Learn Conceptual Modelling to innovate, design and engineer Digital Ecosystems!

NEMO Summer School Series

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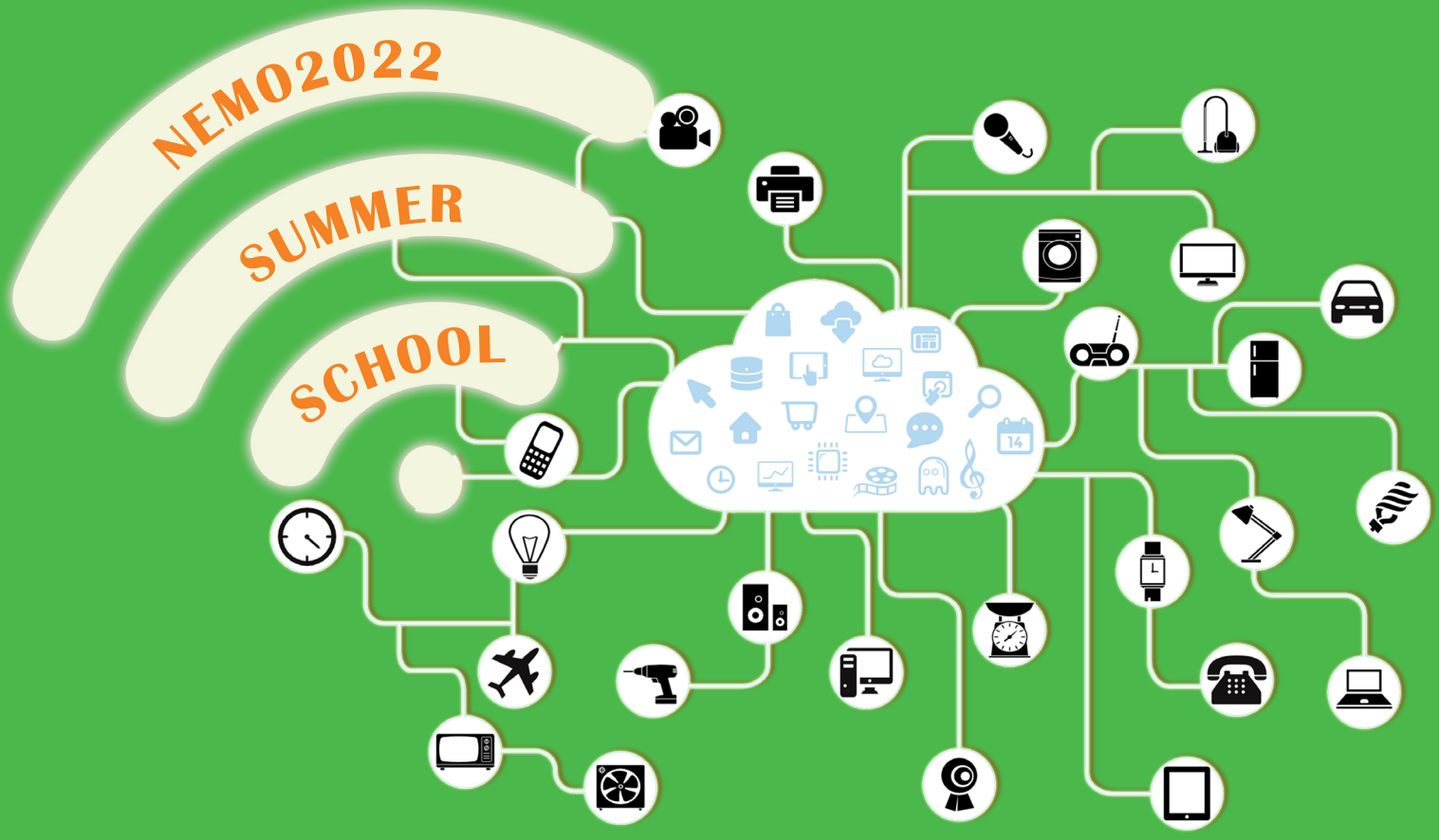
PROGRAMME



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General Information

Summer School Venue
OMiLAB @University of Vienna
Faculty of Computer Science
Währinger Straße 29
1090 Vienna, Austria
T +43 1 4277-78943

Public means of transport
Tram: 5, 33, 37, 38, 40, 41, 42
Tram station:
Spitalgasse/Währinger Straße
Trip planning:
http://www.wienerlinien.at

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Welcome!

The NEMO Summer School Series welcomes you to its 8th Edition, hosted by the University of Vienna!

As in the previous editions, this year's summer school will bring together a wide international community of academics and students with interests in various aspects of conceptual modelling. Since in today's enterprises modelling methods are widely used for numerous purposes. NEMO2022 will focus on the design and implementation of Enterprise Digital Twins and Ecosystems addressing different domains and approaches of modelling:

- Foundations of Conceptual Modelling, e.g. formal methods and tools for the creation, transformation, and application of modelling methods.
- Semantics and Technologies for Digital Ecosystems, e.g. meta-modelling platforms, model-value functionality, interaction with diverse smart devices and multi-client applications.
- Enterprise Digital Twins, e.g. Enterprise Information Systems, security frameworks, and lifecycle behaviour.
- Cross-cutting Issues, e.g. information privacy, risk manament and governance, and quality assurance of models and methods.

Participating students have the opportunity to acquire knowledge by listening to more than 40 speakers from all over the world, covering current topical developments. And in order to consolidate it, practical sessions will take place. There, students will develop prototyping solutions to different kinds of problems and will discuss issues encountered in enterprises and practice. But to form a community, common experiences to bond are needed as well. Different cultural activities and social events will assure the start of a closely linked international community of young specialists.

We would like to thank all the speakers and their teams, who supported us with their commitment and work along the way in order to create this event.

The summer school could not have been realized without the work of the organisational team at the OMiLAB@UNIVIE and the support of the Faculty of Computer Science at the University of Vienna.

We hope that you all will have an extraordinary time, learning and enjoying your time at the NEMO Summer School!

Dimitris Karagiannis

Heinrich C. Mayr

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Vision: an active global community for conceptual modelling that benefits from open artefacts.

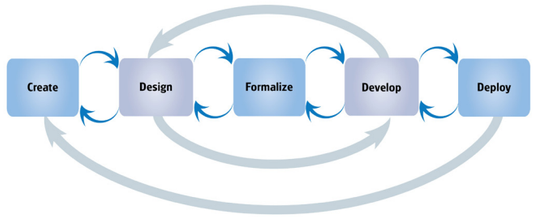
Community of Practice network: supported by a non-profit organisation (NPO) headquartered in Berlin, Germany and governed by a Scientific Advisory Board (SAB).

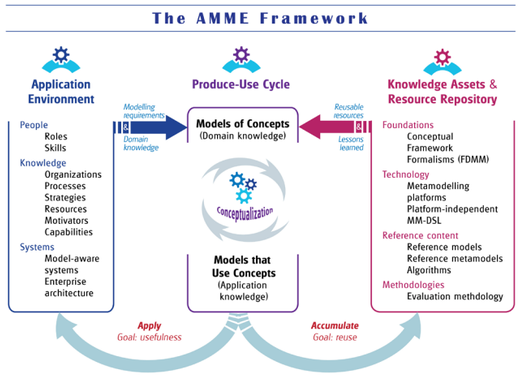
Operations: dedicated research and experimentation spaces for modelling method engineering equipped with tools to explore method creation and design, experiment with method engineering and deploy open-source software tools and services for modelling. They act as facilitators to the development and application of methods to communities who value models, and implicitly modelling methods.

Digital Innovation Environment (DiEn): can be set up as (a) virtual space or as (b) physical and virtual labs. They can be affiliated with academia as well as industrial organisations., forming an international network of OMiLAB Nodes. Each node focuses on thier own core topic and expertise supported by the collaborative, innovative and explorative space driven by DiEn. Individual engineers, researchers and different stakeholders can work together and contribute to modelling method creation, implementation and model-driven value creation.

Openness: to all those interested, either as individuals or as institutions. It acts as a platform where participants can bring in ideas related to modelling and engage in the exploration process. OMiLAB follows a user-driven approach in its understanding of the term "model" thus users are not limited to a certain domain or functional area of organisations. There are useful models in widely different domains like information technology, medicine as well as various models for functional areas like procurement, marketing, logistics and engineering.

the AMME Lifecycle





OMiLAB Community of Practice Benefits:

- knowledge-transfer between scientists, educators and innovators,
- access to infrastructure and open-source services,
- collaborative network of members that are active in domain-specific issues,
- amplification instruments which leverage the impact of the activities performed,
- conferences, workshops, seminars,
- common projects,
- research and teaching stays, internships and traineeships, and
- publications.

Digital Innovation Environment Resources:

- **Knowledge and procedures**: the Agile Modelling Method Engineering Framework (AMME), the Conceptualization Lifecycle, trainings, methodologies.
- **Technology:** open source platforms (e.g. ADOxx, olive), open source domain-specific modelling tools and services like tool packaging and deployment.
- **Community of Practice:** events, publications, exploitation opportunities in third-party funded projects, the NEMO Summer School Series, the ADOxx Crash Courses, Digital Design Thinking Workshops and Bee-Up Tutorials.

Dr. Wilfrid Utz

Managing Directors

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Prof. Dr. Knut Hinkelmann

We are global ...

