MODELS 2024

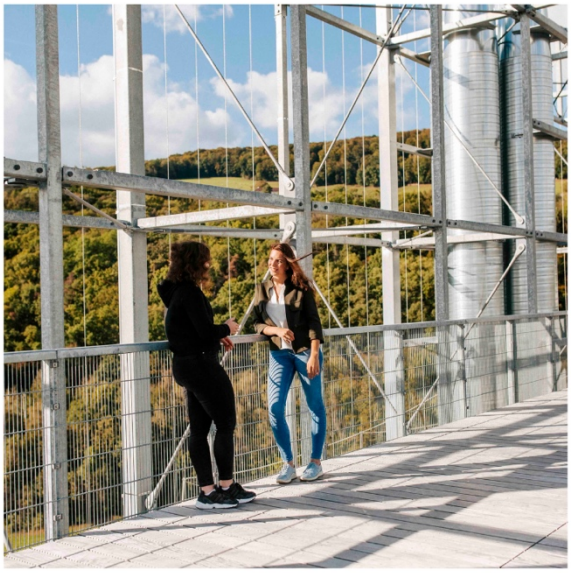
ACM / IEEE 27th International Conference on Model Driven Engineering Languages and Systems

Linz, 22.09.2024 – 27.09.2024

Program Booklet

Welcome

to



Linz

Imprint

Publisher: Alexander Egyed & Manuel Wimmer, Johannes Kepler University Linz
Editor: Alexander Egyed, Manuel Wimmer, Stefan Klikovits
Concept & Design: Alexander Wolf

Table of Contents

Foreword

MODELS, the ACM/IEEE International Conference on Model-Driven Engineering Languages and Systems, is the premier conference series for model-driven software and systems engineering, and is organized with support of ACM SIGSOFT and IEEE TCSE. Since 1998, MODELS has covered all aspects of modelling, from languages and methods to tools and applications. Attendees of MODELS come from diverse backgrounds, including researchers, academics, engineers, and industrial professionals. MODELS 2024 is a forum for participants to exchange cutting-edge research results and innovative practical experiences around modelling and model-driven software and systems. This year's edition will provide an opportunity for the modelling community to further advance the foundations of modelling, and come up with innovative applications of modelling in emerging areas of cyber-physical systems, embedded systems, socio-technical systems, cloud computing, big data, machine learning, security, open source, and sustainability.

Organisation

Organiser

Johannes Kepler University (JKU) Linz

Institute of Software Systems Engineering

Institute for Business Informatics – Software Engineering

Organisation committee

General Chairs:	Alexander Egyed (Johannes Kepler University Linz)
	Manuel Wimmer (Johannes Kepler University Linz)
Program Chairs:	Marsha Chechik (University of Toronto)
	Benoit Combemale (University of Rennes)
Organizing Chairs:	Stefan Klikovits (Johannes Kepler University Linz)
Workshops Chairs:	Esther Guerra (Autonomous University of Madrid)
	Paul Grünbacher (Johannes Kepler University Linz)
Tools & Demo Chairs:	Romina Eramo (University of Teramo)
	Javier Troya (University of Malaga)
Artifact Evaluation Chairs:	Erwan Bousse (University of Nantes)
	Jesús Sánchez Cuadrado (University of Murcia)
Educators Symposium Chairs:	Antonia Garcia-Dominguez (University of York)
	Eugene Syriani (University of Montreal)
Doctoral Symposium Chairs:	Leen Lambers (BTU Cottbus Senftenberg)
	Sébastien Mosser (McMaster University)
Panel Chair:	Marouane Kessentini (Oakland University)
Industry Days Chairs:	Christoph Mayr Dorn (Johannes Kepler University Linz)
	Alois Zoitl (Johannes Kepler University Linz)
Tutorial Chairs:	Shaukat Ali (Oslo Metropolitan University)
	Nelly Bencomo (Durham University)
Journal Chair:	Silvia Abrahão (Technical University of Valencia)
ACM Student Research Competition Chair:	Steffen Zschaler (King's College London)
Proceedings Chairs:	Antonio Garmendia (Autonomous University of Madrid)
	Paula Muñoz (University of Malaga)

Organisation

Poster Chairs:	Jessie Galasso-Carbonnel (McGill University)
	Dominik Bork (TU Wien)
Publicity & Social Media Chair:	Judith Michael (RWTH Aachen University)
Publicity Chairs:	Istvan David (McMaster University)
	Georg Grossmann (University of South Australia)
Registration Chair:	Markus Feneberger (Johannes Kepler University Linz)
Sponsorship Chairs:	Gerti Kappel (TU Wien)
	Stefan Sauer (Paderborn University)
Registration & Virtualization Chair:	Daniel Lehner (Johannes Kepler University Linz)
Student Volunteers Chair:	Bianca Wiesmayr (Johannes Kepler University Linz)
Web Chair:	Martin Eisenberg (Johannes Kepler University Linz)

Technical Sponsors

Organisation

Steering Committee

Richard Paige	McMaster University
Daniel Varro	Linköping University, McGill University
Silvia Abrahão	Technical University of Valencia
Don Batory	University of Texas, Austin
Nelly Bencomo	Durham University
Jordi Cabot	Luxembourg Institute of Science and Technology
Marsha Chechik	University of Toronto
Benoit Combemale	University of Rennes
Alexander Egyed	Johannes Kepler University Linz
Jeff Gray	University of Alabama
Øystein Haugen	Østfold University College
Zhenjiang Hu	Peking University
Marouane Kessentini	Oakland University
Jörg Kienzle	University of Malaga
Thomas Kuehne	Victoria University of Wellington
Vinay Kulkarni	Tata Consultancy Services Research
Shiva Nejati	University of Ottawa
Kathy Park	IEEE Computer Society
Alfonso Pierantonio	University of L'Aquila
Alexander Pretschner	TU Munich
Houari Sahraoui	University of Montreal
Wolfram Schulte	Microsoft
Eugene Syriani	University of Montreal
Gabriele Taentzer	Philipps-Universität Marburg
Manuel Wimmer	Johannes Kepler University Linz
Andrzej Wąsowski	IT University of Copenhagen
Tao Yue	Beihang University
Juan de Lara	Autonomous University of Madrid

General Information

Public Transport

The university is reachable with the tram lines 1 and 2 (Stop: JKU | Universität). From the main train station, a tram towards JKU leaves approximately every 5 minutes. Going from the main train station to JKU takes about 20 minutes.

In the morning, there are also buses going to JKU (Bus Line 77 to JKU | Universität Nord) from the main train station.

On weekdays the buses leave at these times: 07h33 | 07h45 | 08h00 | 08h20 | 08h40. Travel time is approximately 20 minutes.

Taxi Contact Information

Taxi 6969
+43 6969

Taxi 2244
+43 2244

TAXI GELBE SONNE
0677 62945593

Catering

You will be provided with lunch on all days during the conference. There will also be smaller snacks during coffee breaks.

WLAN

If you don't have access to the eduroam network, you will have the chance to get personalized Wi-Fi access at the registration desk.

More information

Campus-Plan:

Contact Person:

Alexander Egyed:
+43 732 2468 4382

Manuel Wimmer:
+43 732 2468 4240

Stefan Klikovits:
+43 732 2468 4255

Accessibility

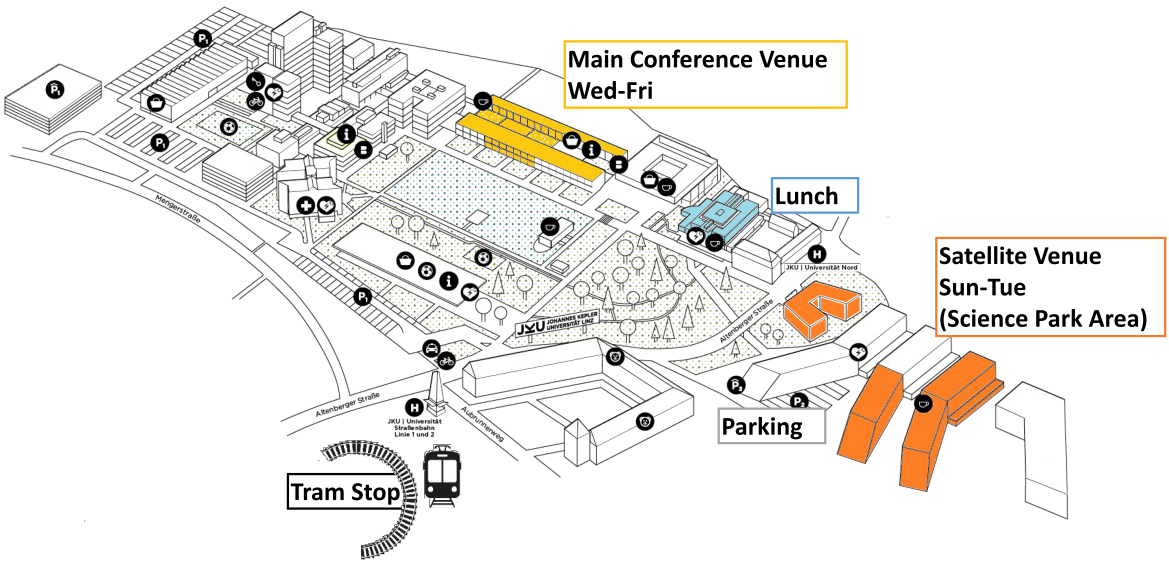
Venue

The conference takes place in the Science Park of the Johannes Kepler University (JKU) Linz, Altenbergerstraße 69, 4040 Linz.

Arrival

If you use the tram, you will reach the conference venue after about 300-400m.

If you arrive by car, you will find barrier-free parking spaces in the campus parking lot. In addition, it is permitted to stop for a short time directly in front of the conference venue.



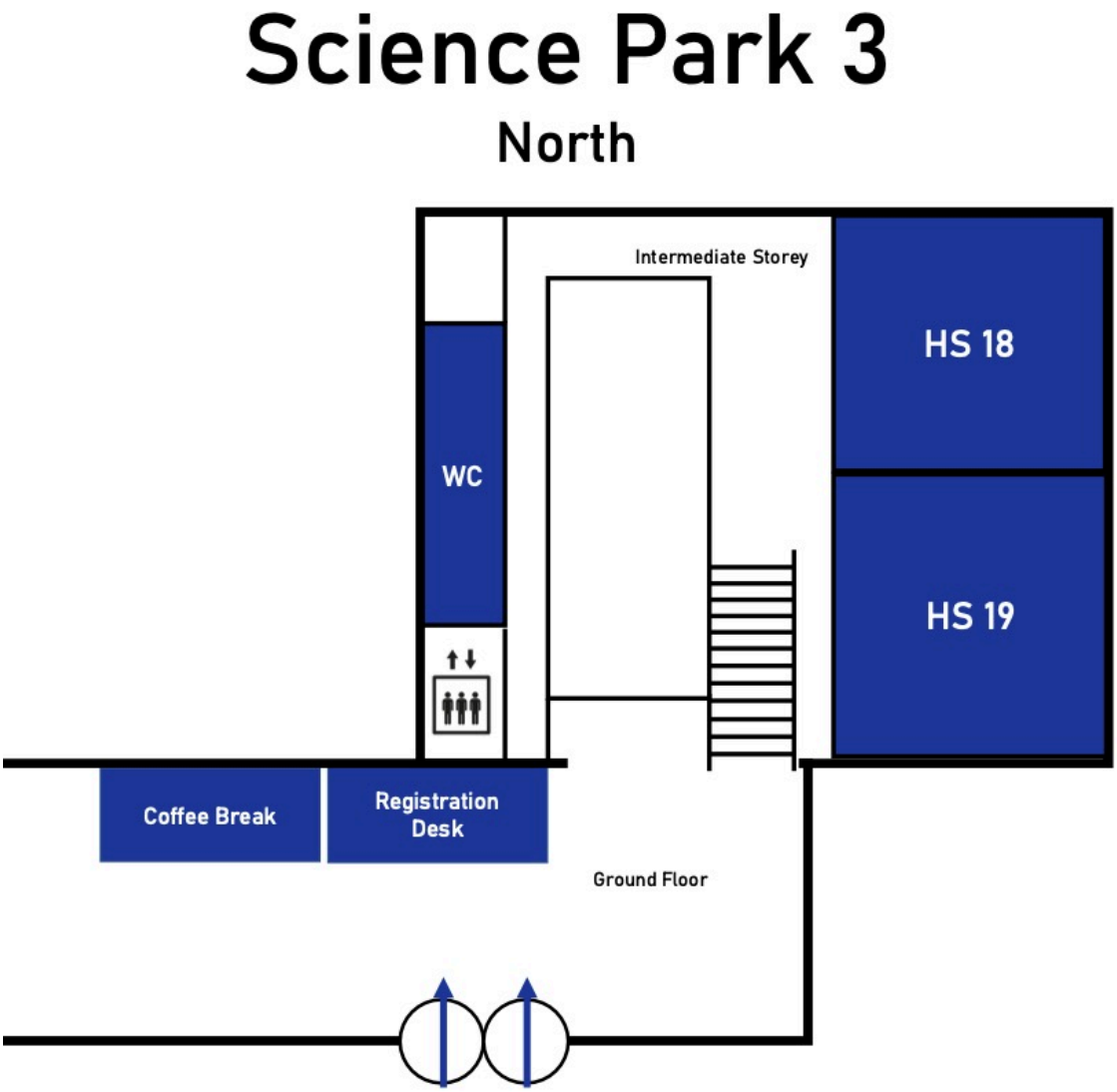
Premises

The conference will take place in Science Park 2, 3 & 5 as well as in the Keplergebäude (Lecture Hall). There are barrier free bathrooms in every building.

