

Preface

The present volume collects the post-proceedings of the first workshop in *Agent-Based Modeling & Policy-Making* (AMPM), held remotely in conjunction with the *JURIX* conference (2021). The AMPM workshop series aims at establishing a forum at the ‘boundary’ between law (legal theory, empirical legal research, computational legal theory), political science/policy studies, social science (computational and generative), complexity science, generative social science, and computer science (agent-oriented programming and policy-based programming). This forum is meant to advance, stimulate, and reflect on possible synergies within this ‘boundary’ space.

Relevance

Global financial and economic crises, critical technological dependencies, pandemics, and the climate emergency have cast serious doubts on the adequacy of conventional policy-making to consider mechanisms underlying social and economic phenomena, as well as to provide effective policy prescriptions. In part in response to this issue, computational models are increasingly being used to guide decisions by studying their potential consequences prior to making them. From their original application in engineering and science, computational models have become a tool for evidence-based policy-making in a diverse set of contexts: public health, ecology, labour markets, urban planning, social security, crime mitigation, economic development, platform economy and techno-regulation. Motivated by their widespread deployment, work on using computational models beyond executive policies and towards law-making – i.e. beyond operational guidance and towards regulation, circumscribing the space in which policies can operate – is gaining momentum.

Computational approaches to policy design face persisting complementary challenges, amongst which formal validity, effectiveness, efficacy, sustainability. Several disciplines have focused on distinct aspects of these dimensions (e.g. computational legal theory, game theory, control systems design), offering alternative methodological standpoints and computational tools. Unfortunately, these specialized domains rarely interoperate, and frequently contain troublesome assumptions (such as overly simplistic fully observable static environments, static pay-off tables, static semantics, homogeneous agents that are perfectly rational and/or controllable). The resulting reduced views fail to take into account possible phenomena occurring at the boundaries between areas of concern.

A crucial role can be played, in this respect, by agent-based modeling (ABM). Based on an interactionist metaphor, agent-based models are an effective tool for understanding and reproducing the functioning and generation/emergence of complex macrodynamics and constructs (shared knowledge, practices, protocols of interaction) at an aggregate level. Applied in social contexts, and particularly within the frame of computational social science (CSS), ABM lends

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itself to regulators and policymakers but also more widely to judges, attorneys, and legislators. Additionally, ABM provides a conceptual basis to develop computational mechanisms more aligned with human systems (e.g. giving more attention to cases, or concrete interpretations of norms, rather than abstract norms), facilitating the embedding in the computational realm of institutional constructs operating in the non-computational one.

Goals

In this vein, the workshop objectives are threefold:

- *Purely scientific and methodological*: to inform and inspire (multi-disciplinary) epistemological and methodological approaches and concepts on how computational approaches can guide and support the design and operationalization of policies, regulations, and law, as well as contributing to the understanding of observed social dynamics.
- *Applications in policy-making*: to collect and to give visibility to case studies of applications of agent-based modeling in policy and law making. This will provide examples of potential avenues for further applications as well as potentially stimulate a return to the fundamentals.
- *Community building*: to establish a diverse community of scholars that together can overcome initial disciplinary and terminological barriers, and formulate a common vocabulary through which cross-disciplinary problems can effectively be described and solved. The forum provides a space that facilitates feedback on manuscripts of unfinished studies of new or unconventional tracks of research.

In the workshop's first installment, we brought together 40 researchers together from a diverse set of educational backgrounds—including social scientists, legal scholars, computer scientist and physicists—and national backgrounds—including countries from Europe, North- and Central-America.

Outline of the first edition of the AMPM workshop

The workshop opened with a keynote by Bruce Edmonds¹ that was divided in two parts. The first part, titled “Using ABM for stress-testing policy: an alternative policy modelling approach” discussed how ABM might be used to stress-test policies. While he emphasized that ABMs could be a useful part in the design of policies, by revealing worst case scenarios that could have otherwise been neglected, he also observed that many published computational models lack an honest and critical discussion of their abilities to inform policy making. The second part, titled “Understanding Social Norms: a multi-level, policy modelling approach” discussed how ABM might help to understand normative and legal compliance. He concluded that legal adherence, which is not just a matter of rules but also of social support for the law and the habits that result from these, can be simulated and explored and in the future be part of the assessments of laws. Taken all together, his observations, critiques and recommendations are

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very valuable for the works in progress that are published in this workshop proceedings and among the first that try to connect ABMs and policy making in the legal context.