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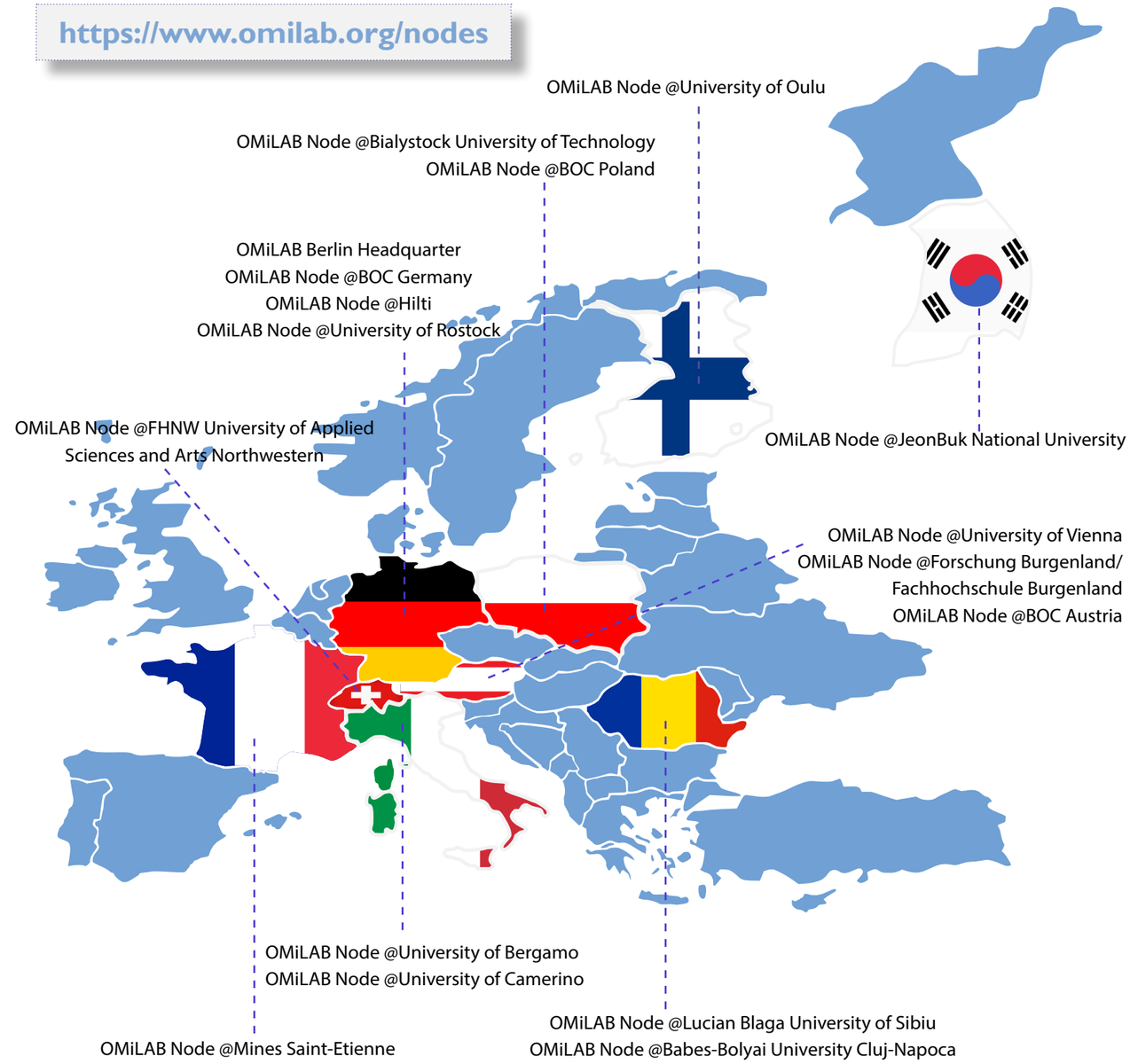
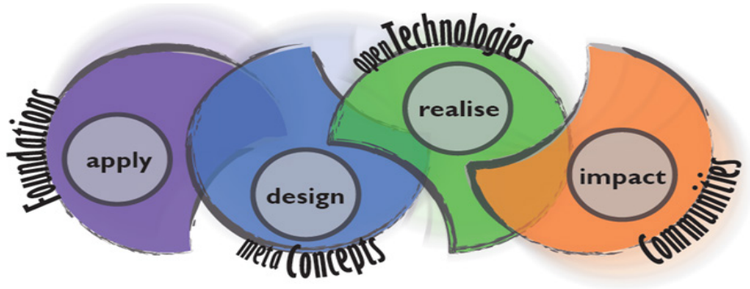


16 OMiLAB Nodes

9 Countries

2 Continents

Research Group Knowledge Engineering and the OMiLAB Vienna Node at University of Vienna



To provide transparent, ubiquitous knowledge that can be semantically processed by IT systems is the main research goal of the Research Group Knowledge Engineering. The group develops concepts for modelling languages and methods as well as step models and realizes concrete models. The contributions herewith advert to the research paradigm of design science in business informatics. Thereby realized results are deployed primarily within the research field of modelling methods and find their applicability in the form of information systems in the economy.

According to the development plan of the University of Vienna and the Faculty of Computer Science the scientific work of the research group is associated to the overall defined research focus "Knowledge-based Methods and Technologies for Digitalisation". Within this core area the work accomplished by the group provides novel research results in the areas of Meta-Modelling, Semantic Technologies, Hybrid Method Engineering and Intelligent and Agile Agents.

Based on mathematical and statistical foundations, theoretical approaches are adapted and applied. The fundamental research paradigm relies on concepts of meta-modelling that are further developed and deployed to derive knowledge out of (un)structured data on the one side and to provide transparent knowledge with formal and semi-formal modelling methods on the other side. The developed meta-models are realized with open technologies in form of web based user and context specific applications and made available to the community.

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In order to promote the exchange in regards to content and technological advancements in the method engineering community, the group has established the OMiLAB (Open Model Laboratory).

The Vienna Node is equipped with tools to explore method creation and design, experiment with method engineering and deploy software tools for modelling. The dissemination of established know-how, the exploitation of recent research results and their further development assure a sustainable impact on the community.

The Agile Modelling Method Engineering Framework is one of the core knowledge resources provided by the OMiLAB Vienna Node. Design Thinking is another valuable expertise of the node, enhanced by the development of the Scene2Model tool.

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Research Group Knowledge Engineering
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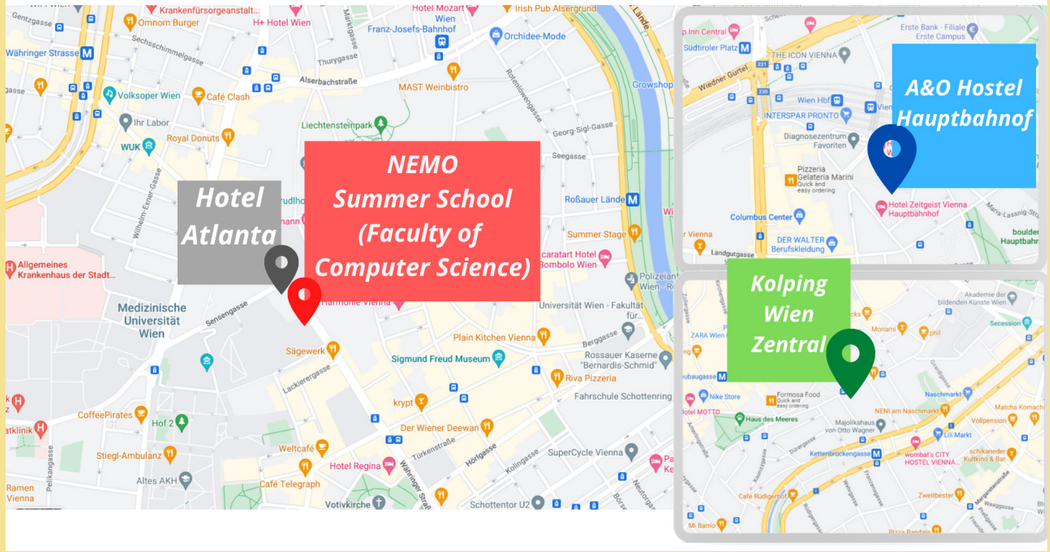
SOCIAL Events

The NEMO Summer School comes with a programme full of lectures and working group sessions: the participants, students and lecturers thus will experience two intensive weeks of insights into the current state of research, theory and practice of modelling.

However, this is only one side of the coin: the other side is the opportunity to meet student colleagues and renowned professors from all over the world, to discuss with them, to exchange ideas, to learn from each other, and to make new friends - all that in the beautiful and exciting capital of Austria, Vienna.

A special „Get Together" evening is planned for the first day. We invite you to enjoy some beer and BBQ food. This event will allow participants to get to know each other right from the start of the summer school and cooperate better during the practical sessions and in the preparation of the student presentations from the last day.

HOTEL CONTACTS & NEMO VENUE



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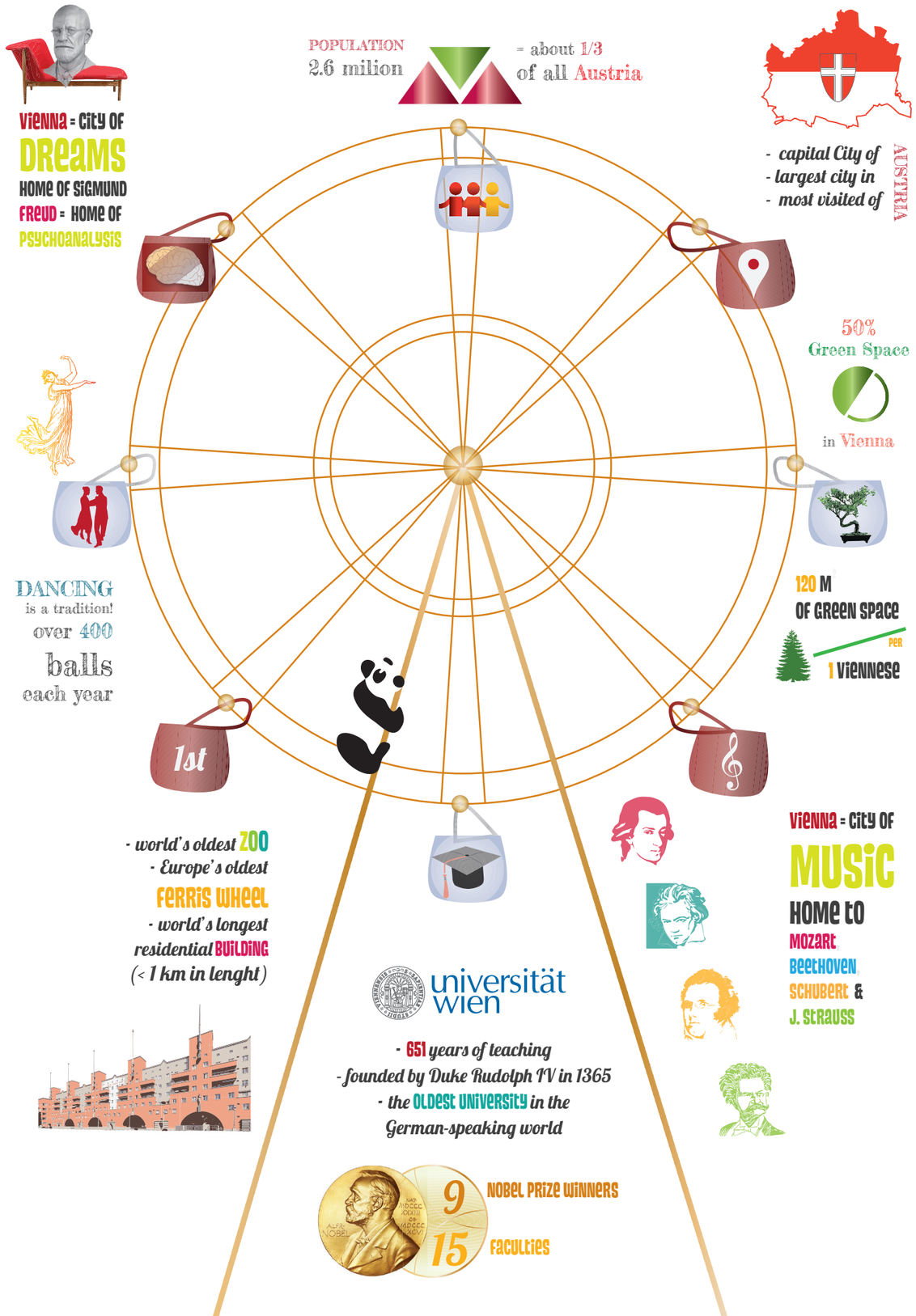