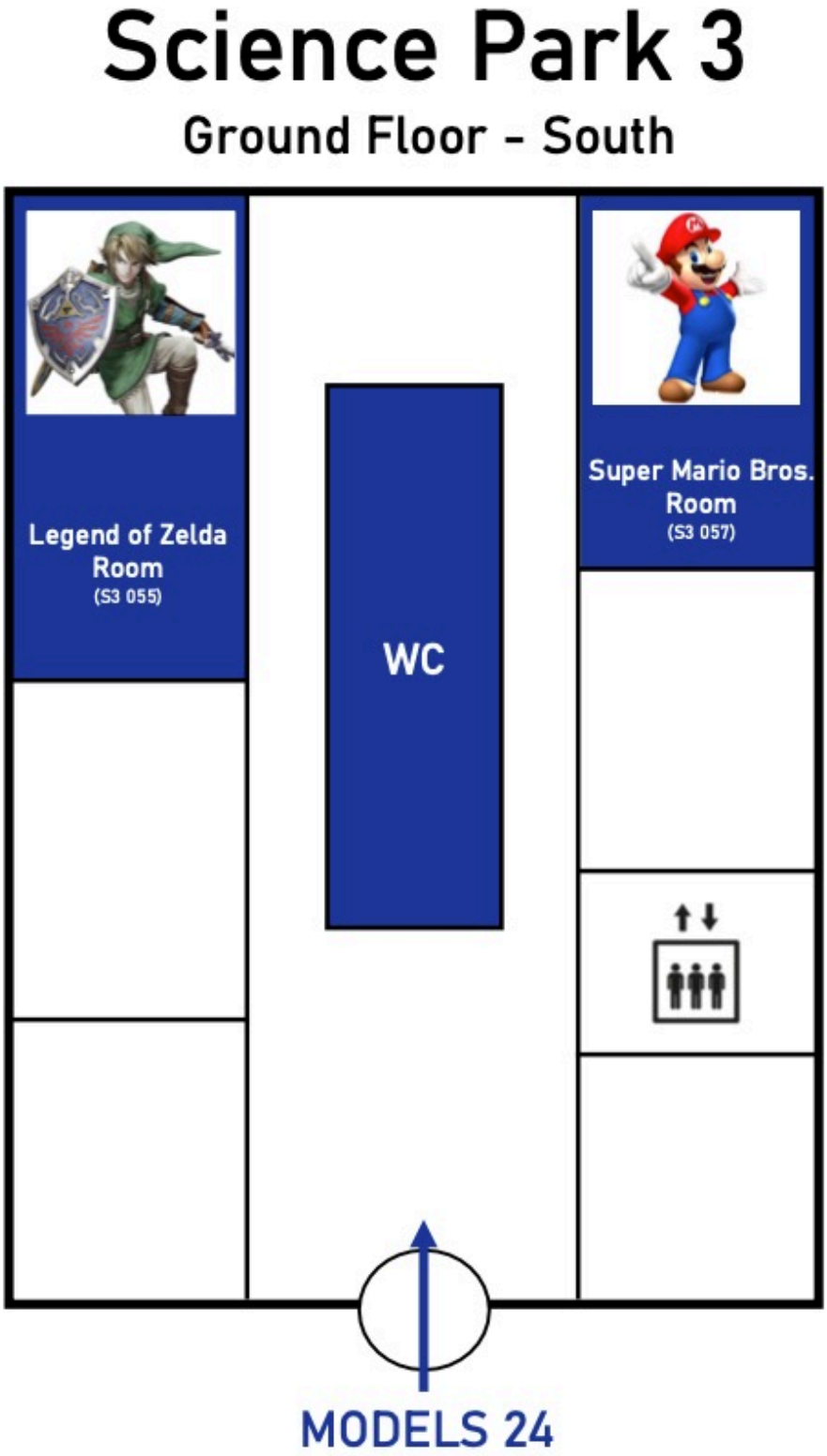
If you have any additional questions regarding accessibility at the event, feel free to contact:

models24@jku.at

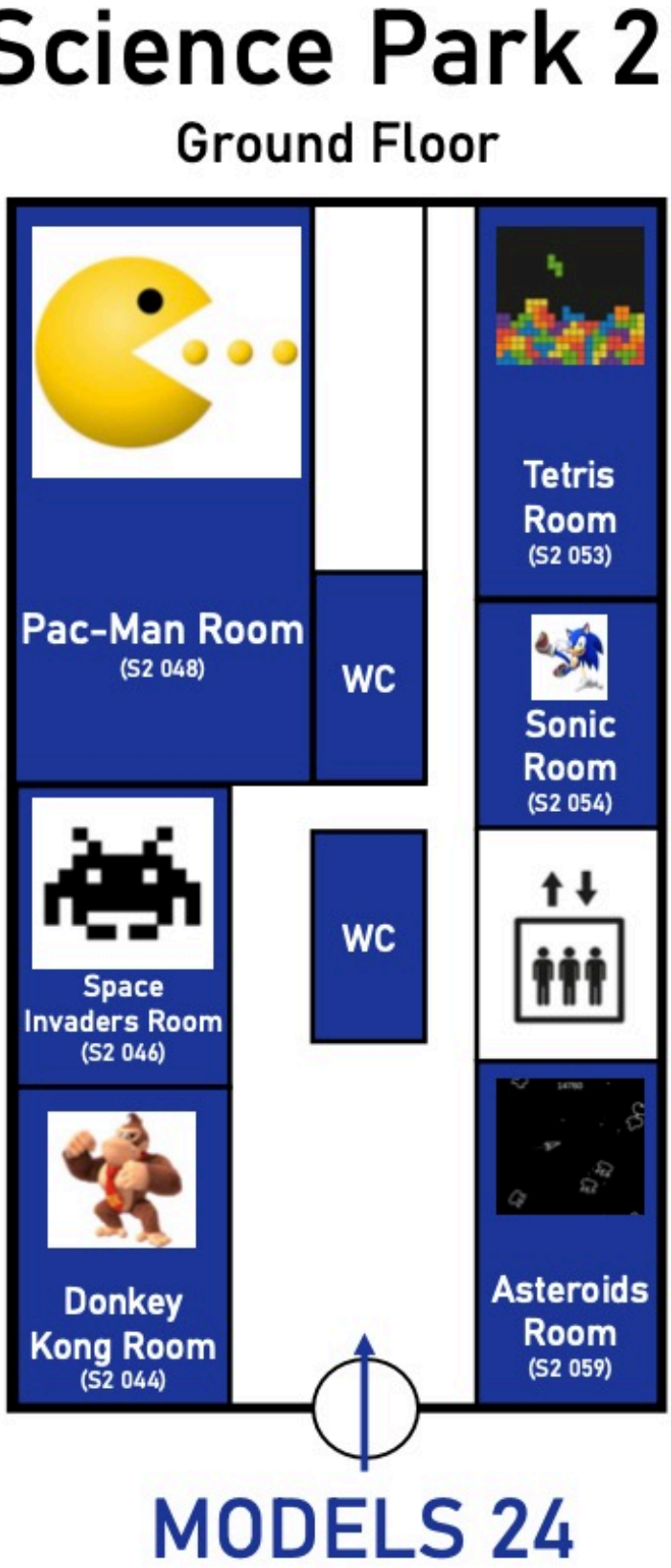
Room Plan


Science Park 3
North
Intermediate Storey
HS 18
WC
HS 19
Coffee Break
Registration Desk
Ground Floor

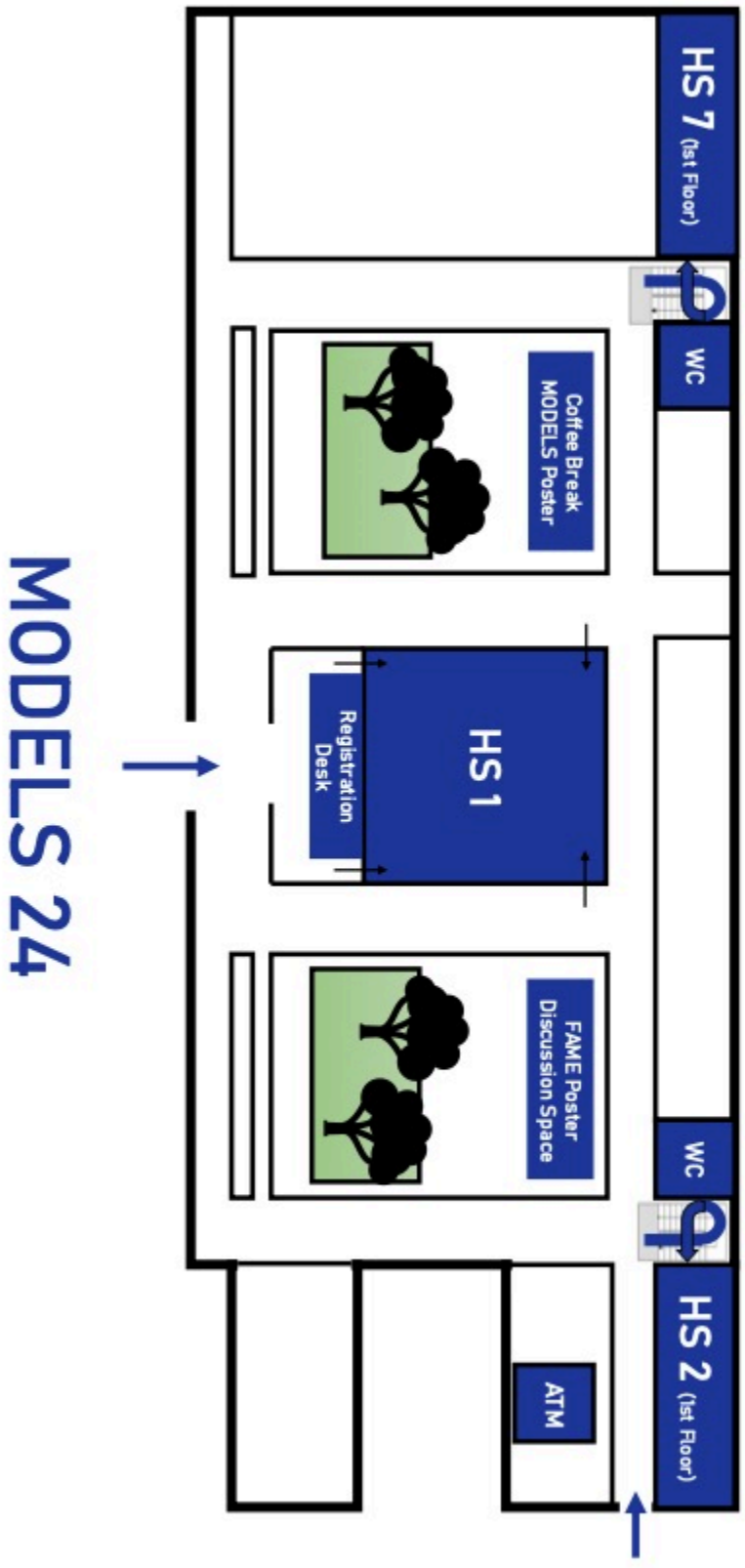
Room Plan


Science Park 3
Ground Floor - South
Legend of Zelda Room
(S3 055)
WC
Super Mario Bros. Room
(S3 057)
MODELS 24

Room Plan


Science Park 2
Ground Floor
Pac-Man Room
(S2 048)
WC
Tetris
Room
(S2 053)
Sonic
Room
(S2 054)
WC
Space
Invaders Room
(S2 046)
Donkey
Kong Room
(S2 044)
Asteroids
Room
(S2 059)
MODELS 24

Room Plan


Kepler Building
(with Lecture Hall Wing)
HS 7 (1st Floor)
WC
WC
HS 2 (1st Floor)
Coffee Break
MODELS Poster
HS 1
Registration
Desk
FAME Poster
Discussion Space
ATM
MODELS 24

Keynotes

Wednesday, 09:15 – 10:15

HS 1 (Lecture Hall)

Chair: Alexander Egyed & Manuel Wimmer

Joanne M. Atlee

Modelling and Analysis of Code

Faced with the goal of performing a system-wide analysis on large heterogeneous systems without the benefit of a system-wide model, we sought instead to derive models from code. The result is a suite of tools for (1) extracting from code, and other software artifacts, a lightweight graphical model of the software that is sufficiently detailed to support analyses of control flows, data flows, and software dependencies; (2) expressing diverse analyses of interest; (3) analyzing relatively large software models; and (4) and visualizing the analysis results. In this talk, we present the tools as well as our experiences in applying them to open-source software systems and to automotive software components and product-lines of components.

Dr. Joanne Atlee (P.Eng) is a Professor in the David R. Cheriton School of Computer Science at the University of Waterloo, where she is the Director of Women in Computer Science and was the founding Director for the Software Engineering program. Her research interests include software requirements, software modelling, automated analysis of software models, modular software development, and the detection and resolution of feature interactions — applied to telephony and automotive software. She served as the General Chair of the 41st International Conference on Software Engineering (ICSE'19), the co-Program Chair of the 31st International Conference on Software Engineering (ICSE'09), and the Program Chair for the 13th IEEE Requirements Engineering Conference (RE'05). She is a member of the International Federation for Information Processing (IFIP) Working Group 2.9 on Software Requirements Engineering. She serves on the editorial boards of Software and Systems Modelling and ACM Transactions on Software Engineering and Methodology. She is an ACM Distinguished Scientist, the 2020 recipient of the IEEE CS TCSE Distinguished Women in Science and Engineering (WISE) Leadership Award, and the 2022 recipient of the ACM SIGSOFT Distinguished Service Award.

