

# Preface

The present volume collects the post-proceedings of the second workshop in *Agent-Based Modeling & Policy-Making* (AMPM), held in a hybrid mode in conjunction with the *JURIX* conference (2022). 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), complex science, generative social science, and computer science (agent-oriented programming and policy-based programming). This preface reorganizes the motivation and the goals of the AMPM workshop, providing a summary of the 2022 edition, and reporting on a survey conducted amongst the workshop participants and the program chairs providing insights on current challenges and practices.

## Motivation

Global financial and economic crises, critical technological dependencies, pandemics, and climate change have cast serious doubts on the adequacy of conventional policy-making and law-making to consider mechanisms underlying social and economic phenomena. From their original application in engineering and science, computational models are increasingly being used to guide decisions by studying their potential consequences prior to making them. They are proposed as a tool for evidence-based policy-making in diverse contexts: public health, ecology, labour markets, urban planning, social security, crime mitigation, economic development, platform economy and techno-regulation. Motivated by such 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.

Existing computational approaches to policy and normative design are known to face persisting complementary challenges: formal validity, effectiveness, efficiency, sustainability and scalability. Several disciplines have focused on distinct aspects of these dimensions (e.g. computational legal theory, game theory, control systems design, dynamic systems, and system dynamics), 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 integrating role can be played by agent-based modelling (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

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knowledge, practices, protocols of interaction) at an aggregate level. Applied in social contexts, particularly within the frame of computational social science (CSS), ABM lends itself to regulators and policymakers and more widely to judges, attorneys, and legislators.

## Goals

The AMPM workshop is envisioned to be complementary to the traditional scope of computational social science, complex system research, and agent-based modeling, focusing on three main tracks:

- models/theories going beyond policies, targeting normative and cognitive phenomena;
- empirical methods associated with the practice of ABM in policy- and norm-making;
- dedicated tooling, such as computational methods, languages, and interfaces.

In perspective, the workshop creates space for the call for a “computation-enhanced regulatory empiricism”, exploiting computation to investigate factual underpinnings of the regulatory phenomena, including intricate networks of cognitive, social, technological, and legal mechanisms through which policies and regulation emerge, are applied, and exert their effects.

## Outline of the second edition of the AMPM workshop

In the workshop’s second instalment, we brought together around 30 researchers from diverse educational backgrounds—including social scientists, legal scholars, computer scientists and physicists—and international backgrounds.

The workshop opened with a keynote by Christopher Frantz (NTNU) and Saba Siddiki (Syracuse University) on *The Institutional Grammar: An analytical paradigm for institutional analysis*. Nine contributions were then grouped into three sessions. Presentations made available by authors are published online.<sup>1</sup> The discussions were rich, and demonstrated the variety, attention, and potential of a community of scholars dedicated to these topics.

The five contributions collected in the present volume (after passing through a post-proceeding phase) confirm such heterogeneity, declining the ABM paradigm to tackle diverse issues, all relevant to policymakers: from norm compliance to financial market dynamics, from the interplay between economic inequality and social segregation, up to the potentially discriminatory effects of redistribution policies.

An online survey was proposed to the workshop participants to take a snapshot of the community of people who attended AMPM.

## Online survey: motivation and results

The use of agent-based models in policy-making is a topic that gathers scholars separated by major distances in terms of language, methodologies, ways of conceptualizing problems, and research questions. In the AMPM workshop context, gathering physicists, engineers and computer scientists, jurists, social scientists, and policymakers, an even minimal mapping

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<sup>1</sup><https://ampmresearch.github.io/ampm2022-program>

seemed useful to us not only to grasp the essential features and issues of the field, but also to derive valuable feedback for organizing future editions of the workshop.

Despite not having a statistically significant sample at our disposal, we gathered precious qualitative insights. We managed to sketch a comprehensive overview describing not only workshop participants (in terms of scientific background, refereed journals, and reasons for interest in ABM) but also the emerging technical, technological and epistemological challenges to the use of agent-based models.

**The community** From the answers collected, we observe that the AMPM workshop involved a community of researchers coming from both the social sciences and technical disciplines. Members of the former group were predominantly economists, sociologists and political scientists. Despite the workshop was joint to the JURIX conference, there were only a few jurists; this seems to confirm that this category of scholars exhibits at the moment only limited interest to empirical, quantitative, and policy-related computational research topics. The second group includes diverse categories of scholars: computer scientists, software engineers, and complexity researchers, with areas of expertise ranging from transportation to normative multiagent systems.

Research goals are equally varied. While at the moment most contributors use simulation primarily for policy specification and policy testing/validation, there are strong indications of interest in using ABM for behavioral exploration and explanation of historical facts, known phenomena, and even prediction.

The heterogeneity of topics and backgrounds should be in principle reflected in the type of journals/venues indicated as relevant by the respondents. We expect that converging on the same journal would be difficult, as scholars coming from different fields usually rely on different metrics (e.g., legal scholars vs computer scientists). However, in our survey, preference was clearly attributed to social simulation journals such as the *Journal of artificial societies and Social Simulation (JASSS)* and MAS publications such as the proceedings of the *Autonomous Agents and Multiagent Systems (AAMAS) Conference*. There were only few references to inter-domain journals (legal, sociological etc.).

**Technological issues** Despite the diversity in terms of provenance and research objectives, the choice of AMPM scholars focused, as for technologies dedicated to ABM, on the *NetLogo* framework, by far the most widely used, plausibly because of its simplicity of use. Few references appear to *MESA*, *Anylogic*, *SPADE*, *Agents.jl*. Instead, reframing the investigation on tools in terms of general-purpose language, the scenario is dominated by *Python*, with only a few references to *Julia* and *Mathematica* for the analysis of results, and one participants relying on hard-coded *C* agents. In terms of higher-level instrumental requirements, the most problematic aspects appear to be model integration, the expressiveness, and the complexity of models (of agents, and of policies/norms), although relevant concerns are also expressed about issues of scalability, accessibility (visualization), and reusability.

**Epistemological challenges** A third set of questions has been devoted to the epistemological challenges perceived in association with the use of ABM; these issues become even more pressing

when the researcher's goals go beyond creating abstract explanatory models and move toward the design of policies expected to produce concrete outcomes in the real world. The responses reflect the different backgrounds of AMPM participants. On the one hand, ABMs have been depicted by almost everyone as a paradigm that needs to be explored to enable non-disciplinary, collaborative investigations of the emerging phenomena feeding social and policy complexity. Yet, at the same time, many issues are raised: the sensible relationship between results, input parameters and scenarios; the challenges with model validation and accuracy testing; the lack of familiarity of yet large areas of social science—law in the first place—with computational modeling; lack of strong appeal for researchers relying on primarily analytical frameworks (eg. rational agents, strategic behaviour).

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The organizers:

Giovanni Sileno, Nicola Lettieri, Christoph Becker

## AMPM 2022

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<https://ampmresearch.github.io/ampm2022>

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