Lecture Hall and PC Labs

Address:

Faculty of Computer Science
Währinger Straße 29
1090 Vienna

Basement (UG1):
Lectures in HS 1
Streaming in PC1
Coffee Break in the Basement Lobby

1st Floor & 2nd Floor (1.OG - 2.OG):
Practice Sessions in:
PC2, PC3, PC5 & PC6

Ground Floor (EG):
Registration

4th Floor (4.OG):
Organisation Team
OMiLAB Node@UNIVIE

Sources: https://www.flickr.com/photos/univienna/14520260667/in/album-72157634231687550/

LECTURE DESCRIPTIONS

Overview

Lectures

Overview

Lectures (continued)

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PRACTICAL ASPECTS OF IMPLEMENTING DIGITALIZATION

John Martin Coyne, IAEA - International Atomic Energy Agency

ABSTRACT

The Safeguards Department of the International Atomic Energy Agency (IAEA) ensures the peaceful use of nuclear material and activities in accordance with legal agreements between the IAEA and member states. In order to verify compliance with the agreements, Safeguards staff verify the consistency between member states declarations with observations in the field (often at nuclear facilities) along with observations from other Safeguards relevant information collected in headquarters. The Department has developed and continues to develop a suite of custom designed software to enable the department's work. The digitalization of work processes is key to increase the efficiency and effectiveness of the workforce. Some important considerations in this regard are: It is vital to know your users, the business of your users, and your user' capabilities. Knowledge gaps in any of these areas increases risks, and increases the likelihood of project failure; well designed digital workflows can bring a range of benefits which may not be immediately evident. While digitizing a workflow can help stakeholders understand what needs to be done now, over time the output could be used to identify patterns of past behavior, and can form the basis of future predictions; training and assessments can be used to increase users' knowledge and engagement with new systems. When deploying a new system, engaging with users and providing training is critical. Post-training assessments can be used to help users identify and retain key points from the training.

BIO

John Martin COYNE, United States of America, has been appointed as Director, Office of Information and Communication Systems, Department of Safeguards, as of 1 July 2018. Prior to Mr Coyne's appointment, he was Acting Director, Office of Information and Communication Systems, Department of Safeguards, since 1 February 2015. Since joining the Department of Safeguards in 2012, Mr Coyne has served as Section Head, Section OC4, Division of Operations C and Section Head, Coordination and Support Section, Division of Operations C, Department of Safeguards. Before joining the Agency, Mr Coyne held several positions in CTBTO (Programme and Project Coordinator, Section Chief, Unit Head and Software Engineer) and in Science Applications International Corporation in Arlington, VA, United States. Mr Coyne has a Master's Degree in Geophysics from Cornell University and a Bachelor's Degree in Geological Sciences from the Pennsylvania State University.

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AMME: HOW METAMODELLING CAN SUPPORT DIGITALIZATION

Prof. Dr. Dimitris Karagiannis, University of Vienna, Austria

BIO

Dimitris Karagiannis is head of the Research Group Knowledge Engineering at the University of Vienna. His main research interests include knowledge management, modelling methods and meta-modelling. Besides his engagement in national and EU-funded research projects Dimitris Karagiannis is the author of research papers and books on Knowledge Databases, Business Process Management, Workflow-Systems and Knowledge Management. He serves as expert in various international conferences and is on the editorial board of several international journals. He is member of IEEE and ACM and on the Special Interest Group on IT Governance of the Austrian Computer Society. He is the founder of the Open Models Laboratory, www.omilab.org.

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ABSTRACT

Internet's evolution into a generic platform and a pervasive environment enables the creation, provision and consumption of digital services. Cloud-based deployment models offer transparent access to services for a worldwide group of users. The models support 24/7 availability, location independence as well as autonomy of resource processing limitations. At the same time, digital services are the basis of new and innovative business models. All of the above is expected to take place in the digital transformation process. Is it really feasible this way?

DEVELOP AND USE CONCEPTUAL MODELS WITH BEE-UP®

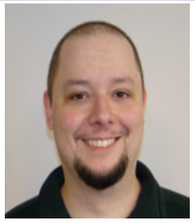
Dipl. Ing. Patrik Burzynski, OMiLAB NPO, Germany

ABSTRACT

The research field of Conceptual Modelling identifies models as artefacts describing a real or proposed system on an abstraction level that is adequate for a given purpose. This presentation focuses on the Bee-Up multi-language modeling environment and key features that increase the value of models beyond their basic function (as diagrammatic documentation/ communication support). Bee-Up supports modeling with several established languages - BPMN, EPC, ER, UML, Petri Nets - enriched with semantic links between various model types. The goal of the presentation is to highlight that Bee-Up is not limited to diagramming with established languages, but also facilitates model-value through model analysis, transformation, execution, and integration with other systems. A selection of these will be demonstrated. Theoretical aspects about what is under the hood of Bee-Up model processing capabilities will also be briefly discussed. Bee-Up is an educational tool available at https://bee-up.omilab.org.

BIO

Patrik Burzynski is a computer scientist, currently working as part of the OMiLAB team, developing applications using cloud services. His interests include programming and meta-modeling. During his study of Business Informatics at the University of Vienna he was involved in several international research projects (e.g., plugIT, ComVantage). After finishing his master's degree (Dipl.-Ing.) he worked at the University of Vienna for the research group Knowledge Engineering as a university assistant, teaching courses on Modelling and Meta-Modelling and working on the Bee-Up tool before moving on to join the OMiLAB NPO. In the OMiLAB NPO he is responsible for the open-source software area and is currently working on different open-source projects, such the ADOxx metamodelling platform.



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PARTICIPATORY ENTERPRISE MODELING WITH THE 4EM METHOD: CHALLENGES AND APPLICATIONS

Prof. Dr. Janis Stirna, University of Stockholm, Sweden

BIO

Janis Stirna has received a degree of Doctor of Philosophy in Computer and Systems Sciences from the Royal Institute of Technology, Sweden in 2001 and Associate Professor (docent) from Jönköping University, Sweden in 2008. In 2015 he was promoted to full professor at Department of Computer and Systems Science (DSV), Stockholm University. Stirna's current research interests include enterprise modelling and requirements engineering methods and tools, organisational patterns, knowledge management and transfer of best practices. Stirna is an author or co-author of some 70 research reports and publications as well as two text books on Enterprise Modelling.

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ABSTRACT

Companies are often involved in Enterprise Modeling (EM) activities that address various business problems usually relayed to business and IT development or improvement of the quality of business operations. This can be done from a number of perspectives, e.g., strategy (goals, challenges, opportunities), business operations (processes, actors, resources), information (concepts, products), information technology (requirements, components), etc. However, to develop efficient solutions and to ensure their fit, all of these perspectives need to be analyzed in an integrated way, which is a core principle of EM. In practice, EM activities often involve groups of people, i.e. the models are created in a participatory way. This presentation will discus participatory EM and the 4EM method, including its meta-model and tooling. We will also discuss what modeling challenges can be addressed by this kind of modeling.

MBSE AND SEMANTIC MODELING ENABLE THE TRANSITION FROM DIGITAL TWINS TO COGNITIVE TWINS

Prof. Dr. Dimitris Kiritsis, Ecole polytechnique fédérale de Lausanne, Switzerland

ABSTRACT

The Cognitive Digital Twin (CDT) concept has been recently proposed which reveals a promising evolution of the current DT concept towards a more intelligent, comprehensive, and full lifecycle representation of complex systems. To explain the CDT vision and facilitate its development, we designed a three-dimensional CDT reference architecture based on the RAMI4.0 architecture. This reference architecture contains the key elements of the CDT vision including full lifecycle phases, system hierarchical level and multi-layer functions. Moreover, we introduce the main enabling technologies for CDT development and implementation directly correlated with the CDT characteristics, including semantic technologies, MBSE, PLM etc. The couplings of these technologies is another challenging task of CDT applications. From cyber-physical system perspective, it is critical to interconnect subsystems across different domains and lifecycle phases using adapters, brokers and other types of middleware mechanisms.