Keynotes

Thursday, 09:15 – 10:15

HS 1 (Lecture Hall)

Chair: Benoit Combemale

Arie van Deursen

Valuable Software Engineering

As software engineers, the value we bring to society lies in the software systems we construct, maintain, and operate. Ideally, we do this in a cost-effective and predictable manner. In reality, however, software projects have a reputation of being late and overly costly.

In this talk, I will reflect on this drawing from experiences in the financial and public sector. Within the former, I will look at agile software development at scale at ING, a global bank headquartered in The Netherlands. Based on years of historic data of around 300 agile software development teams at ING, I will reflect on effort estimation, on time delivery, delay, and team dynamics, at scale. I will contrast this with the public sector by looking at assessments of over 100 government IT projects, conducted by the Advisory Council on IT Assessment (AcICT) of the Dutch government over the past years. Here I will reflect on the assessment procedure and its outcomes, including the main types of risks identified (which may be technical or organizational) and the nature of the advice given (which can include project termination). Given the insights from the financial and public sector, I will conclude by sketching research directions in the areas of governance, predictable value delivery, and modeling.

Arie van Deursen is a professor in software engineering at Delft University of Technology in The Netherlands. His research interests include software testing, human aspects of software development, software portfolio management, and foundation models for software engineering. Based on his research, he co-founded two spin-off companies: The Software Improvement Group (2000) and PerfectXL (2015). He serves as scientific director of AI for Fintech Research (AFR), a collobaration between TU Delft and ING Bank (2020-2024); and of AI for Software Engineering (AI4SE), a collaboration between TU Delft and JetBrains (2024-2028). In 2022, he was appointed by the Dutch cabinet as member of the Advisory Council on IT Assessment (AcICT), which offers advice to ministers and parliament on complex Information Technology projects. In 2023, he was elected Fellow of the Netherlands Academy of Engineering.

Keynotes

Friday, 09:15 – 10:15

HS 1 (Lecture Hall)

Chair: Marsha Chechik

Thomas Zimmermann

The Lord of the Models: The Fellowship of Trust in AI

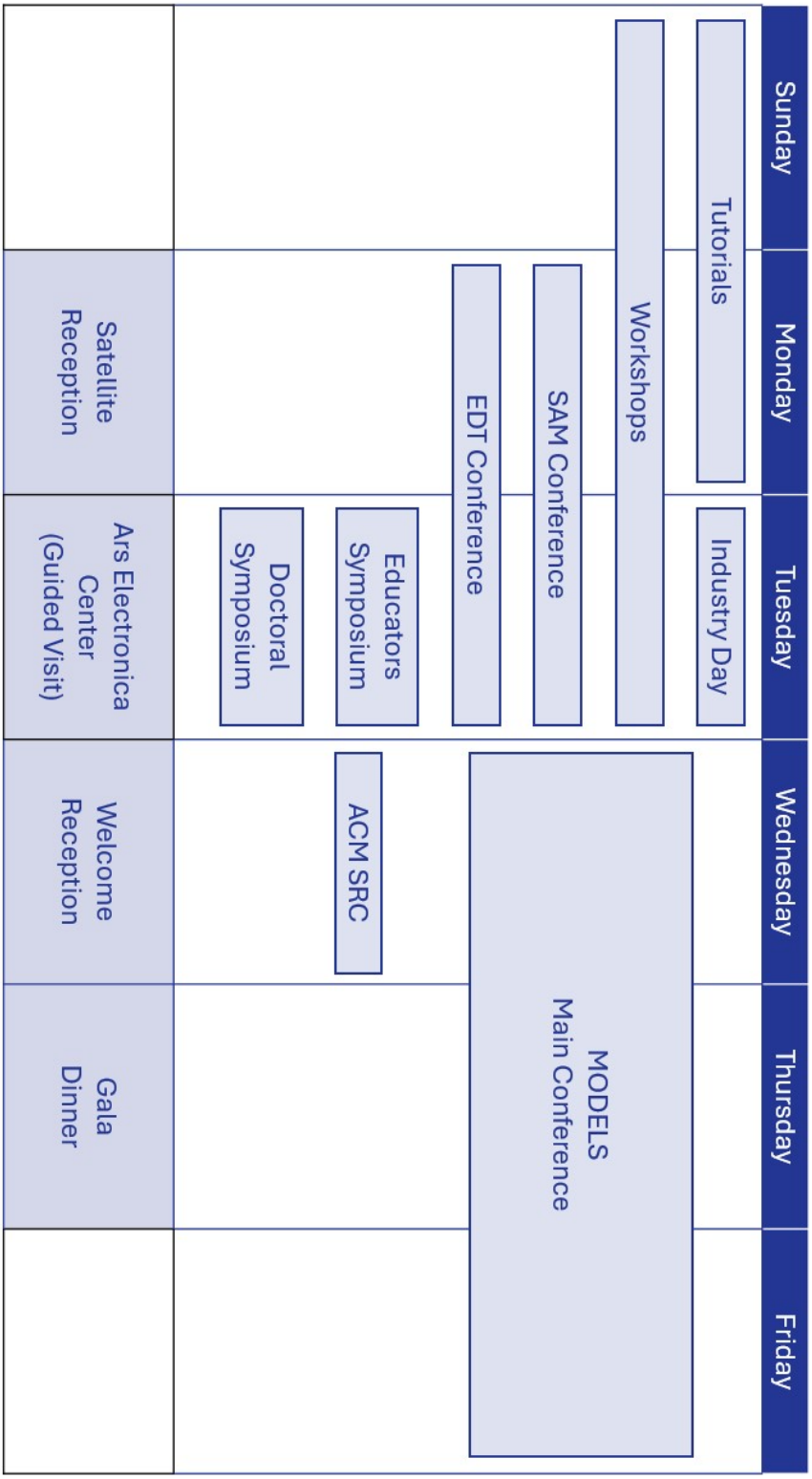
In the realm of software, an AI revolution is afoot, transforming how we create and consume our digital world. In this keynote, I shall share initial observations on the evolution of software engineering and its profound impact on developer productivity and experience. Like the forging of powerful artifacts, AI-driven tools are reshaping development processes, bringing unprecedented efficiencies yet also presenting new trials. Central to this grand transformation is the vital role of trust in AI-based software tools. Understanding and nurturing this trust is paramount for their successful adoption and integration. Moreover, I will reveal why the MODELS community stands as a pivotal fellowship in this epic journey, guiding us through the challenges and triumphs of the AI age. Join us as we embark on this transformative quest, bridging trust, innovation, and productivity in the dawn of AI and software engineering.

(This text has been rephrased by the author using ChatGPT to reflect a different style while maintaining the original meaning and contents.)

Thomas Zimmermann is a Sr. Principal Researcher at Microsoft, where he works on cutting-edge research and innovation in data science, machine learning, software engineering, and digital games. He has over 15 years of experience in the field, with more than 100 publications that have been cited over 25,000 times. His research mission is to empower software developers and organizations to build better software and services with AI. He is best known for his pioneering work on systematic mining of software repositories and his empirical studies of software development in industry. He has contributed to several Microsoft products and tools, such as Visual Studio, GitHub, and Xbox. He is an ACM Fellow, an IEEE Fellow, recipient of the IEEE TCSE Edward J. McCluskey Technical Achievement award, and Co-Editor in Chief of the Empirical Software Engineering journal. He is the Chair of the ACM Special Interest Group on Software Engineering and a frequent committee member for top software engineering conferences.

Program

Overview



Program

Sunday, 22nd September

09:00 - 10:30	Workshop 2 MDEIntelligence	Workshop 12 MLE	Workshop 3 CoPaMo	Workshop 8 MPM4CPS	Workshop 11 MoDeVVa	Tutorial 7 Modeling Workbenches with Jjodel	Tutorial 3 DT Support for Complex System of Systems	
10:30 - 11:00	Coffee Break							
11:00 - 12:30	Workshop 2 MDEIntelligence	Workshop 12 MLE	Workshop 3 CoPaMo	Workshop 8 MPM4CPS	Workshop 11 MoDeVVa	Tutorial 7 Modeling Workbenches with Jjodel	Tutorial 3 DT Support for Complex System of Systems	Tutorial 4 ADOxx
12:30 - 14:00	Lunch Break							
14:00 - 15:30	Workshop 2 MDEIntelligence	Workshop 12 MLE	Workshop 3 CoPaMo	Workshop 8 MPM4CPS	Workshop 11 MoDeVVa	Tutorial 10 Semantically Reflected DT	Tutorial 8 Modeling AAS in Industry 4.0	
15:30 - 16:00	Coffee Break							
16:00 - 17:30	Workshop 2 MDEIntelligence	Workshop 12 MLE	Workshop 3 CoPaMo	Workshop 8 MPM4CPS	Workshop 11 MoDeVVa	Tutorial 9 Refinery	Tutorial 8 Modeling AAS in Industry 4.0	

Monday, 23rd September

09:00 - 10:30	Workshop 7 LowCode	Workshop 9 MoM		Workshop 4 MASE	Workshop 13 MTT	EDTconf	SAM	Tutorial 1 Justification Models Using jPipe	Tutorial 5 Modeling Variability using EASy-Producer	
10:30 - 11:00	Coffee Break									
11:00 - 12:30	Workshop 7 LowCode	Workshop 9 MoM		Workshop 4 MASE	Workshop 13 MTT	EDTconf	SAM	Tutorial 1 Justification Models Using jPipe	Tutorial 5 Modeling Variability using EASy-Producer	
12:30 - 14:00	Lunch Break									
14:00 - 15:30	Workshop 7 LowCode	Workshop 9 MoM	Workshop 1 SusMod	Workshop 4 MASE	Workshop 13 MTT	EDTconf	SAM		Tutorial 2 EZR: understandable models from data	
15:30 - 16:00	Coffee Break									
16:00 - 17:30		Workshop 9 MoM			Workshop 13 MTT	EDTconf	SAM	Tutorial 6 Live Co-Evolution in the Cloud	Tutorial 2 EZR: understandable models from data	Industry Day
from 18:30	**Satellite Reception**									

Tuesday, 24th September

09:00 - 10:30	Workshop 6 MULTI	Workshop 10 ME		Educators Symposium	Doctoral Symposium	EDTconf	SAM	Industry Day	
10:30 - 11:00	Coffee Break								
11:00 - 12:30	Workshop 6 MULTI	Workshop 10 ME		Educators Symposium	Doctoral Symposium	EDTconf	SAM	Industry Day	
12:30 - 14:00	Lunch Break								
14:00 - 15:30	Workshop 6 MULTI	Workshop 10 ME		Educators Symposium	Doctoral Symposium	EDTconf	SAM	Industry Day	
15:30 - 16:00	Coffee Break								
16:00 - 17:30	Workshop 6 MULTI		Workshop 5 FPVM		Educators Symposium	Doctoral Symposium	EDTconf	SAM	Industry Day
from 18:30	**Visit to Ars Electronica Center**								

Program

Wednesday, 25th September

09:00 - 10:15	Keynote 1 Joanne Atlee		
10:15 - 10:45	Coffee Break		
10:45 - 12:30	Foundations (1)	MBSE and Digital Twins	ACM SRC
12:30 - 14:00	Lunch Break (+SoSyM EB Meeting)		
14:00 - 15:45	Modeling Languages Engineering	Applications (1)	ACM SRC
15:45 - 16:15	Coffee Break		
16:15 - 17:30	Birds of a Feather Meetings		
from 18:30	**Welcome Reception**		

Thursday, 26th September

09:00 - 10:15	Keynote 2 Arie van Deursen	
10:15 - 10:45	Coffee Break	
10:45 - 12:30	Foundations (2)	Model Management
12:30 - 14:00	Lunch Break	
14:00 - 15:15	Panel	
15:15 - 15:45	Coffee Break	
15:45- 17:30	MDE and AI (1)	Applications (2)
from 18:30	**Gala Dinner**	

Friday, 27th September

09:00 - 10:15	Keynote 3 Thomas Zimmermann	
10:15 - 10:45	Coffee Break	
10:45 - 12:30	MDE and AI (2)	Modeling Languages and Tools
12:30 - 13:30	Lunch Break	
13:30 - 15:00	Most Influential Papers	
from 15:00	**Farewell Get-together**	

WHITEPAPER

MODELLING COMPLEX CYBER-PHYSICAL SYSTEMS
IS SUITABLE VERSIONING EVEN POSSIBLE?

In our everyday practice of model-based systems engineering in various branches of industry, we repeatedly encounter the question of precise and easy-to-handle versioning of models. This question is becoming increasingly important due to legal regulations, stricter safety regulations and the significant increase in product variants. Therefore, we are responding to a frequently expressed wish and answering the question in this white paper as to whether clean versioning is possible at all when modelling complex cyber-physical systems.

LieberLieber

Workshops (WS)

Co-Chairs: Paul Grünbacher, Esther Guerra

1st International Workshop on Sustainability and Modeling (SusMod)

https://sustainability-and-modeling.github.io

Istvan David, Dominik Bork, Judith Michael

Sustainability is becoming a key characteristic of modern systems. While this trend has been long recognized, rigorous formal methods for assessing sustainability, reasoning about often contradicting sustainability properties, and involving the human in this process are missing. SusMod, the International Workshop on Sustainability and Modeling, aims to unearth visceral links between sustainability and MDE, and that, in both directions: MDE in support of sustainable systems engineering, and sustainability of MDE techniques.

