1st Workshop on Intelligent Modeling for Practical Applications and Community Transformation in Life Sciences (iM-PACT)

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Abstract

Modeling is a vital part of the design thinking of complex systems and in studying and understanding complex phenomena. Its ability to abstract systems, while retaining domain-specific details, allows stakeholders to view the system from different perspectives. Models can serve as the effectively indistinguishable digital counterpart of actual real-world physical products, systems, and processes (sometimes referred to as twins) for practical purposes, such as simulation, integration, testing, monitoring, maintenance, and artifact generation.

In computer science and mathematics, modeling is standard practice across many domains, including but not limited to machine learning models, system models, and performance models. Besides, modeling plays an important role in various domains such as epidemiology, environmental studies, and biology. For example, epidemiological models during the COVID-19 pandemic played a crucial role in understanding the spread of the virus, evaluating the potential impact of interventions, and guiding public health decisions. However, it also became evident that tool support for domains other than computer science is not as developed or as accessible to non-CS experts. Challenges around usability, appropriateness, and representativeness pose obstacles to the adoption of tools traditionally used in software modeling by experts in other.

The objective of this workshop is twofold: first, to expose modeling experts to tooling and automated processes related to modeling, from design to code generation and to simulation, and second, to raise awareness for developers of modeling tools to listen to challenges of other domains and develop appropriate tools.

Theme, Goals, Relevance

The general theme of the workshop is to explore modeling efforts and challenges in domains outside of computer science. It encourages participants to adopt a multidisciplinary mind towards software modeling tools and non-CS modeling. The participants of the workshop will have the chance to discuss and explore the following topics:

- Mathematical and graphical modeling.
- Verification and validation of formal models.
- Reusability, reproducibility, and repeatability of modeling processes and of their products.
- Version control in modeling artifacts.
- Code/equation/simulation generation from models.
- Model merging and integration in multidimensional domains.
- Models as communication artifacts between stakeholders.
- Integrated development environments for multidisciplinary modeling.
- AI-driven model generation.
- Modeling requirement solicitation from non-CS experts.

The primary goal of the workshop is to bridge the gap between non-CS modeling experts and modeling tools. Its purpose is to mediate the communication between modelers and developers so that requirements become clear and more general-purpose modeling tools become available. Software modeling tools are mature enough to offer basic and extended functionality on design, validation and verification, version control and differencing, code generation, and simulation. In the workshop, modeling experts from different domains will outline their challenges and needs from modeling tools, and developers will clarify the capabilities of their tools and how they can be used by non-CS experts.

CASCON has been famous for approaching problems in a practical manner, and offering high-quality hands-on workshops and tutorials. In addition, the scope of the conference is broad enough, with a particular focus on domain applications, so that it attracts experts from a variety of domains, not constrained to traditionally technical fields like computer science and engineering. Consequently, we strongly believe that our workshop will be relevant to CASCON participants. Modeling is a core topic for the main CASCON conference and domains like health, business, and environment, which can benefit from modeling tools, have always been represented in CASCON's technical program. We aspire that such synergy will result in more appropriate tools that will effectively satisfy the requirements of modelers and will consequently lead to more innovation in their respective domains. In parallel to our workshop, we will maintain an online community, so that our participants and other interested practitioners and researchers will stay in touch, and we will merge with other global communities with similar interests, such as the climate-sensitive infectious diseases (CSID) community. We will consider our workshop if we attract 20-30 attendees in total (an average of 15 throughout the entire duration of the workshop). We will also assess the success of the workshop based on the number of accepted invitations for speakers and in the future by the number of modeling and other related tools developed as products of collaborations from our workshop.

Structure

The workshop will be primarily structured around invited talks. We will specifically target experts from various domains that need to use modeling in their practice or research. To maintain a sense of cohesion in the workshop's first iteration, we will aim to invite experts specifically from the domains of health and environment especially due to their current importance. We will also invite developers and researchers that have created or contributed to modeling platforms and tools regardless of the targeted domain. For the first iteration of the workshop, we will host a half-day session with a typical length of two hours. We will host 3-5 invited talks, equally split between modelers and developers, each with an allotted time of 20-30 minutes (including discussion). In the end, we will also organize a roundtable discussion with all speakers, where the audience will have a chance to ask questions and bring together all the topics discussed during the entire session. With respect to invited speakers, our goal is to attract experts and professionals with experience or responsibilities of particular interest to the workshop audience. These can include people that have experience with modeling or modeling tools either through practice or through research. To this end, we have already approached Professor Jianghong Wu (York University), Jacques Bélair(University of Montreal), Professor Diomidis Spinellis (Athens University of Economics and Business), Professor Bentley Oakes (Polytechnique Montreal), Professor Steve Easterbrook (University of Toronto), Angela Okune (Director of Programs, Code for Science and Society), Serge Olivier Kotchi (Public Health Agency of Canada), Dr Maged Elaasar (Technology Researcher at NASA JPL), Dr Sahar Kokaly (General Motors), Professor Yong Zeng (Concordia University), Dr Sarah McGough (Genentech), Dr Blythe Adamson (Flatiron Health), and Professor Olaf Berke (University of Guelph) .

The purpose of the invited talks is first and foremost to guarantee the highest quality of presentation. We believe that our attendees will have the chance to hear from experts that have first-hand experience either with modeling or modeling tools or both. The workshop will serve as a venue to exchange views and perspectives between modelers and tool developers. Its main purpose is to bridge the gap between requirement solicitation and tool implementation and bring both ends of the spectrum in the same room. In the end, we intend to gather all these insights and experiences, summarize them, and, with the permission of our speakers and attendees, submitted for publication in a venue like the Software and Systems Modeling journal, the Environmental Modeling and Software journal or the Journal of Epidemiology. Our goal is for every year to define a new theme, centered around one or two different domains with modeling needs, which will result in unique outcomes and eventually create a community that will benefit from this knowledge. We will further foster this sense of community through the roundtable discussions. Our intention is to bring our audience to the same level as our speakers, allow them to interact with each other, and form new ideas and hopefully new collaborations.

Technical details

Format: Speakers

Duration: half day (2 or 3 hours)

Additional requests: A/V, connectivity (for potential Zoom presentations, although they will not be preferred).