BIO

Dimitris Kiritsis is Faculty Member at the Institute of Mechanical Engineering of the School of Engineering of EPFL, Switzerland, where he is leading a research group on ICT for Sustainable Manufacturing. His research interests are Closed Loop Lifecycle Management, IoT, Semantic Technologies and Data Analytics for Engineering Applications. He served also as Guest Professor at the IMS Center of the University of Cincinnati, and Invited Professor at the University of Technology of Compiègne, the University of Technology of Belfort-Montbéliard and at ParisTech ENSAM Paris. Prof. Kiritsis is actively involved in EU research programs in the area of Factories of the Future and Enabling ICT for Sustainable Manufacturing. He has more than 200 publications. Since September 2013 Dimitris is Chair of IFIP WG5.7 – Advanced Production Management Systems and member of the Advisory Group of the European Council on Leadership on Enabling Industrial Technologies – AG LEIT-NMBP. He is also founding fellow member of the International Society for Engineering Asset Management (ISEAM) and of various international scientific communities in his area of interests including EFFRA.

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GOAL-ORIENTED PROCESS MINING FOR EXTRACTING ENTERPRISE PROCESSES

Prof. Dr. Daniel Amyot, University of Ottawa, Canada

BIO

Daniel Amyot is Professor at the School of Electrical Engineering and Computer Science of the University of Ottawa. His research interests include software engineering, scenario-based and goal-based requirements engineering, business process modelling and mining, regulatory compliance, smart contracts, and healthcare informatics. Daniel led the standardization of the User Requirements Notation at the International Telecommunication Union between 2002 and 2013. He is now heavily invested in the development of Symboleo, a language for specifying, verifying, and monitoring (smart) legal contracts. He was general chair of the RE Conference in 2015 and program co-chair in 2018. Daniel is on the editorial boards of SoSyM and REJ. He holds a Ph.D. in Computer Science from the University of Ottawa (2001), and is a professional engineer (OIQ), I.S.P. (CIPS), and a Senior Member of IEEE.

ABSTRACT

Process mining is used to discover enterprise-level process models from system logs. Process mining practices are mainly activity-oriented and they seldom consider the (often conflicting) goals of stakeholders. Involving goal-related factors, as often done in early requirements engineering phases, can improve the rationality and interpretability of mined models and lead to better opportunities to satisfy stakeholders, especially during digital transformation. In this course, I will first highlight recent challenges related to process mining and the importance of considering goals. I will then introduce a new Goal-oriented Process Enhancement and Discovery (GoPED) method, which aligns discovered models with stakeholders' goals. GoPED first adds goal-related attributes to traditional event characteristics (case identifier, activities, and timestamps), selects a subset of cases with respect to a goal-related criterion, and finally discovers a process model from that subset. The method defines three types of criteria, supported by different algorithms, that suggest desired satisfaction levels from a (i) case perspective, (ii) goal perspective, and (iii) enterprise perspective. The resulting process models are simpler to understand and reproduce the desired level of satisfaction. Example from healthcare organizations will be used to illustrate the benefits of GoPED.

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X-IOT: A MODEL DRIVEN APPROACH FOR CROSS PLATFORM IOT APPLICATIONS

Prof. Dr. Andrea Polini, University of Camerino, Italy

ABSTRACT

Digital transformation asks for digital solutions conceived taking into account the peculiarities of each deployment context. Indeed a "one fits all" approach to the definition of a solution does not lead to satisfactory results. On the other hand, in order to cope with timing constraints that ask for rapid development of digital solutions, it becomes extremely useful to enable the reuse of knowledge acquired in the development of a single solution, and to avoid redeveloping each solution from scratch. IoT based solutions clearly are one of the main pillars enabling digital transformation. In such a context the development is made complex by the many variability dimensions influencing the definition of a possible solution. Variability has to do with the possible adoption of different devices, different processes, different platforms and in different deployment contexts where the specific IoT based application has to be delivered. In the lesson the "X-IoT" (Cross Iot) methods will be introduced. X-IoT proposes a novel model driven approach that, abstracting from technological details, permits to specify cross cutting concerns for an IoT application and, successively, thanks to successive refinement steps, to derive a working application for the given context and specific requirements. The lesson will illustrate the proposed approach and the lesson learned in its definition.

BIO

Andrea Polini is an Associate Professor at University of Camerino. He got his PhD from Scuola Superiore „Sant'Anna" in Pisa. His research interests are in the area of Software Engineering, and in particular on Quality Assurance Strategies for Complex Software Systems, and on Business Process Modelling and Verification. Prof. Polini has conducted research activities within many EU projects and in particular he acted as Scientific Leader for the Learn PAd EU project. He also participated as research member to the FP6 STREP Telcert project, to the FP6 STREP Plastic project, to the FP7 IP TAS3 project. He was WP co-leader in the FP7 IP CHOReOS project, for which he was also responsible for the UNICAM unit. Prof. Polini has been reviewer, among the others, for ICSE 2015, AST11-18, CompSac2018, PESOS12-15, ViDaS10, EGOVIS12-16, ICST10-12, WebTest09, A-MOST08, TAP08, SOQUA07, ICSEA06, CD2005 and he organized events associated to relevant conferences in the Software Engineering domain, such as QASBA11-13, ARAMIS08, IW-SOSwE07, IW-SOSwE06, and WS-MaTe 06. Currently he is the responsible for the Computer Science Division, and UNICAM Rector Delegate for the Development of Digital Infrastructures.

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DATA CLEANSING FOR BUSINESS UNDERSTANDING

Prof. Dr. Wilfried Grossmann, University of Vienna, Austria
Dr. Christoph Moser, University of Vienna, Austria

BIO

Wilfried Grossmann is retired professor at the Faculty of Computer Science at the University Vienna. He got his PhD at the University Vienna in Mathematics and has worked and published in the areas Information Management, Mathematical Statistics, Applied Statistics, Statistical Computing, Operations Research, and Metadata. In connection with his research he has participated in European research programs in Official Statistics (Eurostat) as project coordinator and as work group leader. From 2005-2010 he was chair of the Quality Board of Statistics Austria and vice chair of the Austrian Statistics Council. At the moment his main interests are Business Analytics, Applied Statistics and Information Management.

Christoph Moser completed his doctorate at the Faculty of Computer Science at the University of Vienna after studying business administration. He is currently product manager of ADOIT, an enterprise architecture management software rated as a Leader by analyst firms. In his many years of consulting work, he has supported numerous companies in the introduction of enterprise architecture and process management as part of business transformation initiatives. Furthermore, he is a lecturer at the University of Vienna in the areas of enterprise modelling and enterprise architecture management.

ABSTRACT

Information about business activities is usually captured in data describing on the one hand the structure of the business process (production view), on the other hand the activities of the users (customer view). Correct understanding of the performance of a business process depends essentially on the quality of the information in the different data and appropriate integration of various data sources. Frequently such activities are summarized under the heading Data Cleansing, which covers different types of procedures like data correction, record linkage or imputation of missing values. Due to the abundance of available data about a specific business process in traditional form as well as data on the Internet this is often a challenging task. In this lecture we present a unified process model for data cleansing and data provisioning and show how this model can be realized using the ADOxx platform. The basic idea of the model is simultaneous processing of the data workflow and the associated workflow of the metadata which describe the data processing activities. Such a model supports better understanding of the data and extends traditional methods for accessing data quality. As a use case for application we show how this approach can help in better monitoring of the COVID-19 pandemic.

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MULTI-PERSPECTIVE ENTERPRISE MODELLING AS A FOUNDATION OF IT-BUSINESS ALIGNMENT

Prof. Dr. Ulrich Frank, University of Duisburg-Essen, Germany

ABSTRACT

While it is undisputed that today's enterprises depend crucially on IT, many companies still struggle with exploiting the potential of IT to a full extent. On the one hand, that requires adapting IT infrastructures of ever increasing complexity to changing needs of the business, on the other hand, it recommends rethinking organisational structures and business processes to create new opportunities for the efficient use of IT. In the long run, the digital transformation may even require to reinvent the entire business model, which will usually imply a major restructuring of a company and its IT. IT-Business alignment can be mastered only, if a professional perspective on the business is combined with elaborate knowledge of the IT. The field of enterprise modelling is addressing this demand by integrating models of the business, such as goal models or business process models, with models of the IT, such as models of the IT infrastructure, object models etc. In his talk, Ulrich Frank, will give an overview of "Multi-Perspective Enterprise Modelling" (MEMO) to demonstrate how enterprise models support various kinds of business and IT related analyses that support both, IT managers and line managers and that thereby serve as a pivotal instrument to foster IT business alignment. For this purpose, he will give an overview of the domain-specific modelling languages that are part of MEMO, the language architecture and the language specification. The presentation will be supplemented by a tutorial on the use of MEMO4ADO, a tool that facilitates the construction of integrated enterprise models using the MEMO languages.

BIO

Ulrich Frank holds the chair of Information Systems and Enterprise Modelling at the Institute of Computer Science and Busines Information Systems at the University of Duisburg-Essen. His main research topic is enterprise modelling, i.e. the development and evaluation of modelling languages, methods and corresponding tools. "Multi-Perspective Enterprise Modelling" (MEMO), a method for enterprise modelling that was developed under his supervision is among the most elaborate methods available today. In recent years, he focused especially on multilevel DSMLs and corresponding tools. Together with Tony Clark from Sheffield University, he conducts the project "Language Engineering for Multilevel Modelling" (LE4MM). Ulrich Frank is on the editorial board of multiple journals. He has been actively involved in numerous conferences and various major research projects. He had assignments as visiting researcher/ professor in various countries. He is a review board member of the German National Science Foundation and the founding director of the international student exchange network IS:link.

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ENTERPRISES AS MODEL-DRIVEN SYSTEMS

Prof. Dr. Erik Proper, LIST, Luxembourg

BIO

Henderik A. Proper is Head of Academic Affairs of at the Luxembourg Institute of Science and Technology in Luxembourg, and senior research manager for Innovative Services department. He also holds a chair in Information Systems at the Radboud University Nijmegen. Furthermore, he chairs the Enterprise Engineering research network involving researchers from these two institutions. He is interested in the further development of the field of enterprise engineering, and enterprise modelling in particular. He has co-authored several journal papers, conference publications and books. His main research interests include enterprise architecture, systems theory, business/IT alignment and conceptual modelling. Erik received his Master's degree from the University of Nijmegen, The Netherlands in May 1990, and received his PhD (with distinction) from the same University in April 1994. In his Doctoral thesis he developed a theory for conceptual modelling of evolving application domains, yielding a formal specification of evolving information systems.