6th Workshop on Artificial Intelligence and Model-driven Engineering (MDE Intelligence)

https://mde-intelligence.github.io

Lola Burgueño, Dominik Bork, Jordi Cabot, Sebastien Gerard, Aurora Ramirez

Artificial Intelligence (AI) has become part of everyone's life. It is used by companies to exploit the information they collect to improve the products and/or services they offer and, wanted or unwanted, it is present in almost every device around us. Lately, AI is also impacting all aspects of the system and software development lifecycle. There is no doubt that MDE has been a means to tame until now part of this complexity. However, its adoption by industry still relies on their capacity to manage the underlying methodological changes including among other things the adoption of new tools. To go one step further, we believe there is a clear need for AI-empowered MDE, which will push the limits of "classic" MDE and provide the right techniques to develop the next generation of highly complex model-based system and software systems engineers will have to design tomorrow.

This workshop provides a forum to discuss, study and explore the opportunities and challenges raised by the integration of AI and MDE. It aims to feature topics such as how to choose, evaluate and adapt AI techniques to MDE as a way to improve current system and software modeling and generation processes in order to increase the benefits and reduce the costs of adopting MDE. We believe that AI artifacts will empower the MDE tools and boost hence the advantages, and then adoption, of MDE at industry level. At the same time, AI is software (and complex software, in fact), we also believe that such AI-powered MDE approach will also benefit the design of AI artifacts themselves and specially to face the challenge of designing "trustable" AI software.

Lastly, we also believe that any kind of technique that provides human cognitive capabilities and helps creating "intelligent" software are also in the scope of this workshop. An example would be the knowledge representation techniques and ontologies that can be useful on its own or support other kinds of AI techniques.

International Workshop on Collaborative and Participatory Modeling (CoPaMo)

https://copamo.github.io

ISTVAN DAVID, ANNE GUTSCHMIDT, LUCIANO MARCHEZAN

Collaborative modeling is an important enabler to engineering complex systems. While mostly focusing on the technical and technological aspects of collaboration, the MDE community has also recognized the need for more pronounced stakeholder-facing concerns in collaborative modeling techniques and tools. Such stakeholder-facing concerns are the ones researched under the broader participatory modeling umbrella. This workshop aims to showcase the latest developments in collaborative and participatory modeling, as well as to expose the synergies between collaborative and participatory modeling by inviting researchers and organizers from both communities.

Workshop on Modeling in Automotive System and Software Engineering (MASE)

https://www.es.mdu.se/mase2024

ALESSIO BUCAIONI, JO ATLEE, JUERGEN DINGEL, SAHAR KOKALY

Modelling and model-based approaches to system and software development already have a long tradition in the automotive industry due to, e.g., the high need for abstraction, standardisation and interoperability. It is reasonable to believe that advances in modelling will be key to further advancing automotive system and software engineering as well. A central objective of the workshop is to provide a forum for practitioners and researchers from industry and academia in which novel, innovative, model-based solutions to current and future challenges in automotive system and software development can be presented and discussed.

Another important objective is the identification of new research problems arising from current trends. MASE'24 encourages submissions presenting novel and insightful descriptions of applications of modelling techniques to problems arising in the context of automotive system and software engineering. Moreover, we welcome experience reports describing insightful uses of modelling, and position papers on future challenges and open problems in the area. All submissions are expected argue the relevance of the described work to automotive software engineering clearly and convincingly.

Workshops (WS)

3rd International Workshop on Foundations and Practice of Visual Modeling (FPVS)

https://fpvm.github.io

FRANCESCO BASCIANI, AMLETO DI SALLE, RICCARDO RUBEI, JUHA-PEKKA TOLVANEN

The sheer complexity of software systems nowadays makes modeling artifacts pervasive throughout development, be it use requirements, analysis, design, or development. Whether models are used for communication or prescriptive purposes, their syntax and pragmatics affect usability and represent contributory factors concerning accidental complexity. The diversity of modeling notations and approaches permits classifying them according to different taxonomies. General-purpose and domain-specific modeling languages can be created with different intended scopes. However, all of them can use graphical, textual, maps, matrices, tables, and combinations regarding their concrete syntax. These representations have the undoubted advantage of capturing and increasing understanding of complex software systems and better grasping their rationale. In essence, a visual modeling language creates a joint base for the modeler by improving communication and laying a solid foundation for the implementation. FPVM 2024 aims to promote and foster discussions on visual modeling languages, including novel and visionary ideas and techniques, notations for the generations of support tools for visual languages, and the usability of tools and meta-tools.

11th International Workshop on Multi-Level Modeling (MULTI)

https://multi-workshop.github.io

GERGELY MEZEI, CLAUDENIR M. FONSECA, FERNANDO MACÍAS

The MULTI workshop series is the premier venue for researchers and practitioners working on multi-level modeling and multi-level software development. Multi-level modeling represents a new object-oriented paradigm for both conceptual modeling and software engineering. In contrast to conventional two-level approaches, it supports an unbounded number of classification levels and introduces concepts and mechanisms that foster reuse, adaptability, and control. While multi-level languages and tools have reached considerable maturity, the field still offers numerous challenges. The MULTI workshop series aims at providing a platform for exchanging ideas and promoting further development of multi-level languages, methods, and tools. A particular goal is to encourage the community to, beyond proposing new approaches, analyse different approaches to multi-level modelling and define objective ways to evaluate their respective strengths and weaknesses.

Workshops (WS)

Workshop on Low-Code Development Platforms (Low-Code)

https://lowcode-workshop.github.io

DAVIDE DI RUSCIO, ANTONIO GARMENDIA, DIMITRIS KOLOVOS, MASSIMO TISI

Cloud-based low-code development platforms such as Google's AppSheet, Microsoft's PowerApps, OutSystems and Mendix have become increasingly popular over the last few years, owing to an increasing demand for bespoke, cost-efficient and reliable data-intensive (e.g., back-office) software solutions. Low-code platforms are model-driven at their heart and hence closer interaction and cross-pollination is found to be highly beneficial for the low-code and model-driven engineering communities. The LowCode 2024 workshop aims to bring together vendors and users of low-code platforms with model-driven engineering researchers and practitioners, and to explore opportunities for technology and experience transfer, and collaboration between them.

Workshop on Multi-Paradigm Modelling for Cyber-Physical Systems (MPM4CPS)

http://msdl.uantwerpen.be/conferences/MPM4CPS/2024

MOUSSA AMRANI, RANDY PAREDIS, JOERI EXELMANS, ROBERT HEINRICH

Tackling the complexity involved in developing truly complex, designed systems is a topic of intense research and development. System complexity has drastically increased once software components were introduced in the form of embedded systems, controlling physical parts of the system, and has only grown in CPS, where the networking aspect of the systems and their environment are also considered. The complexity faced when engineering CPS is mostly due to the plethora of cross-disciplinary design alternatives and inter-domain interactions. To date, no unifying theory nor system design methods, techniques, or tools to design, analyze, and ultimately deploy CPS exist. Individual (physical systems, software, network) engineering disciplines offer only partial solutions and are no match for CPS complexity.

Multi-Paradigm Modeling (MPM) offers a foundational framework for gluing several disciplines together in a consistent way. The inherent complexity of CPS is broken down into the most appropriate views and architectures, at the most appropriate levels of abstraction, and expressed in appropriate modeling formalisms, each with precisely defined semantics. Often complex, collaborative workflows are modeled explicitly too. MPM aims to provide processes and tools that can combine, couple, and integrate the many concerns that define a system.

Workshops (WS)

MPM encompasses many research topics: from language engineering (for DSLs, including their (visual/textual) syntax and semantics), to processes to support multi-view and multi-abstraction modeling, simulation for full-system analysis, and deployment. The added complexity that CPS brings compared to embedded and software-intensive systems requires consideration of how MPM techniques can be applied or adapted to these new applications, tying together multiple domains. Many remaining research questions require answers from researchers in different domains, as well as a unified effort from researchers who work on supporting techniques and technologies. The community needs a workshop setting to meet up and align past and future research activities.

This year, the Workshop will be organised as a highly interactive session making large room for exchange and discussions, based on out-of-the-box presentations targeting one of the central notions at the heat of MPM4CPS: what makes formalisms, views, abstraction levels, etc. the most appropriate for a given context, task(s), and stakeholders? The morning will invite a keynote speaker, as well as a few, high-quality scientific contributions; the afternoon will be organised as small group discussions around targeted topics on this year's theme. We welcome anyone interested in joining, or contributing, to these discussions and topics to actively attend.

First International Workshop on Model Management (MoM)

https://mom2024.wp.imt.fr

Dominique Blouin, Sylvain Guerin, Vasco Amaral, Anish Bhobe, Chahrazed Boudjemila, João Almeida

Model-Based Systems Engineering (MBSE) is a popular way to specify, design, implement, deploy and maintain complex systems with high quality and lower costs. These systems combine multiple areas of engineering, including mechanical, electrical, hydraulic, biochemical, control, signal processing, and more. To represent all these aspects, a large number of heterogeneous models are required. However, managing these models correctly can be challenging, especially when different teams work on them simultaneously, which is common in collaborative and concurrent engineering. This activity is called Model Management (MoM) and includes activities beyond maintaining model consistency, such as managing model views, model validity, model versions, and development workflows.

MoM is crucial for industries that are moving from traditional engineering methods to MBSE. Therefore, there are many approaches to MoM, both from academia and industry. However, there is still no single theory or approach to tackle this problem. To address this, this MoM workshop's first edition aims to bring together international researchers and practitioners from academia and research for an intense one-day workshop. The goal is to further the state-of-the-art in MoM, develop new collaborations, and define future directions.

Workshops (WS)

Workshop on Models and Evolution (ME)

https://models-and-evolution.github.io

Djamel Eddine Khelladi, Juri Di Rocco, Dalila Tamzalit

Model artifacts are subject to constant evolution throughout the life cycle of modern systems.

These dynamics necessitate proper theories, techniques and tools to ensure correctness, consistency, and high quality across the trajectory of evolution. However, evolution issues are critical, complex and costly to manage, and even more concerned by constant increase in complexity. They concern requirements, software architecture, design, source code, documentation, integration or deployment. They also typically affect various kinds of models (data, behavioural, domain, source code or goal models).

The Models and Evolution workshop will be in its 18th edition in 2024 and aims to bring together researchers and practitioners to discuss the latest developments around the topic of evolution of models and various artefacts used in MDE.

Workshop on Model Driven Engineering, Verification and Validation (MoDeVVa)

https://sites.google.com/site/modevva

Saad Bin Abid, Jens Kosiol, Rakshit Mittal, Iulian Ober, Ernesto Posse

The workshop on Model Driven Engineering, Verification, and Validation (MoDeVVa) offers a forum for researchers and practitioners who are working on verification and validation (V&V) in Model-Based Systems Engineering (MBSE) and Model Driven Software Engineering (MDE) or who are applying model-based techniques in V&V activities. The main goals of the workshop are to discuss the state of practice in V&V approaches in MBSE/MDE, of applying MBSE/MDE to V&V and to identify, investigate and discuss emerging research in the mutual impacts of model-based engineering and V&V, as well as to explore tools, integration and applications of V&V in MBSE/MDE and vice-versa.

Workshops (WS)

Workshop on Modeling Language Engineering (MLE)

https://mleworkshop.github.io/editions/mle2024

ED SEIDEWITZ, ANTONIO BUCCHIARONE, DORIAN LEROY

Software-intensive systems are complicated, driven by the need to integrate across multiple concerns. Consequently, the development of such systems requires the integration of different concerns and skills. These concerns can be covered by different domain-specific modeling languages, with specific concepts, technologies, and abstraction levels. This multiplication of languages eases the development related to each individual specific concern but raises language and technology integration problems at the different stages of the software life cycle. To reason about the global system as a whole, it is necessary to explicitly describe the different kinds of relationships that exist between the different languages used in its development. To support effective language integration, there is a pressing need to reify and classify these relationships, as well as the language interactions that the relationships enable. Equally, the proliferation of domain-specific modeling languages required increases the need for effective and efficient techniques for engineering languages and their support infrastructures (transformations, analysis tools, editors, execution infrastructure, debuggers, ...). The Modeling Language Engineering (MLE) workshop aims at bringing together researchers and practitioners working on modeling-language and software-language engineering. It is a meeting opportunity for Software Language Engineering (SLE) enthusiasts within the software-modeling community.

2nd Working Session on a Common Architecture/Infrastructure for Modelling Tools for Teaching (MTT)

https://modellingtoolsforteaching.github.io

JÖRG KIENZLE, STEFFEN ZSCHALER

Many academic modelling tools have accumulated significant technical debt and lack of the nowadays quality standards. Following on from the success of the 1st working session on a common architecture/infrastructure for modelling tools for teaching, held at MODELS'23, which produced a comprehensive catalogue of requirements for modelling tools for teaching to be published in SoSyM, we propose a 2nd working session to focus on designs and implementations delivering on these requirements. The session will have a short programme of presentations, but will prioritise discussion and consensus-forming to work towards community-owned assets as the foundations for modelling tools for teaching.

Doctoral Symposium

Co-Chairs: Leen Lambers, Sébastien Mosser

The goal of the MODELS 2024 Doctoral Symposium is to provide an international forum for students registered for a research degree to interact with and engage with academic mentors working in model-based engineering. The symposium supports contributors directly, led by a champion from the Programme Committee, and provides independent and constructive feedback about contributors' already completed and planned research. To this end, the Symposium Programme Committee comprises experts in various fields of model-based engineering.

