. **Borut Trpin**, Department of Philosophy, University of Ljubljana. Olga Markic/Stephan Hartmann (Influence of conditionals on belief updating)
8. **N.K. Shinod**, Humanities and Social Science, IIT Delhi, postdoc. (Thought Experiments and Their Epistemic Roles in Natural Sciences)
9. **Nenad Filipović**, Dept. of Philosophy, University of Belgrade. Vladan Djordević (Conditionals)
10. **Sanja Srećković**, Dept. of Philosophy, University of Belgrade. Miloš Aresnijević (Scientific and philosophial understandings of music)
11. **Jelena Mijić**, Dept. of Philosophy, University of Belgrade. Živan Lazović (Contextualism in epistemology)
12. **Stevan Rakonjac**, Dept. of Philosophy, University of Belgrade. Slobodan Perović (Evidence in economics)
13. **Jelena Pavličić**, Dept. of Philosophy, University of Belgrade. Živan Lazović (Contextualism in epistemology)
14. **Ana Katić,** Dept. Of Philosophz, Universitz of Belgrade, Slobodan Perović (Complexity in biology)

Course Assistants:

Vlasta Sikimić, Dept. of Philosophy, University of Belgrade. Slobodan Perović (Social epistemology of Science)

Jelena Dimitrijević, Dept. of Philosophy, University of Belgrade. Slobodan Perović (Maxwell's Demon)

Practical information

Most conference attendees who are not from Serbia will be staying at the studio apartments *Konak Kralj Aleksandar* (Bulevar Kralja Aleksandra 75-The King Alexandar Boulevard 75).

There is an exchange office at the airport where you can buy local currency (Serbian dinar-RSD). There are plenty of exchange offices throughout the city, but we recommend that you exchange at least some money to local currency at the airport because you can pay for the taxi or whatever else only in local currency.

Here is the map of the airport to help you navigate: http://www.beg.aero/passengers/airport_map/airport_map.153.html

There are several options to get to the city from the airport. An airport shuttle van line A1 will drive to *Slavija square* for approx. 10 Euros, from where you can take a taxi to your studio apartments or walk. The city bus line 72 will get you to Zeleni Venac from where you can also take a taxi to your hotel. It's a 40 minute drive through the suburbs and it will cost you less than 2 Euros. Here is a link with more details about the buses: http://www.beg.aero/passengers/to_and_from_the_airport/bus_transport.326.html

We`d recommend taking a taxi because it can get you directly to your hotel. Taxi service from the airport is strictly regulated. It will probably cost you about 1800 RSD (about 15 Euros). Please get a voucher from the info desk and pay for it depending on the zone you are going into and then you can pay the cabby with the voucher. ***Please don't go directly to a taxi without it.*** Here is the link with instructions how to use this taxi service: http://www.beg.aero/passengers/to_and_from_the_airport/taxi/from_belgrade_airport.327.html

The address you should give to a cabby is *Konak Kralja Aleksandra* or Student Hall "Lola" (Bulevar Kralja Aleksandra 75). You then check in at the main entrance. We arranged also that someone will be there to assist you. As soon as we obtain your arrival timetables, everything should be fine.


Computer Simulation
As a Tool for the Philosopher
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