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ABSTRACT

In this lecture, we will look at enterprises (companies, organizations, agencies, factories, etc.) from the perspective of them being essentially model-driven systems. We will start with a refelection on what a model is, where it is important to realize that the notion of model involves more than "boxes and lines" diagrams. From this broader perspective, we then briefly explore the natural role that models play in the (continous) development, operation, and regulation of enterprises. new technologies, such as AI, low-code, rule engines, IoT, Digital Twins, etc., provide additional drivers and enablers for the usage of models (in the broader sense) in enterprises. At the same time, some of these technologies (e.g. low-code, rule engines, big data, and explainable AI) actually put even more stress on the role of models. Based on this exploration, we then return to the more fundamental question of the value of models. When creating and using models in an enterprise context it becomes important to consider its costs and benefits. The creation, administration, and use, of such domain models requires an investment in terms of resources (time, money, cognitive effort, etc.). We contend that such investments should be met by a (potential) return. In other words, the Return on Modelling Effort (RoME).

THE NEXT GENERATION SOLID CORE – FLEXIBLE BOUNDARY AT HILTI

Dr. Martin Petry, Hilti AG

ABSTRACT

For companies that achieved standardized enterprise processes & data, business modularity can be achieved with the vision and execution of an architectural principle distinguishing solid core and flexible boundary. In Hilti, our solid core included systems enabling business value creation through a globally available standard business process. On the other hand, allocating systems into the flexible boundary enabled agility to meet business needs on time by building on the highly standardized solid core. However, with time and added complexity, this approach needs to be adapted and upgraded to its next generation. The attendees of this lecture will learn about the most influential factors triggering this upgrade and what the next generation of "solid core - flexible boundary" entails.

BIO

Martin Petry became Hilti's CIO in 2005. In this function he was responsible for Hilti's 500 IT employees based in Switzerland (Buchs SG), US (Tulsa, Oklahoma and Plano, Texas) and Malaysia (Kuala Lumpur). In addition to his CIO role in 2009 he became in charge of Hilti's Business Excellence initiatives and EVP. Martin joined Hilti in 1993 and has held various leadership roles in Liechtenstein, Switzerland, Great Britain and Japan. He has developed Hilti's groundbreaking IT Strategy in 2000 and has lead its implementation, in particular Hilti's global SAP implementation cum business transformation project (standard global data structures and business processes supported by a global SAP system with ERP, BI, CRM and SCM). Since 2010 Martin has initiated various cloud computing / SaaS initiatives at Hilti and he has lead the development of the comprehensive Information Technology at Hilti strategy, which is now the foundation of all digital and software initiatives in the Hilti group. Under his leadership Hilti became a pioneer in the usage of next generation ERP systems and in setting up an intelligent enterprise. Beginning of 2022 Martin has handed over the CIO position to his successor and assumes a new role as Advisor on Digital Transformation at Hilti. Martin earned his PhD in applied mathematics from Georg-August University in Goettingen, Germany.

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ACQUIRING MODELS FROM DATA

Prof. Dr. Aditya Ghose, University of Wollongong, Australia

BIO

Aditya Ghose holds PhD and MSc degrees in Computing Science from the University of Alberta, Canada (he also spent parts of his PhD candidature at the Beckman Institute, University of Illinois at Urbana Champaign and at the University of Tokyo) and a Bachelor of Engineering degree in Computer Science and Engineering from Jadavpur University, Kolkata, India. While at the University of Alberta, he received the Jeffrey Sampson Memorial Award. His research has been funded by the Australian Research Council (Chief Investigator on 8 ARC Discovery and Linkage Projects), the Canadian Natural Sciences and Engineering Research Council, the Japanese Institute for Advanced Information Technology (AITEC) and various Australian government agencies (such as NSW State Emergency Services and the NSW Defence Innovation Network) as well as companies such as Bluescope Steel, CSC and Pillar Administration. His research has been published in the top venues in service-oriented computing (ICSOC), software engineering (IEEE Transactions on Software Engineering, ICSE and ER) and AI (Artificial Intelligence Journal, AAAI, AAMAS and ECAI).

ABSTRACT

There is a growing body of evidence that certain classes of models (enterprise architecture models, goal models as well as process and service models, for instance) are amenable to automated acquisition from readily available enterprise data. These techniques seek to mine useful "first-cut" models from the available data, which can be subsequently edited and refined by analysts, thereby easing the model acquisition bottleneck (there are other benefits, including the ability to improve model quality, and the use of models as dashboard artefacts). Data-driven methods can also indirectly contribute to the development of more resilient models. This tutorial will provide a timely exposition to these techniques whose importance is likely to grow significantly in the near future.

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AN APPROACH TO THE INFORMATION SYSTEM CONCEPTUAL MODELING BASED ON THE FORM TYPES AND ADOXX TOOLS

Prof. Dr. Ivan Lukovic, University of Belgrade, Serbia

ABSTRACT

Nowadays we still identify a plethora of methods and techniques that can be deployed in the development of information systems (ISs). 'Optimal' methods are still far from obvious. For decades we have developed a methodology approach and a framework, named IISStudio, for support of the IS development process. IISStudio can be categorized as a Model Driven Software Development and Domain Specific Modeling framework and relies on a specific meta-model named as IISCase Meta-model. It is aimed at improving the IS development process by increasing designers' efficiency and the overall quality of the systems being developed. In this lecture we present the main idea of our approach, and discuss our experiment that was to implement a selected part of IISCase Meta-model in ADOxx Modeling and Configuration Platform. Some of lessons learned from our experimental work in this research indicate that the ADOxx framework successfully addresses some of the issues present in other meta-modeling frameworks.

BIO

Ivan Luković received his diploma degree (5 years) in Informatics from the Faculty of Military and Technical Sciences in Zagreb in 1990. He completed his Mr (2 year) degree at the University of Belgrade, Faculty of Electrical Engineering in 1993, and his Ph.D. at the University of Novi Sad, Faculty of Technical Sciences in 1996. Currently, he works as a Full Professor at the Faculty of Organizational Sciences of the University of Belgrade, where he lectures in several Computer Science and Informatics courses. He also created B.Sc. and M.Sc. study programs in Information Engineering – Data Science at Faculty of Technical Sciences. His research interests are related to Database Systems, Business Intelligence Systems, and Software Engineering. He is the author or co-author of over 200 papers, 5 books, and 30 industry projects and software solutions in the area.

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MODELING TEMPORAL REQUIREMENTS OF PROCESSES

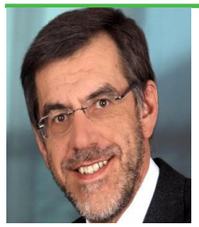
Prof. Dr. Johann Eder, University of Klagenfurt, Austria

BIO

Johann Eder is full professor for Information and Communication Systems in the Department of Informatics-Systems of the Alpen-Adria Universität Klagenfurt, Austria. From 2005-2013 he served as Vice President of the Austrian Science Funds (FWF). He held positions at the Universities of Linz, Hamburg and Vienna and was visiting scholar at AT&T Shannon Labs, NJ. The research interests of Johann Eder are databases, information systems and data management for medical research. A particular focus of his work is the evolution of information systems and the modelling and management of temporal information and temporal constraints. Another focus is the application of Information technology for medical research from information systems for biobanking, information privacy to modelling of biological processes.

ABSTRACT

Processes are ubiquitous for modeling dynamic phenomena in many areas like business, production, health care, robotics etc. Many of these applications require to adequately deal with temporal aspects: durations, deadlines, temporal constraints and goals. Nevertheless, temporal aspects are not yet prominently treated in requirements engineering or business process management. Models for representing requirements need to express temporal properties of the context resp. the environment, which have to be considered for designing systems. And they need to express temporal conditions, which have to be satisfied or which represent properties of goals that should be reached. Models, therefore, contain constructs for durations, temporal constraints like admissible time-span between events, and deadlines. Furthermore, these models need a notion of correctness and we discuss different notions like satisfiability and controllability. We also present techniques, which can be employed to check whether temporal requirements are conflicting and to derive temporal properties.



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SAPNET: A SECURITY ASSESSMENT PLATFORM FOR SPN IN THE IOT ECOSYSTEM

Prof. Dr. Christos Douligeris, University of Piraeus, Greece

ABSTRACT

SAPnet is an ADOxx-based modelling tool which includes the ontology toolkit for stochastic Petri net (SPN) modeling enriched with the tools that enable the security evaluation of the model. SAPnet provides (a) a modeler-friendly interface for the composition and the updating of the security vulnerabilities list that affect the model, and (b) fast and accurate results regarding the security metric of the model, at any point of the designing phase.

BIO

Christos Douligeris, currently a professor at the department of Informatics, University of Piraeus, Greece held positions with the Department of Electrical and Computer Engineering at the University of Miami. He was an associate member of the Hellenic Authority for Information and Communication Assurance and Privacy and the President and CEO Hellenic Electronic Governance for Social Security SA.Dr. Douligeris has published extensively in the networking scientific literature and he has participated in many research and development projects (MEDUSA, CYSM, MIIGATE, SAURON) – in many of them as coordinator and/or technical project manager. He is the co-editor of a book on "Network Security" published by IEEE Press/ John Wiley, a co-editor of a special issue of IEEE Communications Magazine on Medical Informatics and he is on the editorial boards of several scientific journals as well as on the technical program committees of major international conferences. He has been involved extensively in curriculum development both in the USA and Greece.