The Symposium will have a one-day workshop format, with presentations by the students whose papers are accepted by peer reviewers, feedback from the mentors (who are among the peer reviewers), and plenty of time for discussion. The workshop is open to all research students, mentors, presenters, and all other conference participants, except that we request that the research supervisors not attend their own supervisee's presentations.

We are pleased to announce that this year's keynote presentation will be given by Pr. Silvia Abrahão, Full Professor of Software Engineering in the Department of Computer Science at Universitat Politecnica de Valencia.

Keynote

Secrets to a successful PhD in MDE: from technical aspects to wellbeing and resilience - Silvia Abrahão

Accepted Papers

AI Assisted Domain Modeling Explainability and Traceability - Jonathan Silva

Automated Generation and Configuration of Domain-Specific Recommender Systems - Rickson Simioni Pereira

Automated Synchronization of Enterprise Architecture Models with Deployment Models - Marcel Weller

Automating Digital Twins Development in Industry 4.0 - Lina Bilal

Collaborative Platform for Heterogeneous Modeling - Théo Giraudet

Contract-based Validation of Conceptual Design Bugs for Engineering Complex Machine Learning Software - Willem Meijer

Ensuring the consistency of information between two versions of a mechanical drawing – Alexandre Monnier Weil

Estimation, Impact and Visualization of Schema Evolution in Graph Databases – Dominique Hausler

Probabilistic Graph Queries for Design Space Exploration Under Uncertainty - Máté Földiák

Educators Symposium

Co-Chairs: Antonio Garcia-Dominguez, Eugene Syriani

Model-driven engineering has been part of university curricula and corporate training programs for many years. Modeling notations are taught in various courses and programs, from software engineering to enterprise architecture. Most educators would agree that teaching modeling is challenging, especially given the growing student population interested in modeling.

The 20th Educators Symposium at MODELS 2024 provides educators, researchers, and practitioners with a forum to discuss educational issues relating to modeling and modeling technologies, and share their experiences in the field.

Keynotes

Detecting Modelling Plagiarism: Navigating Automated Obfuscation and Generative AI - Timur Sağlam

Personalized and Playful Education: the ENCORE platform - Antonio Bucchiarone

Accepted Papers

Designing and Generating Lesson Plans combining Open Educational Content and Generative AI - Antonio Bucchiarone, Antonio Cicchetti, Andrea Vazquez-Ingelmo, Filippo Adami, Gianluca Schiavo, Alicia García-Holgado, Francisco José García-Peñalvo

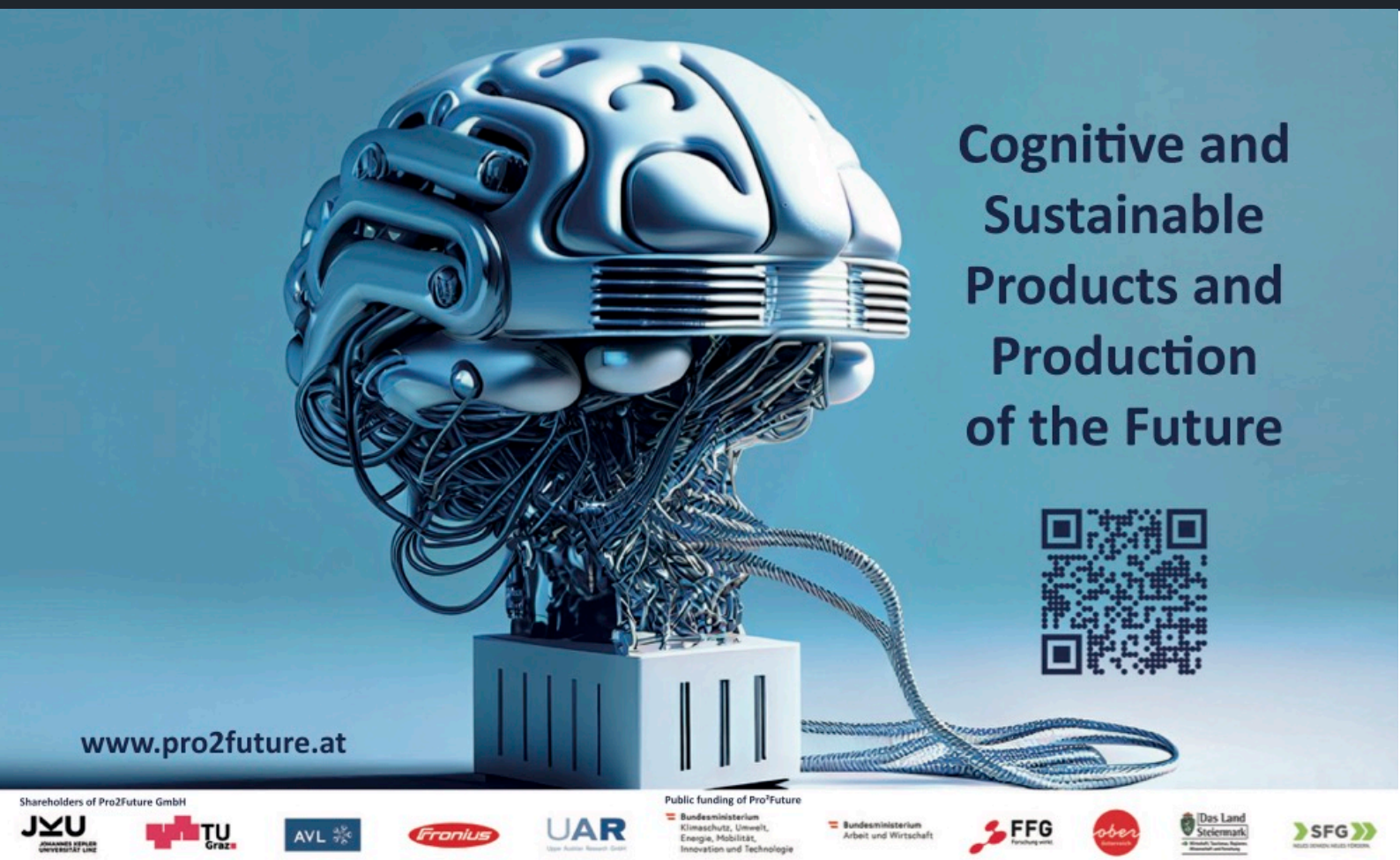
Embedding-based Automated Assessment of Domain Models - Kua Chen, Boqi Chen, Yujing Yang, Gunter Mussbacher, Daniel Varro

Enhancing Software Modeling Learning with AI-Powered Scaffolding - Pasquale Ardimento, Mario Luca Bernardi, Marta Cimitile, Michele Scalera

Teaching Model-Driven Low-Code Development Platforms - Joel Charles, Judith Michael, Lukas Netz, Bernhard Rumpe

Towards an Interoperable Model-driven Automated Assessment System for Computer Science Education - Markus Hamann, Sebastian Götz, Uwe Aßmann

UML++: Enhancing Student Learning of Object-Oriented Modeling through Executable Objects - Pierre Maier, Tobias Schwarz



Tutorials

Co-Chairs: Shaukat Ali, Nelly Bencomo

Creating and Operationalizing Justification Models Using jPipe

Sébastien Mosser, Nirmal Chaudhari, Cass Braun, Kai Sun

Justification models are a lightweight approach to supporting accreditation, validation, or certification. Usually, when engineers work on pipelines (e.g., continuous integration/deployment, machine learning, notebooks), their primary focus is on the pipeline itself, and the justification of why this pipeline is the right one for their software is, at best, part of the documentation. This leads to operational/maintenance problems: Is your machine learning pipeline reusable? What is the purpose of that "weird" step in your continuous integration pipeline that you have no idea why it is there, but the pipeline fails if you remove it? With jPipe, we assume that justifying software should be easy and support both the initial modelling of a system and its incremental evolution. In this tutorial, we will present how the jPipe compiler can be used to model a justification, how composition algorithms can be used to support incremental/iterative evolution, and how the compiler's modular nature allows one to integrate it into one's own system. The tutorial will illustrate these key points of jPipe by using a family of good practices to validate a data science notebook automatically. It will guide the audience through (1) the definition of justification models to validate notebooks, (2) their organization into composable artifacts, (3) their operationalization into CI/CD pipelines through code generation and (4) the integration of these justification models in a standalone Java application.

EZR: How to build understandable models from data, simpler, smarter, faster

Tim Menzies

How to simplify modeling? After decades of work building models with AI tools, what have we learned? Over the years, there have been many reports that very simple models can perform exceptionally well. Yet, where are the researchers asking "say, does that mean that we could make modeling simpler and more comprehensible?"

To fill that gap, we offer EZR, a simple, fast toolkit that can model complex problems with just a few data points (using incremental sampling). The approach supports classification, regression, optimization, fairness, explanation, data synthesis, privacy, compression, planning, monitoring, and runtime certification (but not generative tasks).

For all these tasks, our minimal data usage simplifies model construction and verification. The lesson from all this work is not everything can be simplified, but many things can. When simplicity works, we should embrace it. Who can argue against that?

Tutorials

We illustrate EZR with 49 examples from the SE domain ranging from (a) the control of software processes to (b) controlling the models learned by AI tools to (c) the configuration of video encoders. With EZR, certain tasks that were previously intimidating complex (e.g. hyperparameter optimization) are now practical, easy, and fast.

All the materials used here are available on-line under and open-source license (BSD2). This content would be suitable for a one semester advanced SE graduate class on “how to refactor AI to make it simpler”.

Digital Twin based Support for Complex System of Systems

VINAY KULKARNI, SOUVIK BARAT, TONY CLARK, BALBIR BARN

We live in a world replete with complex system of systems that need to operate in a dynamic and uncertain environment thus necessitating continuous adaptation so as to deliver the stated goals which may also change over time. These systems, characterized by large size and non-linear interactions, are spread across spaces such as information-only, cyber-physical, societal, and biological. They raise new concerns to be addressed such as: (i) Why things are the way they are? (ii) What are the right interventions to bring the system back to the desired state? (iii) Is a better state possible? And (iv) How best to reach the desired to-be state from as-is state? With current practice found wanting, we present a digital twin centric simulation-based approach and associated technology that builds further upon proven results from Modelling & simulation, AI, Control Theory, and Software Engineering. We illustrate utility and efficacy of the approach with a representative sample of real world use cases and highlight open challenges that need to be overcome going forward. We also touch upon leveraging Generative AI in supporting Digital Twin life cycle.

The Open-Source Metamodelling Platform ADOxx: Implementing Conceptual Modelling Tools

WILFRID UTZ, CHRISTIAN MUCK, PATRIK BURZYNSKI

The research field of conceptual modelling identifies models as artefacts describing a real or proposed system on an abstraction level adequate for a given purpose. To fully utilize the value of models, a modelling method and a corresponding tool must be created, which is no easy undertaking. This tutorial introduces the open-source metamodelling platform ADOxx as a way to ease the creation of modelling tools. It will show in a hands-on manner how ADOxx can be used to implement modelling tools and corresponding model processing functionality to increase model value, allowing users to process, transform or execute the models. Therefore, models cannot only be used within the modelling tool but can be used to interact with and control other information systems or smart devices. To provide insight into the possibilities of model processing, the Bee-Up tool will be introduced as an ADOxx best practice.

Tutorials

The scenarios used in the tutorial stem from established teaching cases and from the EU-funded FAIRWork project. The tutorial will provide a theoretical background in metamodelling and metamodelling platforms, showing what is under the hood of the processing functionality. Afterwards, the theoretical concepts will be applied in a hands-on manner during the tutorial.

Modeling Variability and Its Transformation using the EASy-Producer tool suite

KLAUS SCHMID, HOLGER EICHELBERGER

This tutorial provides an introduction to the variability modeling capabilities of the EASy-Producer tools. EASy-Producer is an open-source toolset for modeling variability for product lines and has been applied in numerous studies. It differs from other tool sets as it focuses on domain-specific language approach, has very high expressiveness, is fully typed, open to extension and allows for modeling also dynamic product lines. The full tool set consists of three sub-languages: the Integrated Variability Modeling Language IVML for modeling the actual variability and the VIL and VTL languages, focusing on transforming the variability into customized artifacts. Within this tutorial, we will focus on a general overview and the IVML.

As an outcome, the participants of the tutorial will understand the capabilities and design decisions of the toolset and gain a basic practical understanding of how to use it to define variability models, constraints and product configurations.

EASy-Producer has been developed over many years to support complex and large-scale variability-intensive product lines. It is available via our update site and as open source on GitHub (via http://ssehub.net/).

Live Co-Evolution of Modeling Languages, Tools and Models in the Cloud

STEVEN KELLY, JUHA-PEKKA TOLVANEN

A language for a particular domain must evolve along with that domain. Keeping the modeling tools and existing models in sync with the language is an interesting challenge. Doing it live with multiple modelers and multiple metamodelers is fun. This tutorial investigates and demonstrates proven solutions for industrial scale co-evolution of languages, tools and models. Participants will see how changes to a language can be propagated to users safely and automatically, in the same way as changes made to models. The evolution of the language and models will be recorded in the version history, with participants able to see their changes and document them in version comments. Participants will gain practical experience and understanding by taking part in the modeling and metamodeling using the provided cloud-based tools. Explanations, discussions and tasks will help all participants think through the hows and whys of co-evolution and its mechanisms.