The submissions were grouped into three sessions: “Contexts and Topics”, “Models”, and “Methods and Technologies”.

The first session hosted contributions with a focus on the application of agent-based models to international and criminal law, as well as for investigating the consequences of software producing legally relevant consequences, providing feedback for policy-design. In their work, Katharina Luckner and Veronika Fikfak lay out how ABMs can be used to gain insights into state behavior relevant to international law, specifically on state compliance with European Court of Human Rights judgements. Understanding how state compliance depends on their relative geographical location, past behavior and internal compliance apparatus can help in determining potential remedies for poor compliance performances within the European Human Rights regime. Valentina Punzo discusses the role of agent-based social simulation in crime research, in particular, criminal policy-making, offering some suggestions about the utility of applying simulated experiments to crime research. After a review of some examples regarding such type of simulations in predicting and assessing the impact of crime-prevention interventions and policy changes, the specific tasks and purposes of agent-based social simulation along the different stages of the overall policy making process are summarized and discussed. The work of Margherita Vestoso and Ilaria Cecere presents a summary of the ongoing discussion between the different practices, methodologies and constraints of computational social simulations, law, and policy-making with a focus on the clash between formal and informal norms. They draw from recent visual-perceptual research experiences that combine behavioral experiments and agent-based simulations. Together with his coauthors, Sebastian Benthall addresses the accountability of software making decisions that impact people’s lives, an issue that has become increasingly relevant for regulators in recent years. Agent-based modeling is proposed in this respect as a solution to model the social environment in which the software system operates, a novel approach to auditing, testing and, ultimately, regulatory design. The proposal is explored by considering the use of ABM for the regulation of ad targeting to prevent housing discrimination.

The second session was about the policy relevance of implemented computational models. Gido Schoenmacker et al. investigate the EU lighting market through an agent-base model that simulates consumer behaviour. Using heterogeneous agents, each having a distinct set of preferences based on empirical market research, the model is able to hint at possible reasons for consumers’ reluctance to switch to energy saving LEDs in place of the traditional incandescent bulbs. This is followed by works on epidemiological simulations by two distinct groups of researchers, respectively presented by Martina Fazio and by Jan de Mooij. Both works examine policy interventions, based on mobility restrictions, on an agent population in which a viral disease spreads, taking SARS-Cov-19 as a case study, in Italy and Virginia, USA, respectively. While both approaches incorporate physical mitigation measures (e.g. mobility restrictions) and exclude medical mitigation measures (e.g. vaccinations), their methodological approach differs in several other ways, such as, how mobility patterns and restrictions are incorporated and what modelling framework was used. A third study is presented by Laura Mazzarino et al., who model a community of investors forming their expectations with heterogeneous strategies in order to optimize their portfolios, providing a general analysis of the effectiveness of the different strategies.

In the third and last session, two examples are given on methods and technologies. Etienne Houze et al. started the session by introducing a novel approach to complex sequences analysis, originating from the study of smart homes, that seeks to unravel the causal chain that leads to a certain event. It is a high-level argumentative process that coordinates components' expertise to generate explanatory reasoning in socio-technical systems. The last work by Ada Diaconescu et al. focuses on multi-paradigm modeling for policy-driven socio-technical systems. Through a survey and comparison of existing systems engineering and self-adaptation solutions for complex cyber-physical systems, they analysed and identified spaces for a new framework for socio-technical systems for policy-making.

Future Directions

This first edition of the AMPM workshop has been held in conjunction with the 34th edition of the International Conference on Legal Knowledge and Information Systems (JURIX 2021). It was undoubtedly a promising first opportunity to fuel the discussion about the potential intersections between agent-based models and policy making in the legal context, an area that for many reasons is less familiar with the topic. However, the community of legal scholars and computational legal scholars that comes together within the JURIX conference represents only a starting point of the cross-fertilization process we are trying to trigger. Our idea is to establish links with other research communities (including in law, eg. constitutional, administrative law, but also looking at social psychology, behavioral sciences, complexity science) that are likewise relevant to feed a policy and rulemaking oriented use of agent-based simulation. For the future, we aim to widen the set of disciplinary fields with which the workshop will get in touch. The idea is to bring into the next AMPM editions disciplines and perspectives that have not appeared so far but that can contribute to empirically founded understanding of social complexity. Failing that, despite their attractiveness, ABM will not help to improve the way in which human beings govern themselves and their societies.

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<https://ampmresearch.github.io/AMPM2021>

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