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PRE-CONCEPTUAL MODELING FOR EXPLORING ACTORS AND INTERACTIONS IN REAL WORLD SYTEMS

Prof. Dr. Siegfried Vössner. Technical University of Graz, Austria

BIO

Siegfried Vössner holds a PhD degree in Engineering Sciences from Graz University of Technology. Until 1999 he was a postdoctoral fellow and visiting scholar at the Department for Engineering Economic Systems and Operations Research at Stanford University, USA. After being a project manager for McKinsey&Company he became professor and chairman of the institute of Engineering- and Business Informatics in 2003 and was Vice-Dean of the School of Mechanical Engineering and Economic Sciences of Graz University of Technology from 2004-2015 and holds this position again since 2020. He has been a visiting professor at Stanford University, the Naval Postgraduate School in Monterey and at the University of Auckland in New Zealand and is an alumnus of the Strategic Leadership Program from Austrian National Defense Academy. His research interests are: Modeling and Simulation of Business and Social Systems, Systems Architecture and System Engineering, Public Safety and Systems Safety, Critical Infrastructure, Production Systems – Design, Operations, Optimization.

ABSTRACT

When modeling real world activities involving social, economic and technical aspects conceptual modeling is a necessary prerequisite to set the stage and define the system boundaries, which becomes difficult - especially when not all relevant actors, shareholders and stakeholder as well as their intrinsic and extrinsic motivations are known. One of the methodological challenges is to provide a unified framework to collect as many relevant perspectives and pieces of information and create a most comprehensive but yet insightful and understandable representation. Another challenge is to transform these findings into standardized and re-usable information which can serve as input for other modeling tools downstream in the tool chain. We will present both a methodology based on value networks and a modeling tool (EcoViz), which is intended to address these issues and can also be used right before the typical conceptual modeling starts – in a "pre- conceptual phase" and show some practical applications.

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NEMO 2022 Summer School - Programme Overview

Week 1

ADOXX TRAINING DAYS

	07 - 08 July	11 July	12 July	13 July	14 July	15 July
08:45 - 09:00		**Opening** OMiLAB@UNIVIE Team				
09:00 - 10:00		**Practical Aspects of Implementing Digitalization** J. Coyne	**Goal-oriented Process Mining for Extracting Enterprise Processes** D. Amyot	**Acquiring models from data** A. Ghose	**The Essence of Conceptual Models** H.C. Mayr	**The industrial transition towards smart PSS: enterprise modelling to support value creation processes** X. Boucher
10:00 - 11:00		**AMME: How Metamodelling Supports Digitalization?** D. Karagiannis	**X-IoT: a Model Driven approach for cross platform IoT applications** A. Polini	**An Approach to the Information System Conceptual Modeling based on the Form Types and ADOxx Tools** I. Lukovic	**Engineering Digital Languages** B. Rumpe	**OMiLAB: An Introduction to the Digital Lab** K. Hinkelmann, W. Utz
11:00 - 11:30		N E T W O R K I N G			B R E A K	
11:30 - 12:30		**Practice Session** Develop and use conceptual models with Bee-Up© P. Burzynski	**Data Cleansing for Business Understanding** W. Grossmann, C. Moser	**Temporal requirements of processes** J. Eder	**Process Algebra to Model Probabilistic Behavior of Smart IoT** M.K. Lee	**OMiLAB@UNIVIE in Action** **Digital Design Thinking Workshop** I. Vaidian
12:30 - 14:00		L U N C H		L U N C H		L U N C H
14:00 - 15:00		**Participatory Enterprise Modelling with the 4EM Method: challenges and applications** J. Stirna	**Multi-Perspective Enterprise Modelling as a Foundation of IT-Business Alignment** U. Frank	**SAPnet: A Security Assessment Platform for SPN in the IoT Ecosystem** D. Douligeris	**Ontology-based Enterprise Modelling for Human and Machine Interpretation** K. Hinkelmann	**OMiLAB@UNIVIE in Action** **Digital Design Thinking Workshop** V. Döller, I. Vaidian, A. Völz, C. Muck, W. Utz
15:00 - 16:00		**MBSE and Semantic Modeling enable the transition from Digital Twins to Cognitive Twins** D. Kiritsis	**Enterprises as model-driven systems** E. Proper	**Pre-Conceptual Modeling for Exploring Actors and Interactions in Real-World Systems** S. Vössner	**Hybrid Knowledge Bases: the Interplay between Domain-specific Models and Knowledge Graphs** R. Buchmann, A-M. Ghiran	**OMiLAB@UNIVIE in Action** **Digital Design Thinking Workshop** C. Muck
16:00 - 16:30		N E T W O R K I N G			B R E A K	
16:30 - 17:30		**Get Together | Open End**	**HILTI** **The next generation solid core – flexible boundary** M. Petry	**Practice Session** with EcoViz S. Vössner	**Practice Session** with RDF R. Buchmann, A-M. Ghiran	**Service Engineering models for the design and development of Digitalized Product-Service-Systems** G. Pezzotta

Week 2

LEISURE DAYS

	16- 17 July	18 July	19 July	20 July	21 July	22 July
09:00 - 10:00		**Enterprise Modeling for Continuous Requirements Engineering** M. Kirikova	**The Role of Requirements in the Digital Age: Requirements Engineering Revisited** M. Glinz	**Data asset monetization as a modelling concern** M. Rossi	**Capability Oriented Requirements Engineering** E. Kavakli	**GROUP PRESENTATIONS** **Innovation Scenarios**
10:00 - 11:00		**Integrated Process and Decision Modelling** J. Vanthienen	**Digital Transformation of Organizations: How Enterprise Modelling can help** K. Sandkuhl	**Business Processes as a Driver for Digital Transformation within Business Communities** A. Oberweis	**Design and modelling of digital value networks, business models and architectures in the energy domain of the future** D. Hertweck, P. Küller	**GROUP PRESENTATIONS** **Innovation Scenarios**
11:00 - 11:30		N E T W O R K I N G			B R E A K	
11:30 - 12:30		**Practice Session Introduction** Digitalization in Smart Cities: A Case Study A. Völz	**Practice Session** Digitalization in Smart Cities with ADOxx© OMiLAB@UNIVIE Team	**Practice Session** Digitalization in Smart Cities with ADOxx© OMiLAB@UNIVIE Team	**Practice Session** Digitalization in Smart Cities with ADOxx© OMiLAB@UNIVIE Team	**GROUP PRESENTATIONS** **Innovation Scenarios**
12:30 - 14:00		L U N C H		L U N C H		L U N C H
14:00 - 15:00		**Towards Tool-Supported Situational Roadmap Development for Business Process Improvement** F. Johannsen	**Security and AI: Regulatory Frameworks Proposals** S. Tjoa	**Modelling Knowledge Action and Time: Action Theories and Their Application in Dynamic Domains** D. Plexousakis, T. Patkos	**Architecting the Enterprise - A Design Science Approach** M. Helfert	**GROUP PRESENTATIONS** **Innovation Scenarios**
15:00 - 16:00		**Managing ship arrivals in a port: The Design Process of Digital Objects in Context of Software Architectures** H. Züllighoven	**How to model your eco-system?** J. Gordijn	**Enterprise Modelling and Blockchains: Recent Findings and Future Prospects** H.G. Fill	**Challenging the Design of Digital Products and Services with Modelling Approaches and the OMiLAB@Hilti** M. Nemetz	**GROUP PRESENTATIONS** **Innovation Scenarios**
16:00 - 16:30		N E T W O R K I N G			B R E A K	
16:30 - 17:30		**CITY OF VIENNA** **Digital City Vienna** K. Himpele	**Working Session** Innovation Scenarios Group Work	**Working Session** Innovation Scenarios Group Work	**Working Session** Innovation Scenarios Group Work	**Closing Ceremony**

THE ESSENCE OF CONCEPTUAL MODELS

Prof. Dr. Heinrich C. Mayr, University of Klagenfurt, Austria

ABSTRACT

Models are the basic human tools for managing complexity and understanding. In the context of digital transformation, modeling plays a central role in ensuring the functionality, security and quality of complex digital ecosystems and enter-prise digital twins. Many modeling paradigms have evolved over time in different disciplines, resulting in a wide variety of modeling languages, methods and tools that have come and gone. This is particularly true for informatics, which is a modeling discipline in it-self: for long it has systematized the field of mod-eling, for example by introducing model hierar-chies, by ontological foundations, by developing universal modeling languages such as UML, or by specifying domain-specific modeling methods (DSSMs) for areas of application where universal approaches fail. A core modeling method in Informatics is that of Conceptual Modeling. In this talk we aim at a bet-ter understanding of the essence of this method. For that purpose, we address the "anatomy" of conceptual models and show how they can be characterized by a signature. We combine this with a transparent explanation of the nature of conceptual models as the link between the dimen-sion of linguistic terms and the encyclopedic or ontological dimension of notions: Figuratively this leads to the triptych of conceptual modeling. Building on this, we show how digital ecosystems can be designed and developed in a rigorous mod-el-centered approach. This is illustrated by the results of projects we have carried out in the areas of assistance systems and the development of mechatronic systems.

BIO

Heinrich C. Mayr has been Full Professor of Informatics at the Universität Klagenfurt since 1990. Until then he was assistant professor at the Universität Karlsruhe (today: KIT), visiting professor at several universities and managing director of a German software company. His research is documented in more than 240 publications and includes methods of information system design, domain specific modeling languages, requirements modeling as well as knowledge management. Among other things, he held the position of President of the Gesellschaft für Informatik (GI) and Vice-President of the Council of European Professional Informatics Societies (CEPIS). He was rector of his university for 6 years. For 20 years he was editor-in-chief of the „Lecture Notes in Informatics" and chairman of the council of the Software Internet Cluster SIC. Currently, he is a board member of the „Kärntner Beteiligungsverwaltung.

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ENGINEERING DIGITAL LANGUAGES

Prof. Dr. Bernhard Rumpe, RWTH Aachen University, Germany

BIO

Bernhard Rumpe is heading the Software Engineering department at the RWTH Aachen University, Germany (one of the top three universities in CS as well as Mechanical Engineering). Earlier he had positions at INRIA/IRISA, Rennes, Colorado State University, TU Braunschweig, Vanderbilt University, Nashville, and TU Munich. His main interests are rigorous and practical software and system development methods based on adequate modelling techniques. This includes agile development methods like XP and SCRUM as well as model-engineering based on UML-like notations and domain specific languages. He has to many modelling techniques, including the UML standardization. He also applies modelling, e.g. to autonomous cars, human brain simulation, BIM energy management, juristical contract digitalization, production automation, cloud, and many more. In his projects he intensively collaborates with all large German car manufacturers, energy companies, insurance and banking companies, a major aircraft company, a space company as well as innovative start-ups in the IT-related domains. He is author and editor of ten books and Editor-in-Chief of the Springer International Journal on Software and Systems Modelling (www.sosym.org). His newest books „Agile Modelling with the UML" and „Engineering Modelling Languages: Turning Domain Knowledge into Tools" were published in 2016 and 2017.