Tutorials

Building Advanced Modeling Workbenches with Jjodel

Juri Di Rocco, Damiano Di Vincenzo, Alfonso Pierantonio, Giordano Tinella

This tutorial presents Jjodel, a cloud-based model-driven platform designed to minimize accidental complexity and cognitive load. By eliminating the need for installation and maintenance, it offers a zero-setup experience, reducing technical overhead and allowing users to focus on creative tasks. The session explores Jjodel's real-time collaborative modeling capabilities, enabling concurrent work on all language elements, including metamodels, syntax, validation viewpoints, and model authoring. Utilizing state-of-the-art web technologies, Jjodel simplifies complex modeling tasks, including metamodeling and concrete syntax definition.

Attendees will engage in interactive demonstrations and practical exercises, honing their skills across examples at different levels of granularity. By the end of this tutorial, attendees will fully grasp Jjodel's functionalities and be ready to adopt it in their Model-Driven Engineering (MDE) initiatives. This includes learning to specify multiple syntax viewpoints for various stakeholders. Jjodel is particularly suitable for educators teaching model-driven engineering and modeling courses, as it simplifies the adoption of technological platforms in educational contexts. The tutorial will emphasize Jjodel's ability to streamline diverse modeling tasks, increasing the efficiency and accessibility of MDE.

Modeling Asset Administration Shells in Industry 4.0 - A critical overview

Holger Eichelberger, Klaus Schmid

This tutorial provides an introduction to the Industry 4.0 modeling approach of Asset Administration Shells (AAS, IEC 63278-1 ED1). AAS aim at model-based interoperability on the shop floor or in value chains, e.g., for products in terms of their digital product passport or their product carbon footprints. Based on the AAS meta model, the Industrial Digital Twin Association (IDTA)1, who is coordinating the standardization efforts on AAS, is currently specifying various data AAS (submodel) data formats, out of which 19 were published in June 2024 and further 66 are announced.

We introduce the AAS approach and discuss recent industrial use cases, the metamodel, serialization formats, available tooling and, in particular, recent model-driven research approaches for AAS approaches in different communities. As part of the discussion, we compare AAS to related approaches like OPC UA as well as scalability and expressiveness of AAS. To a certain degree, research results stem from our own work on realizing the AI-integrating open-source Industry 4.0 platform oktoflow2, which has been developed in the funded project IIP-Ecosphere3 based on an industrial requirements collection.

At it's core, oktoflow is steered by a ver- tical integration of AAS and provides model-driven data stream integration of services and connectors for relevant standards, including AAS and IDTA AAS submodel templates. Besides many other open-source components, oktoflow relies for modeling capabilities on EASy-Producer, an open-source toolset for variability modeling and instantiation. Oktoflow was presented in terms of Industry 4.0 demonstrators at industrial fairs like the Hannover Fair or the EMO fair.

As an outcome, the participants of the tutorial will understand the AAS standard, which is currently trending in Industry 4.0/IIoT, its modeling capabilities, relations to other modeling approaches in the field as well as relevant trade-offs.

Refinery: Logic-based Partial Modeling

KRISTÓF MARUSSY, OSZKÁR SEMERÁTH, ATTILA FICSOR, DANIEL VARRO

During the early modeling phase, model developers must manage a wide range of potential design alternatives that are frequently incomplete or inconsistent. However, existing modeling tools force developers to work with concrete models, making developers formulate possible design decisions outside the modeling editor and losing the available model validation or transformation support.

Partial modeling is a technique to support the explicit modeling of uncertainty in models, which needs mathematically precise reasoning tools to inform the user about the impact of each design decision on the range of valid models. Scalability challenges make traditional logic solvers ill-equipped to analyze partial graph models in industrial contexts.

More recently, the Refinery framework has been introduced to manage partial models and carry out analysis and graph generation using algorithms specifically tailored for large software and system models. In this tutorial, we present the partial modeling formalism and language offered by Refinery and showcase its analysis and graph generation capabilities for (1) querying and reasoning over models with incomplete information, (2) pinpointing validation errors and inconsistencies in information coming from multiple sources, and (3) concretizing partial models to obtain possible test cases or design candidates automatically. The tutorial leverages Refinery's web-based partial modeling environment for an installation-free experience.

Tutorials

The Semantically Reflected Digital Twin

EINAR BROCH JOHNSEN, EDUARD KAMBURJAN, SILVIA LIZETH TAPIA TARIFA

Digital twin applications use digital artifacts to twin physical systems. The purpose is to continuously mirror the structure and behavior of the physical system, such that stakeholders can analyze the physical system by means of the digital twin for, e.g., decision support, scenario exploration, model-based control, systematic reconfiguration, etc. In this tutorial, we discuss the basic concepts of a digital twin, and how digital twins differ from models and control systems. We show how digital twins can be realized in a framework that integrates models at runtime, semantic technology and simulation models, in order to leverage domain knowledge in model-based analysis driven by live data. We further discuss how a digital twin can systematically evolve over time to mirror a changing physical system. For this purpose, we discuss our work on semantic reflection, which enables a digital twin to query a knowledge graph about itself, and leverage formalized knowledge of the application domain in its (re)configuration strategies. The tutorial will be illustrated by concrete easy-to-understand examples of digital twins, including our on-going work on digital twins for natural systems such as the Oslo fjord.

BEASTLY GOOD OPPORTUNITIES WANTED?

Fabasoft®

Apply Now!

We are Fabasoft, a leading software product company and cloud service provider. Join our ambitious team of experts and shape with us the future of digital process management.

Technical Track

Foundations Track

Chair: Marsha Chechik

A Comparative Analysis of Energy Consumption Between Visual Scripting models and C++ in Unreal Engine: Raising Awareness on the importance of Green MDD -Javier Verón Mérida, Carlos Pérez, Coral Calero, Mª Angeles Moraga, Francisca Pérez, Carlos Cetina

AI-Driven Consistency of SysML Diagrams - Ludovic Apvrille, Bastien Sultan

AlloyASG: Alloy Predicate Code Representation as a Compact Structurally Balanced Graph - Guanxuan Wu, Allison Sullivan

Automated Derivation of UML Sequence Diagrams from User Stories: Unleashing the Power of Generative AI vs. Rule-Based Approach - Munima Jahan, Mohammad Mahdi Hassan, Reza Golpayegani, Golshid Ranjbaran, Chanchal K. Roy, Banani Roy, Kevin Schneider

EditQL: A Textual Query Language for Evolving Models - Jakob Pietron, Benedikt Jutz, Alexander Raschke, Matthias Tichy

Meta-Modelling Kindness - Faeq Alrimawi, Bashar Nuseibeh

Model Everything but with Intellectual Property Protection—The Deltachain Approach - Thomas Weber, Sebastian Weber

ModelMate: A recommender for textual modeling languages based on pre-trained language models - Carlos Durá, José Antonio Hernández López, Jesús Sánchez Cuadrado

Partial Bidirectionalization of Model Transformation Languages - Soichiro Hidaka, Massimo Tisi

Product Lines of Graphical Modelling Languages - Antonio Garmendia, Esther Guerra, Juan de Lara

Requirement-Driven Generation of Distributed Ledger Architectures - Kristóf Marussy, Oszkár Semeráth, Imre Kocsis

Text2VQL: Teaching a Model Query Language to Open-Source Language Models with ChatGPT - José Antonio Hernández López, Máté Földiák, Daniel Varro

Toward Intelligent Generation of Tailored Graphical Concrete Syntax - Meriem Ben Chaaben, Oussama Ben Sghaier, Mouna Dhaouadi, Nafisa Elrasheed, Ikram Darif, Imen Jaoua, Bentley Oakes, Eugene Syriani, Mohammad Hamdaqa

Towards Automated Test Scenario Generation for Assuring COLREGs Compliance of Autonomous Surface Vehicles - Ulf Kargén, Daniel Varro

Towards Runtime Monitoring for Responsible Machine Learning using Model-driven Engineering - Hira Naveed, John Grundy, Chetan Arora, Hourieh Khalajzadeh, Omar Haggag

Technical Track

Practice Track

Chair: Benoit Combemale

10 years of Model Federation with Openflexo: Challenges and Lessons Learned - Jean-Christophe Bach, Antoine Beugnard, Joel Champeau, Fabien Dagnat, Sylvain Guérin, Salvador Martínez

A DSL for Testing LLMs for Fairness and Bias - Sergio Morales, Robert Clarisó, Jordi Cabot

Advancing Domain-Specific High-Integrity Model-Based Tools: Insights and Future Pathways - Qurat Ul Ain Ali, Dimitris Kolovos, Antonio Garcia-Dominguez, Michael Bennett, Joe Newton, Piotr Zacharzewski

AutoMW: Model-based Automated Medical Writing - Asha Rajbhoj, Ajim Pathan, Tanay Sant, Vinay Kulkarni, Padmalata Nistala, Rajesh Pandey, Sabarinathan Narasimhan, Geetha Thiagarajan

Enhancing Automata Learning with Statistical Machine Learning: A Network Security Case Study - Negin Ayoughi, Shiva Nejati, Mehrdad Sabetzadeh, Patricio Saavedra

EpiMDE: A Model Driven Engineering Platform for Epidemiological Modeling - Bruno Curzi-Laliberté, Marios-Eleftherios Fokaefs, Michalis Famelis, Mohammad Hamdaqa

Extensions and Scalability Experiments of a Generic Model-Driven Architecture for Variability Model Reasoning - Camilo Correa Restrepo, Jacques Robin, Raul Mazo

Give me some REST: A Controlled Experiment to Study Effects and Perception of Model-Driven Engineering with a Domain-Specific Language - Maximilian Schiedermeier, Jörg Kienzle, Bettina Kemme

Modeling Languages for Digital Twins: A Survey Among the German Automotive Industry - Jérôme Pfeiffer, Dominik Fuchß, Thomas Kühn, Robin Liebhart, Dirk Neumann, Christer Neimöck, Christian Seiler

Mutation Testing of Java Bytecode: A Model-Driven Approach - Christoph Bockisch, Deniz Eren, Sascha Lehmann, Daniel Neufeld, Gabriele Taentzer

Tree-Based versus Hybrid Graphical-Textual Model Editors: An Empirical Study of Testing Specifications - Ionut Predoaia, James Harbin, Simos Gerasimou, Christina Vasiliou, Dimitris Kolovos, Antonio Garcia-Dominguez

Journal First

CHAIR: SILVIA ABRAHÃO

Accepted Presentations

A model-based reference architecture for complex assistive systems and its application - Judith Michael, Volodymyr Shekhovtsov

Current trends in digital twin development, maintenance, and operation: an interview study - Hossain Muhammad Muctadir, David A Manrique Negrin, Gunasekaran Raghavendran, Loek Cleophas, Mark van den Brand, Boudewijn Haverkort

Fault localization in DSLTrans model transformations by combining symbolic execution and spectrum-based analysis - Bentley Oakes, Javier Troya, Jessie Galasso-Carbonnel, Manuel Wimmer

FloBP: a model-driven approach for developing and executing IoT-enhanced business processes - Arianna Fedeli, Fabrizio Fornari, Andrea Polini, Barbara Re, Victoria Torres, Pedro Valderas

Identifying and fixing ambiguities in, and semantically accurate formalisation of, behavioural requirements - Thuy Nguyen, Imen Sayar, Sophie Ebersold, Jean-Michel Bruel

MBFair: a model-based verification methodology for detecting violations of individual fairness - Qusai Ramadan, Marco Konersmann, Amir Shayan Ahmadian, Jan Jürjens, Steffen Staab

OIL: an industrial case study in language engineering with Spoofax - Olav Bunte, Jasper Denkers, Louis van Gool, Jurgen Vinju, Eelco Visser, Tim A.C. Willemse, Andy Zaidman

Tools and Demonstrations

Chair: Romina Eramo, Javier Troya

Accepted Papers

A RAG-based Feedback Tool to Augment UML Class Diagram Learning - Pasquale Ardimento, Mario Luca Bernardi, Marta Cimitile, Michele Scalera

Concretize: A Model-Driven Tool for Scenario-Based Autonomous Vehicle Testing - Jerry Hou-Liu, Zhekai Jiang, Aren Babikian

Cross-IDE remote debugging of model management programs through the Debug Adapter Protocol - Antonio Garcia-Dominguez, Dimitris Kolovos

dpDebugger: a Domain-parametric Debugger for DSLs using DAP and Language Protocols - Josselin Enet, Erwan Bousse, Massimo Tisi, Gerson Sunyé

DSL-Xpert: LLM-driven Generic DSL Code Generation - Victor Lamas, Miguel Rodríguez Luaces, Daniel Garcia-Gonzalez

Enhancing Model Management with Automated REST API Generation - Adiel Tuyishime, Francesco Basciani, Javier Luis Cánovas Izquierdo, Ludovico Iovino

IMP-Logics: a metamodel for analysis and transformations of Datalog programs - José Francisco Crespo, Martí Juanola I Ametller, Xavier Oriol, Martí Recalde, Ernest Teniente

Keeping clients' models up-to-date with Edelta - Lorenzo Bettini, Davide Di Ruscio, Amleto Di Salle, Ludovico Iovino, Alfonso Pierantonio

M2AR: A Web-based Modeling Environment for the Augmented Reality Workflow Modeling Language - Fabian Muff, Hans-Georg Fill

Modelling Tool Extension for Vulnerability Management - Avi Shaked, Nan Messe, Tom Melham

Move your MDE-teaching online: The MDENet Education Platform - Steffen Zschaler, Will Barnett, Artur Boronat, Antonio Garcia-Dominguez, Dimitris Kolovos

Nautilus: Implementation of an Evolution Approach for Graph Databases - Dominique Hausler, Meike Klettke

PolyGloT-UML: A Gamified Framework for Enhancing UML Learning Paths - Antonio Bucchiarone, Tommaso Guidolin, Lorenzo Fasol, Gianluca Schiavo, Jörg Kienzle, Sebastian Gerard, David Négrier, Tommaso Martorella

SCCD Debugger: a Debugger for Statecharts and Class Diagrams - Francisco Simões, Miguel Goulao, Vasco Amaral, Joeri Exelmans, Hans Vangheluwe

SMOKE: Simulink Model Obfuscator Keeping Structure - Alexander Boll, Timo Kehrer, Michael Goedicke

Industry Days

Chair: Christoph Mayr-Dorn, Alois Zoitl

Presentations

Advancing Web-Based Modeling Tools with Sirius Web: An Illustration with SysON - Cédric Brun (Obeo)

Ansys SysML v2 Modeler and Digital Engineering Methodology - Thierry Le Sergent (Ansys)

Bridging the Validation Gap: Next-Level Model Governance in Digital-Twin Engineering - Ákos Horváth

Collaborative Architecture and AbRA - Florian Beer (Robert Bosch GmbH)

Complex system of systems and digital twins - Vinay Kulkarni (Tata Consultancy Services Research)

Continuous integration of models using LemonTree - Markus Benedikt

Integrated Knowledge Centric Engineering (IKCE): a novel approach to Systems Engineering and Model-Driven Development for the Aerospace industry - Lewis Humphries (University of York / Leonardo UK)

LionWeb – Language Interfaces on the Web - Ulyana Tikhonova (F1RE)

Low-Code Edge Intelligence in Smart Factories - Kirill Dorofeev (Siemens AG)

MBSE und BIM: Interdisziplinäre Ansätze für Mehrwerte in der Digitalisierung der Bauindustrie - Maximilian Billmaier (Geoconsult ZT GmbH)

Model-Based Enterprise - Empowering Excellence by Transforming into a Model- and PLM-Centric Enterprise - Simon Rädler (Liebherr-Aerospace)

MUST Visibility - DeepTech Startup for Quality Management - Muaaz Abdul Hadi (Pro2Future GmbH)

Next-generation modeling frameworks - Philip Langer (EclipseSource Services GmbH)

Practical Experience with Petriflow: Enriched Process Models Serving as Implementation - Gabriel Juhás (Netgrif)

Industry Days

Practical IoT-Edge-Cloud continuum for BPMN-based quality assurance - Björn Fanta, Feyza Nur Bozkaya (Fabasoft)

Resources, the key to business process optimization - Emmanuel Gaudin (Pragma Dev)

Shifting Focus in Model-Based Methods in Multidisciplinary Space Systems Design: From Tool-Centric to Data-Centric Approaches - Michael Felderer

SysIDE : SysML v2 tool enabling the System-as-Code paradigm – overview and applications - Juozas Vaicenavicius (Sensmetry)

Web-based DSLs for industrial use cases with Langium - Johannes Meier (Typefox)

Why the Economics of MDD Fail... and How to Succeed - Steven Kelly (MetaCase)

Birds of a Feather

On the use of models to support digital transformation in healthcare

Chair: Leen Lambers

Healthcare services are increasingly supported by digital solutions ranging, for example, from telemedicine or clinical decision support to apps on prescription. The concerted adoption of such digital solutions comes with quality concerns such as safety and security, but also interoperability and maintainability. The goal of this session is to foster exchange on the use of models to support digital transformation in healthcare with these quality concerns in mind.

We follow three lines of discussion:

- Which potential does modeling have for digital transformation in healthcare?
- Which modeling foundations are still lacking to support digital transformation in healthcare?
- Which case studies, data sets, and tools have been proven useful to perform research on modeling for digital transformation in healthcare?

We kickoff the session with sketching a patient journey related to the diagnosis and treatment of sepsis illustrating the relevance of the above-mentioned questions.

Model Quality in the era of AI

Co-Chairs: Gabriele Taentzer, Jose Antonio Hernandez Lopez, Kristof Marussy, Jesus Sanchez Cuadrado, Daniel Varro

The existence of high quality model sets is often a prerequisite for applying AI techniques to modelling. There are public sets of models such as ModelSet that can be used in principle for application. There are also automatic model generators that can synthesize models with specific properties. In order to be useful, models often have to meet certain quality criteria. In this BoF session, relevant quality criteria should be collected to get an overview of the quality models need to have in order to be useful for a given task. Once the quality criteria are defined, tools could be developed to assess the quality of a set of models or to filter out a subset that meets the desired criteria.

Birds of a Feather

Around Abstraction Engineering: Challenges, Feedback, and Collaboration

Co-Chairs: Nelly Bencomo, Jordi Cabot, Marsha Chechik, Betty H. C. Cheng, Benoit Combemale, Andrzej Wąsowski, Steffen Zschaler

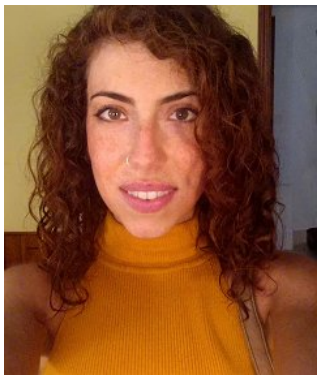
It has been widely acknowledged that abstraction is central to systematic software engineering. Abstraction is already widely used in software development, from deductive reasoning and formal modeling to the inductive reasoning found in modern data science. We propose that the demands of future software systems require an engineering approach to the systematic creation, maintenance, and use of abstractions; we call this Abstraction Engineering (https://arxiv.org/pdf/2408.14074). Importantly, Abstraction Engineering (AE) brings together concepts of abstraction across the inductive/deductive reasoning divide. Our paper outlines the foundations, explores key challenges, presents research questions, and offers a roadmap for future development in this new field. Our primary goals for this BoF session are: Promote the Topic, Gather Feedback, Further Identification of Challenges, Contribute to AEBoK and Build a Diverse Community. Anybody who is interested in moving beyond software models to a broader engineering discipline for Abstractions across all types of software-intensive systems, whether deductive and constructed 'top down' or inductive and constructed 'bottom up' (e.g., through machine learing and AI) are highly welcome to join this BoF session.

Panel

CHAIR: MAROUANE KESSENTINI

AI for Modeling and Modeling for AI

PANEL MEMBERS



Lola Burgueño

Mehrdad Sabetzadeh

Daniel Varro

Davide Di Ruscio

Jordi Cabot

ACM Student Research Competition

Chair: Steffen Zschaler

MODELS 2024 is hosting an ACM Student Research Competition (SRC). The ACM SRC is a forum for undergraduate and graduate students to present their original research, exchange ideas, and improve their communication skills while competing for prizes at MODELS 2024. The Student Research Competition has the following goals (for general information on the ACM SRC see https://src.acm.org/):

- To give undergraduate and graduate students the opportunity to share their research ideas and results at MODELS in a special forum that provides visibility for their work.
- To give students the opportunity to meet with and interact with MODELS attendees to share ideas, gain new insights, and understand possible practical applications.
- To give students an opportunity to sharpen their communication skills, including visual, organizational, oral, and aural modalities.
- To provide detailed feedback to students about their research and presentation, from a panel of distinguished judges.
- To recognize and reward outstanding student research.

Accepted Abstracts

Co-simulation and Crop Representation for Digital Twins of Controlled Environment Agriculture Systems - Pascal Archambault

Enhanced Interoperability and Consistency in Heterogeneous Systems with CorrLang and OpenAPI - Joshua Tetteh Ocansey

Language Protocols for Domain-Specific Debugging - Josselin Enet

Pipelines Have Feelings Too: A Structured Way To Design CI/CD Pipelines - Nirmal Chaudhari

Software Modeling Assistance with Large Language Models - Meriem Ben Chaaben

Space System Modeling Approach for Exploring of the Iced-Covered Ganymede Moon Subsurface Oceans - Cyrus Nejat

Towards Model Repair by Human Opinion--Guided Reinforcement Learning - Kyanna Dagenais

SAM Conference

The System Analysis and Modelling (SAM) conference provides an open arena for participants from academia and industry to present and discuss the most recent innovations, trends, experiences and concerns in modeling, specification, analysis, and realization of complex systems using ITU-T's Specification and Description Language (SDL-2010) and Message Sequence Chart (MSC) notations, as well as related system design languages — including but not limited to UML, ASN.1, TTCN-3, SysML and the User Requirements Notation (URN).

Selected papers for SAM 2024

A Comparative Study of Large Language Models for Goal Model Extraction - Vaishali Siddeshwar, Sanaa Alwidian, Masoud Makrehchi

AI-based User Emotion Recognition from Interaction Data: Challenges and Guidelines for Training Data Creation - Carina Bieber, Patrick Harms, Dominick Leppich, Katrin Proschek

A Multi-Platform Specification Language and Dataset for the Analysis of DevOps Pipelines - Manas Manoj Bedekar, Gunter Mussbacher

Automation Support for System Simulation and Architecture Layout Design in Cyber-Physical Systems Engineering - Johan Cederbladh, Martin Eisenberg, Luca Berardinelli, Damir Bilic

Digital Twins of Socio-Technical Ecosystems to Drive Societal Change - Federico Bonetti, Antonio Bucchiarone, Judith Michael, Antonio Cicchetti, Annapaola Marconi, Bernhard Rumpe

Experimenting low code with SDL and BPMN - Emmanuel Gaudin

Exploring the Fundamentals of Mutations in Deep Neural Networks - Zaheed Ahmed, Philip Makedonski

Extending MagicGrid to Support Virtual Prototyping for Early System Performance Validation and Verification - Johan Cederbladh, Daniel Krems. Antonio Cicchetti

From Transpilers to Semantic Libraries: Formal Verification With Pluggable Semantics - Ármin Zavada, Kristóf Marussy, Vince Molnár

Modeling Service Choreographies and Collaborative Tasks for Autonomous Mixed-Fleet Systems - Bianca Wiesmayr, Alois Zoitl, David Hästbacka

Towards a Model-Based Systems Engineering Framework for the Design and Configuration of Communication Networks in a Data-Driven and Interconnected Aircraft Cabin - Fabian Giertzsch, Marvin Blecken. Ralf God

Monday, Sept. 23rd, 9:00 – 10:00

ROOM: CRASH BANDICOOT

Ina Schieferdecker

Next-Gen Software Engineering: Merging Models with AI Power

This keynote discusses the development of Model-Driven Software Engineering (MDSE) from its origins to the present day: It presents the components of models, modelling activities, and the challenges and open issues in MDSE. The keynote reviews the use of modelling languages and tools in MDSE processes. It concludes with a review of the still open relationships and implications of Artificial Intelligence (AI) for software engineering, including MDSE, and the coming developments in the Internet of Collaboration for distributed MDSE.

Prof. Dr.-Ing. Ina Schieferdecker is Honorary Professor for Software-Based Innovations at the Technical University of Berlin. She was Director of Research for Technological Sovereignty and Innovation at the German Federal Ministry of Education and Research, focusing on modern key technologies such as quantum technologies, materials technologies, microelectronics, communication, software and AI technologies, as well as the future of work and value creation. Previously, she was Co-Director of the Fraunhofer Institute for Open Communication Systems, Professor for Quality Engineering of Open Distributed Systems at the Technical University of Berlin, co-founder of the Weizenbaum Institute for the Networked Society, and member of the German Advisory Council on Global Change. She is a member of the German Academy of Science and Engineering acatech and an honorary member of the German Testing Board.

Tuesday, Sept. 24th, 9:00 – 10:00

ROOM: CRASH BANDICOOT

Horst Kargl

Why should I actually do modelling? - Challenges and paths to success with a modeling approach in industrial practice and the way to modelling maturity.

Faster, bigger, further – all while being more cost-effective: These are the demands of today's business landscape. As systems grow in complexity, traditional text-based specification approaches are increasingly reaching their limits. In response, model-based approaches emerge as a promising solution, offering a broad spectrum of modelling languages, tools, and methods tailored to various domains.
However, in practice, the adoption of model-based approaches often encounters significant hurdles. Despite their potential, fully leveraging the power of modelling and using models to drive profitable outcomes remains a challenge. This raises the question: Why is modelling, though widely regarded as beneficial, so difficult to implement in practice? Is it the complexity of the modelling languages, the tools, the methods, or simply a lack of adequate training?
In this talk, we delve into the challenges and opportunities of model-based approaches, examining the reasons behind their successes and failures. We explore how these approaches can be effectively implemented in practice through structured and adaptive strategies. A critical aspect of this process is selecting the right methods, tailoring them appropriately, and sensibly limiting the degrees of freedom, alongside finding the most suitable tools. Interestingly, these constraints and added restrictions often lead to a more agile approach and broader acceptance than one might expect. Furthermore, clarifying goals and analysing the current status are vital steps in guiding the change process within the organization, ultimately helping to achieve the desired level of modelling maturity.

Dr. Horst Kargl (Head of Training & Principal Consultant @ SparxSystems Europe) Horst Kargl has been involved in modelling since 1998. Before joining SparxSystems Central Europe in 2008, he was a research associate at the Vienna University of Technology and conducted research on eLearning, semantic web as well as model-based software development (dissertation).
His focus is on software and systems engineering, but also on enterprise and data modelling. He is an expert in the customization and extension capabilities of the modelling tool Enterprise Architect. As a coach and consultant, he is happy to support customer in the development and implementation of modelling approaches. Since 2022 he is leading the training department of SparxSystems CE. Together with his team, he develops new ways and approaches to help you get started with modelling in an even easier and more sustainable way.