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ABSTRACT

We examine the current state and problems of modelling for software and for cyberphysical systems and discuss a number of approaches to tackle those. In particular, we discuss how to make use of models in large development projects, where a set of heterogeneous models of different languages needs is developed and needs to fit together, e.g. describing high-level structures of the organisation, business processes, data structures, physical components, their operation and so on. A model based development process (both with UML/SysML as well as a domain specific modelling language (DSML)) heavily relies on modelling core parts individually and composing those through generators to early and repeatedly cut code and tests from these models. We discuss in detail compositionality on models and heterogeneous modelling languages and how it supports agile evolution of such infrastructures.

PROCESS ALGEBRA TO MODEL PROBABILISTIC BEHAVIOR OF SMART IOT

Prof. Dr. Moon Kun Lee, Chonbuk National University, South Korea

ABSTRACT

In general, process algebra can be the most suitable formal method to specify IoT systems due to the equivalent notion of processes as things. However there are some limitations to predict smart IoT systems with the properties of distribution, mobility and real-time. For example, Timed pi-Calculus has capability of specifying time property, but is lack of direct specifying both execution time of action and mobility of process at the same time. And d-Calculus has capability of specifying mobility of process itself, but is lack of specifying various time properties of both action and process, such as, ready time, timeout, execution time, deadline, as well as priority and repetition. In order to overcome the limitations, this lecture presents a process algebra, called, dTp-Calculus, extended from d-Calculus, by providing with capability of specifying probabilistic transitions with the set of time properties, as well as priority and repetition. Further the method is implemented as a tool, called SAVE, on the ADOxx meta-modeling platform. It can be considered one of the most practical and innovative approaches to model probabilistic behavior of smart IoT systems.

BIO

Moonkun Lee is professor in Division of Computer Science and Engineering in Chonbuk National University, Republic of Korea. Received Bachelor degree in Computer Science, Pennsylvania State University, USA; Master and Ph.D. degrees in Computer & Information Science, The University of Pennsylvania, USA. Worked at CCCC, USA, as Computer Scientist; Developed SRE (SW Re/reverseengineering Environment); Applied to modernization of legacy OS and SW of NSWC in US Navy to Ada. Main research interests are SW round-trip engineering, distributed real-time systems, formal methods, ontology, behaviour engineering, etc. Currently focusing on Smart City and Factory in order to implement CPS (Cyber-Physical Systems) with dTp-Calculus in SAVE on ADOXX and Web Server.

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ONTOLOGY-BASED ENTERPRISE MODELLING FOR HUMAN AND MACHINE INTERPRETATION

Prof. Dr. Knut Hinkelmann, University of Applied Sciences and Arts Northwestern Switzerland FHNW, Switzerland

BIO

Knut Hinkelmann is Head of the Master of Science in Business Information Systems at the FHNW University of Applied Sciences and Arts Northwestern Switzerland. He also is visiting professor at the University of Camerino, Italy, and research associate at the University of Pretoria, South Africa. In 1988 he obtained a diploma in Computer Science and in 1995 a PhD from the University of Kaiserslautern. After the study he worked for the Research Institute for Applied Knowledge Processing (FAW). Then he was researcher and head of the Knowledge Management research group at the German Research Center for Artificial Intelligence (DFKI). After having worked as product manager for Insiders Information Management GmbH, he joined FHNW in August 2000 as a professor for Information Systems.

ABSTRACT

The continuous alignment of business and IT in a rapidly changing environment is a grand challenge for today's enterprises. Decision-makers use models to understand and analyze a situation, to compare alternatives, and to find solutions. While humans prefer graphical or textual models, semantic annotation makes the knowledge in models machine-interpretable. The approach has been applied in the CloudSocket project for the selection of cloud services to achieve Business Process as a Service. This presentation also describes a meta-modelling approach, which combines human-interpretable graphical enterprise architecture models with machine-interpretable enterprise ontologies. A metamodel which is represented as a formal ontology determines the semantics of the metamodel. Every time a new modelling element is created during modelling, an instance for the corresponding class is created in the ontology. Thus, models for humans and machines are based on the same internal representation.

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HYBRID KNOWLEDGE BASES: THE INTERPLAY BETWEEN DOMAIN-SPECIFIC MODELS AND KNOWLEDGE GRAPHS

Prof. Dr. Robert Buchmann, Babes-Bolyai University, Romania
Dr. Ana-Maria Ghiran, Babes-Bolyai University, Romania

ABSTRACT

The interplay between Knowledge Graphs and Domain-specific Modelling Languages was traditionally concerned with the challenge of "ontological commitment" - i.e., checking the ontological qualities of a language in order to enforce coherence and consistency in model contents. An alternative approach to coupling the two knowledge representation approaches will be promoted by this lecture, motivated by pragmatic requirements of externalizing and combining both human-readable and machine-readable representations, thus giving a novel interpretation to the seminal SECI knowledge conversion cycle. Agile modelling languages are treated here as schemas for knowledge that is amenable to linking, reasoning and publishing with the help of semantic technology - i.e., RDF graph databases, OWL axioms, SPARQL queries and endpoints. The presentation highlights benefits of combining the Agile Modelling Method Engineering Framework with the Resource Description Framework in order to build novel knowledge acquisition methods. The lecture will present results derived from applying and refining this idea in the ComVantage FP7 EU project and the EnterKnow PED Romanian research project, taking it to the point where it may inspire a novel "model-aware" software engineering method.

BIO

Robert Andrei Buchmann received his doctoral degree in the field of E-commerce application models from BabeșBolyai University of Cluj Napoca, Romania, in 2005. Since then, he has been specializing in Semantic Technology and Conceptual Modelling, as enablers for Knowledge Management Systems and Enterprise Architecture Management. During 2012-2015 he occupied a postdoctoral research position at University of Vienna, specializing in Agile Modelling Method Engineering, while managing metamodelling and requirements engineering tasks for the ComVantage FP7 project. Currently, he occupies a Professor position at Babeș-Bolyai University and is the Scientific Director of the University's Business Informatics Research Center, where his team is investigating opportunities of interplay between the paradigms of Semantic Web, Enterprise Modelling and Requirements Engineering.

Ana-Maria Ghiran has research experience with the Semantic Web technological space, as she had applied it in her own doctoral thesis developed at Babeș-Bolyai University of Cluj Napoca, in the field of IT Infrastructure Auditing. She has been involved in teaching and developing the „Information Systems Security" and „Semantic Web" disciplines for the Business Information Systems Department at the same university. Currently she is investigating the Conceptual Modelling paradigm and applications of semantic technology in model-driven software engineering.

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THE INDUSTRIAL TRANSITION TOWARDS SMART PRODUCT-SERVICE-SYSTEMS: ENTERPRISE MODELLING TO SUPPORT VALUE CREATION PROCESSES

Prof. Dr. Xavier Boucher, École des Mines de Saint-Étienne, France

BIO

Xavier Boucher is Professor in Industrial Management at the Ecole des Mines de Saint Etienne (France). He is Research Director at FAYOL Institute, a research Center focusing on Sustainable Industrial performance and Organisations. His current research focuses on Product Service Systems (PSS), Service oriented production systems, collaborative-agile networks and decision models to manage the supply chain agility. Prof. X. Boucher is currently leading several collaborative research projects in the field of design and management of PSS with an economic and manufacturing point of view.

ABSTRACT

The current industrial transition towards Factories of the Future (FoF) implies strong transformation of enterprise Business Models within the manufacturing sector. Product Service Systems are a key component of this transition, and contribute to renovate both the underlying enterprise models and the needs of enterprise engineering tools. The objective of the lecture is to articulate the overall needs of transition towards FoF with the requirements for innovative conceptual modelling approaches and new enterprise engineering methods and tools. The lecture will first give a synthetic insight on PSS within the context of FoF, to make possible for the audience to understand the key concepts of PSS and key industrial needs for developing innovative enterprise modelling and engineering solutions. The second part of the lecture articulate two dimensions of Enterprise engineering: an advanced modelling method dedicated to support PSS design and engineering (based on a PSS-oriented meta-model) and a decision-making approach for PSS economic-model balancing.

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SERVICE ENGINEERING MODELS FOR THE DESIGN AND DEVELOPMENT OF DIGITALISED PRODUCT-SERVICE SYSTEMS

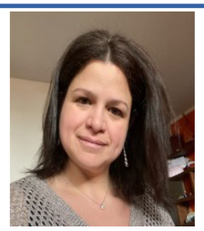
Assoc. Prof. Giuditta Pezzotta, University of Bergamo, Italy

ABSTRACT

Despite their recent introduction and consolidation in the industrial practice, Product Service System business models are subjected to a further revision in order to fully exploit the opportunities and challenges provided by the Industry 4.0 technological paradigm. Companies need to identify and define new business models integrating PSS with digital technologies and, as a result, revise their decision-making processes. The design and development of a Product–Service System (PSS) raises new issues since the service component introduces further requirements than traditional product engineering. Compared to traditional and smart products, services are generally under-designed and inefficiently developed. Approaches such as New Service Development, Service Design and Service Engineering have emerged during the last decades to support the design and development of service either as a system itself or as a constituting element of a PSS. In particular, Service Engineering investigates service design and development with a systematic perspective and with a seamless integration of product and service contents. Purpose of the lecture is to provide a holistic conceptualisation and an up-to-date analysis of the current state of the art on the evolution of the concept of Product Service system and Service Engineering models with a specific focus on their adoption in the PSS context. A critical analysis is also performed with the aim to define a research agenda and the most prominent key actions that could give directions for future research.