EDTConf

Aims and scope

The International Conference on Engineering DTs (EDTconf) aims to bring together researchers and practitioners on DTs, from both academia and industry, and from different engineering disciplines and application domains to shape the future of systematically designing, developing, deploying, evolving, maintaining, and validating DTs.

Digital Twins (DTs) have emerged over the last decade as a key technology to better understand, use, monitor, and improve systems in a broad range of application domains, including agriculture, automotive, avionics, construction, health care, manufacturing, smart cities, and many more. DTs are based on the use of data and models, and their development requires the integration of different technologies for diverse purposes, including design-space exploration, virtual commissioning, and behavior optimization. Their development is a multi-disciplinary process that requires the collaboration of experts from different disciplines and application domains. This includes software engineers at the core of the DT engineering process to architect, develop, deploy, test, evolve, and validate the DT software, but also engineers from other engineering disciplines with domain expertise in the specific aspects of the DTs. Even though the use of DT is growing at a fast pace, their development is still generally conducted in an ad hoc manner. The lack of systematic frameworks and approaches represents a main obstacle to the rapid and scalable development of industrial DTs.

Monday, Sept. 23rd, 9:20 – 10:40

HS 18 (Science Park 3)

Nicolaus Hanowski

ESA Digital Twin Earth

ESA is implementing two large Digital Twin Earth programmes that are aimed at transforming traditional Earth Observation which provides information about the past and present of the Earth into predictive Earth Observation and corresponding future scenarios. As part of the recently launched EU programme "Destination Earth" ESA has developed and operates the Digital Twin Earth Core Service Platform. In addition, ESA is implementing a complementary Digital Twin Earth programme which aims at integrating a wide range of Earth System themes and communities for the expansion of applications and services of the Digital Twin of the Earth.

Nicolaus Hanowski holds a Ph.D. in Earth and Planetary Sciences. He started as a researcher in the US and then transferred to Mission Operations at the German Space Operations Centre. In 2009 he joined ESA and became responsible for the development of Science Ground Segments for missions, such Rosetta, Gaia, JWST, Solar Orbiter and Euclid in the Science Directorate. Since 2014 he is responsible for the Operations and Ground Segments of the ESA Earth Observation Missions and the Copernicus Sentinel satellites and the corresponding data management aspects at ESA.

Tuesday, Sept. 24th, 9:10 – 10:40

HS 18 (Science Park 3)

Katia Gatti

Digital Twins: First Strides Into the Industrial Metaverse

In the rapidly evolving landscape of industrial digitalization, the concept of the digital twin stands at the forefront of transformative innovation. This keynote speech, presented by Katia Gatti, delves into the profound impact of digital twin technology on modern industries, highlighting Siemens Digital Industries Software's pioneering role in this revolution. Indeed, the digital twin as it's known today, a virtual replica of a physical asset, system, or process, that bridges the physical and digital worlds, enabling real-time simulation, analysis, and optimization is the result of a continuous evolution that isn't yet concluded. This is why we will further introduce the concept of the digital thread, a communication framework that ensures seamless data integration across the product lifecycle. Through the digital thread, industries achieve unparalleled data continuity, traceability, and collaboration, from design and manufacturing to maintenance and operation. The aim is to inspire industry leaders and innovators to embrace digital twin technology, by bringing practical examples of excellence from different industries.

Katia Gatti, an established professional in the software industry, graduated in Aerospace Engineering from the Politecnico di Milano in 1997. Katia's career began at Electronic Data System Ialia S.p.A. as an Application Engineer, then moved to Senior PLM Consultant, where she took part in projects for famous companies such as Ducati and Baker Huges, landing in the PreSales team, interacting with leading Italian companies such as Stellantis, Leonardo, Iveco, CNH, Same Deutz Fahr, De Longhi, Lima and many others. Since 2008, she has been PreSales Director for Italy, Israel and Greece. In this role, she manages a team of 24 people, supervising evaluations, demos and pilot projects in different sectors; she is also involved in international projects as a representative for EMEA in the Global PreSales Council.

Accepted papers

A DevOps Framework for the Engineering of Digital Twins for Build Assets -Sara Aissat, Jonathan Beaulieu, Francis Bordeleau, Julien Gascon-Samson, Erik A. Poirier and Ali Motamedi

A Digital Twin Architecture for the Provisioning, Management, and Monitoring of Heterogenous IoT Devices - Jean-Marc Maree, Karel Kruger and Anton Basson

A Digital Twin System for Oil And Gas Industry: A Use Case on Mooring Lines Integrity Monitoring - Vinicius Kreischer de Almeida, Douglas Ericson de Oliveira, Claudio Daniel T. de Barros, Gabriel dos Santos Scatena, Asdrubal N. Queiroz Filho, Fabio Levy Siqueira, Anna Helena Reali Costa, Edson Satoshi Gomi, Leonardo A. F. Mendoza, Evelyn C. S. Batista, Cristian E. Muñoz, Isabela G. Siqueira, Rodrigo A. Barreira, Ismael H. F. dos Santos, Carlos Cardoso, Eduardo Ogasawara and Fabio Porto

A MBSE approach for Virtual Verification & Validation of E-Drives with Digital Twins - Rene Honcak and Ana Wooley

A Modeling Methodology for Crop Representation in Digital Twins for Smart Farming - Pascal Archambault, Houari Sahraoui and Eugene Syriani

AI Simulation by Digital Twins: Systematic Survey of the State of the Art and a Reference Framework - Xiaoran Liu and Istvan David

An Architecture for the Integration of Product and Production Digital Twins in the Automotive Industry - Ryno Visser, Anton Basson and Karel Kruger

Declarative Lifecycle Management in Digital Twins - Eduard Kamburjan, Nelly Bencomo, Silvia Lizeth Tapia Tarifa and Einar Broch Johnsen

Engineering Interoperable Ecosystems of Digital Twins: A Web-based Approach - Andrea Giulianelli, Samuele Burattini, Andrei Ciortea and Alessandro Ricci

Manufacturing Digital Twin Standards - Guodong Shao

Opportunities for Digital Twins for the Provisioning, Management and Monitoring of Heterogeneous IoT Devices - Jean-Marc Maree, Karel Kruger, Anton Basson and Jurie Kritzinger

Understanding Semantic Drift in Model Driven Digital Twins - Faima Abbasi, Pierre Brimont, Cedric Pruski and Jean Sebastien Sottet

Digital twin architecture for the AEC Industry: A case study in collective robotic construction - Lior Skoury, Samuel Leder, Achim Menges and Thomas Wortmann

Digital Twins to drive Robot-based Disassembly Applications - Asset Models for Autonomous Planning - Christoph Walter, Eric Bayrhammer and Ajaykumar Nadoda

Engineering a Digital Twin for Diagnosis and Treatment of Multiple Sclerosis - Giordano D'Aloisio, Alessandro Di Matteo, Alessia Cipriani, Daniele Lozzi, Enrico Mattei, Gennaro Zanfardino, Antinisca Di Marco and Giuseppe Placidi

Semantic Descriptions for Interoperability in Ecosystems of Digital Twins - Samuele Burattini, Antoine Zimmermann, Marco Picone and Alessandro Ricci

Towards A Framework For Farm Scale Digital Twin - Ireoluwa Fakeye, Ellen Maas, Paul Harris, Bader Oulaid and Chris Baker

Towards Measuring Digital Twins Fidelity at Runtime - Paula Muñoz, Javier Troya and Antonio Vallecillo

Towards Ontological Service-Driven Engineering of Digital Twins - Bentley Oakes, Claudio Gomes, Eduard Kamburjan, Giuseppe Abbiati, Elif Ecem Bas and Sebastian Engelsgaard

Towards Re-Engineering Digital Twins - Gwendal Beaumont, Antoine Beugnard, Salvador Martinez, Christelle Urtado and Sylvain Vauttier

GreyCat: A Framework to Develop Digital Twins at Large Scale - Francois Fouquet, Thomas Hartmann, Cyril Cecchinel and Benoit Combemale

HoloWoT: A First Step Towards Mixed Reality Digital Twins for the Industrial Internet of Things - Fady Salama, Idil Sezgin, Ege Korkan, Sebastian Käbisch, Sebastian Steinhorst

Managing Digital Twins of The Test Lab with SystemLink™ Software - Taylor Riche, Joshua Prewitt, Cristian Hotea, Cosmin Neagu and Tj Giere

Practical design and implementation of an augmented reality based digital twin - Lionel Protin, Wassila Aggoune-Mtalaa and Carlos Kavka

Social Events

Monday, 23rd Sept.: Satellite Reception

On Wednesday evening, the satellite reception takes place at JKU in the Festsaal A and B (Uni Center, 1st floor). The lively campus atmosphere serves as an ideal venue for scholarly discourse and opening the satellite events.

© JKU

Location: JKU - Uni Center

Tuesday, 24th Sept.: Visit to the Ars Electronica Center

On Tuesday, we're going to have a collective visit to the Ars Electronica Center. It's also called the "museum of the future", and it's a truly special place where ***art, technology and society come together*** in a miraculous way. It provides the opportunity to ***experience fascinating exhibitions*** on topics such as artificial intelligence, autonomous systems and robotics, as well as genetic and biotechnologies on the global changes of our time, and much more.

© E. Stephan (Linz Tourismus)

© Ars Electronica / Robert Bauernhansl

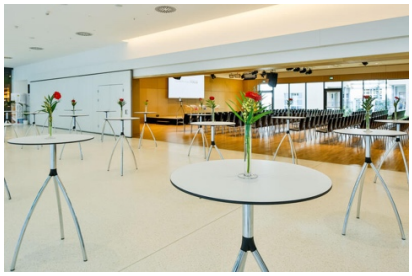
Location: Ars-Electronica-Straße 1, 4040 Linz

Social Events

Wednesday, 25th Sept.: Welcome Reception

The welcome reception will be held at the OÖ Nachrichten Forum, which is located along the central Linzer Promenade in the bustling city centre. It provides a dynamic hub for vibrant networking experience, fostering dialogue on emerging trends within the conference theme and insightful discussions among visitors.

© OÖ Nachrichten Forum



© Stadt der Museen GmbH

Location: Promenade 25, 4020 Linz, OÖ Nachrichten Forum

Thursday, 26th Sept.: Banquet

The banquet will take place at the 'Palais Kaufmännischer Verein Linz', a renowned venue for gala events situated in the heart of Linz. The elegant architecture offers a majestic setting for professional networking events.

© Palais Kaufmännischer Verein

Location: Landstraße 49, 4020 Linz

Sponsors

Platinum Sponsors

Fabasoft

Gold Sponsors

IKARUS security software

Pro²Future

Silver Sponsors

OBEO

netgrif

SIEMENS

Raiffeisen Software

RAITEC IT Services

LieberLieber

SPARX SYSTEMS CENTRAL EUROPE

EclipseSource

Supporting Sponsors

LINZ TOURISMUS

L_nz

ober österreich

iv INDUSTRIELLENVEREINIGUNG OBERÖSTERREICH

Information about JKU

In this section we have compiled some information about the JKU:

- Foundation year: 1966
- 4 faculties: Faculty of Social and Economic Sciences (since 1966), Faculty of Law (since 1975), Faculty of Science and Technology (since 1969), Faculty of Medicine (since 2014).
- 6 Schools: Linz Institute of Technology (LIT, since 2015), Linz School of Education (SoE, since 2016), Business School (BUS, since 2019), Kurt Rothschild School of Economics and Statistics (since 2021), School of Social Sciences and Humanities (SSSH), Linz Institute for Transformative Change (LIFT_C, since 2021).
- 173 professors at around 140 institutes and university hospitals
- About 23.000 students currently enrolled in degree programs at JKU
- Over 16% foreign students from 100 different countries are studying at JKU
- Budget for the performance agreement period 2022-2024: approx. 614 million euros
- Currently 14 direct company investments, 11 competence centres, and 9 Christian Doppler laboratories
- Cooperations with over 150 universities and exchange agreements with universities in 50 countries.

Information about Linz

Linz is the capital of Upper Austria and the third largest city in Austria. The Danube, the longest river in Europe, flows through the city centre. The name Linz is derived from the Celtic Lentia/Lentos, which means flexible or curved and probably alludes to the Linz Danube curvature.

- ***State:*** Upper Austria
- ***Size:*** 96,048 km²
- ***Inhabitants:*** 207.247 (1. Jänner 2022)
- ***Mean sea level:*** 260 m
- ***Highest Point:*** 604 m (in Urfahr, Oberbairinger Straße after Altenberg)
- ***Lowest Point:*** 244 m (Donau near Weikerlsee)
- ***Width oft he Danube in Linz:*** 252 m
- ***Depth of the Danube in Linz:*** 5 bis 8 m
- ***Length of the Nibelungenbridge:*** 330 m
- ***Length of the Voestbridge:*** 407 m

Emergency Contact Numbers

112 – General Emergencies

Call 112 if you are unsure of which number to call. In Austria you will be redirected to the police.

122 – Fire Brigade

Call 122 in case of any fire emergencies.

133 – Police

Call 133 in case of imminent danger or active crimes. Only call 133 in emergency situations. If you have non-urgent questions, call the number of a specific police department directly.

144 – Ambulance

Call 144 in case of accidents or urgent medical conditions.


Feuerwehr-
aufstellfläche