BIO

Giuditta Pezzotta is Associate Professor at the Department of Management, Information and Production Engineering and Vice Chancellor for Quality Assurance at University of Bergamo. She received her PhD degree in Management, Economics and Industrial Engineering from Politecnico di Milano in 2010. During her PhD studies, she was a visiting PhD student at DIAL - Institute for Manufacturing - University of Cambridge in UK. Her PhD was in the Service Engineering and Product Service System fields. She has also been visiting researcher at the University of Botswana, Tokyo Metropolitan University and Blekinge Institute of Technology. She carries out her research activities interested in the design, engineering and management of product-service systems and in modeling and simulation of production and service delivery processes. Through her work at the University of Bergamo she has been involved and has coordinated several industrial and research projects related to the Product-Service field. She is author of more than 100 refereed international and national journal and conference papers. Since 2019, she is co-coordinator of the Special Interest Group (SIG) in Service Systems Design, Engineering and Management of IFIP. She is part of the Scientific committee of "Centro interuniversitario di ricerca sull'innovazione e la gestione dei servizi nelle imprese industriali"(http://www.asapsmf.org/).



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ENTERPRISE MODELING FOR CONTINUOUS REQUIREMENTS ENGINEERING

Prof. Dr. Mārīte Kirikova, Riga Technical University, Latvia

BIO

Mārīte Kirikova is a Professor in Information Systems Design at the Department of Artificial Intelligence and Systems Engineering, Faculty of Computer Science and Information Technology, Riga Technical University, Latvia. She has more than 200 publications on the topics of requirements engineering, business process modelling, knowledge management, systems development and educational informatics. She is also a co-editor of several scientific proceedings in the area of databases, information systems, information systems engineering, enterprise modelling, systems and business, and business informatics. Marite Kirikova has participated in university research and teaching teams in Sweden, Denmark, Austria, and USA. In her research currently she focuses on continuous information systems engineering in the context of agile and viable system paradigms.

ABSTRACT

In the era of global economy and frequent changes, caused, for instance, by digital transformation and innovation, the information systems development faces the need for continuous realignment with the business processes and systems. Continuous development, continuous delivery, and continuous engineering have become common notions in contemporary systems development language. In this context, right requirements still are the key of project success; however the methods for their engineering must adhere to challenges and possibilities of enterprise digitalization levels. One of the opportunities that are provided by enterprise modeling tools is the possibility to utilize enterprise models in requirements engineering. FREEDOM framework is one of the means for structured and purposeful usage of As-Is and To-Be enterprise models for requirements engineering in different project types and enterprises.

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INTEGRATED PROCESS AND DECISION MODELLING

Prof. Dr. Jan Vanthienen, KU Leuven, Belgium

ABSTRACT

Modelling business processes is essential for business effectiveness and efficiency. But not all business processes can easily be modelled as simple arrangements of flows and activities. Certainly knowledge-intensive processes incorporate lots of decisions and decision knowledge, that should not be hidden in process flows or activities, because hardcoding (decision) rules in processes leads to complex and inflexible process models. In analogy with the Business Process Modelling & Notation Standard (BPMN), a Decision Model & Notation standard (DMN) was developed, that allows to model the decisions separately, thereby simplifying the process model. Decision models describe business decisions, with their interrelationships and requirements, together with the detailed decision logic used to make the decision. This session is about the basics of decision modelling, and mainly about how decision models and process models should be combined (and separated) into an integrated model of processes and decisions.

BIO

Jan Vanthienen is full professor of information systems at KU Leuven (Belgium), Department of Decision Sciences and Information Management, where he is teaching and researching on business intelligence, analytics, business rules, processes & decisions. He has published numerous papers in reviewed international journals and conference proceedings. Jan is a founding member of the Leuven Institute for Research in Information Systems (LIRIS) and he received the Belgian Francqui Chair 2009 at FUNDP and an IBM Faculty Award in 2011. He is co-founder and president-elect of the Benelux Association for Information Systems (BENAIS). Jan is actively involved in the Decision Modeling & Notation standard (DMN) at OMG (Object Management Group). He is also member of the IEEE task force on process mining, and co-author of the Business Process Mining Manifesto.

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TOWARDS TOOL-SUPPORTED SITUATIONAL ROADMAP DEVELOPMENT FOR BUSINESS PROCESS IMPROVEMENT IN THE ERA OF "QUALITY 4.0"

Prof. Dr. Florian Johannsen, Schmalkalden University of Applied Sciences, Germany

BIO

Florian Johannsen will hold the position of a locum professor for "Operational Application Systems" at the University of Applied Sciences Schmalkalden starting in April 2019. Until March 2019 he was a locum professor for Industrial Services in the "Department of Economics" at the University of Bremen. He successfully completed his postdoctoral thesis in October 2017 and was appointed private lecturer (Privatdozent) at the University of Regensburg. He received his doctoral degree at the University of Regensburg in March 2011, where he worked as a research assistant and postdoctoral researcher from 2006 to 2017. During that time, he led several projects with partners from industry and published his research at highly regarded conferences and in reputable journals.

ABSTRACT

The quality management discipline is continuously evolving over time and the term "quality 4.0" coins the stage of development, in which "industry 4.0's digital technologies" (e.g., cyber-physical systems, internet of things, cloud manufacturing, augmented reality, etc.) are applied to quality management. The "quality 4.0" concept is lively discussed in literature and it will play a decisive role in the factory of the future. However, there are still uncertainties regarding the operationalization of the concept in practice and the topic is "too fresh" to have experienced a thorough theoretical foundation yet. So, it is rather unclear whether existing quality management methods and techniques can be transferred to industry 4.0 settings or not. As a result, guidelines for the effective implementation of quality 4.0 principles are missing yet. Furthermore, companies often lack the resources to investigate the design of new quality management methods for industry 4.0. This lecture proposes "tool-supported situational roadmap development for BPI" as an instrument to arrive at enterprise-adapted and easy-to-use approaches for "quality 4.0" that can be applied straight away. In this way, employees are enabled to design BPI approaches to match their particular needs. This lecture presents a first conceptual solution and a prototype implemented via the ADOxx platform.

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MANAGING SHIP ARRIVALS IN A PORT: THE DESIGN PROCESS OF DIGITAL OBJECTS IN CONTEXT OF SOFTWARE ARCHITECTURES

Prof. Dr. Heinz Züllighoven, University of Hamburg, Germany

ABSTRACT

The lecture describes the path from the task-oriented analysis of ship traffic management in the Port of Hamburg to the design and realisation of a touch table application "Sounding Table". The focus is on supporting the arrival and departure of large ships in the Port of Hamburg. This example shows how we narrowed the classical gap between the domain-oriented analysis of the application area and the design of the user model. We will then outline how this design process has a direct influence on the architecture of the software. architecture. Key roles are played here by our metaphor-oriented Tool & Material approach and user participation with Domain Story Telling.

BIO

Heinz Züllighoven graduated in Mathematics and German Language and Literature, holds a PhD in Computer Science. From 1991 until 2015 he held a chair in software architecture at the University of Hamburg and was head of the attached Software Technology Centre. He is one of the original designers of the Tools & Materials approach to object-oriented application software and the eGPM approach which preceded Domain Storytelling. Since 2000, Heinz Züllighoven is also one of the managing directors of WPS Workplace Solutions Ltd. He has published a number of papers and books on various software engineering topics. Among his current research interests are a revision of the Tools & Materials approach in the light of new interaction means of current frontend technologies and the architecture of large industrial software systems. In addition, he an his co-researchers are further developing the tool support for Domain Storytelling.

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DIGITAL CITY VIENNA

Dipl. Vw. Klemens Himpele, Stadt Wien

BIO

Klemens Himpele was born in 1977 in Emmendingen/Germany. He studied economics at the University of Cologne where he graduated in 2005. He started his professional career as an educational researcher in Cologne and Berlin. After this, he worked for Statistics Austria in Vienna and the German Education Union (GEW) in Frankfurt am Main. Between 2012 and 2020, he was head of the City of Vienna's Department for Economic Affairs, Labour and Statistics. He has been CIO of the City of Vienna since October 2020.

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ABSTRACT

The expectations of the population that they can also handle services and official matters digitally are very high. Accordingly, the City of Vienna has to offer its services in a user-oriented and benefit-centred way. The goal of generating a high quality of life for all people in Vienna through social and technical innovation in all areas with maximum conservation of resources is Vienna's guiding principle on its way to becoming the digitisation capital of Europe.

THE ROLE OF REQUIREMENTS IN THE DIGITAL AGE: REQUIREMENTS ENGINEERING REVISITED

Prof. Dr. Martin Glinz, University of Zurich, Switzerland

ABSTRACT

Requirements Engineering (RE) has been applied with remarkable success for specifying the requirements for systems or products. However, as RE has traditionally been performed as a heavy-weight, upfront process for creating a comprehensive specification, it has been criticized or even declared obsolete in recent years, particularly by the proponents of agile development. In this talk, I will shed light on the role of requirements in today's digital world, discuss how this relates to enterprise modeling, and show how modern RE can contribute to shaping, evolving and sustaining digital systems and products.

BIO

Martin Glinz is a full professor emeritus at the University of Zurich (UZH). From 1993 until 2017, he was a professor of Informatics at UZH's Department of Informatics. From 2007-2016, he also was the department head. His interests include requirements and software engineering – in particular modelling, validation, quality, and evolution. He received a Dr. rer. nat. in Computer Science from RWTH Aachen University in 1983. Before joining the University of Zurich, he worked in industry for ten years where he was active in software and requirements engineering research, development, training, and consulting. He is on editorial boards and program committees of major journals and conferences in software and requirements engineering and served as general chair, program chair, steering committee chair and organizer for the top international conferences in his field. For his research and services, he has received several awards. He is a member of the International Requirements Engineering Board (IREB), where he chairs the IREB Council.

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DIGITAL TRANSFORMATION OF ORGANIZATIONS: HOW ENTERPRISE MODELLING CAN HELP

Prof. Dr. Kurt Sandkuhl, University of Rostock, Germany

BIO

Kurt Sandkuhl, born 1963 in Germany, is full Professor of "Business Information Systems" at University of Rostock (Germany) and has an adjunct position as Professor of "Information Engineering" at School of Engineering, Jönköping University. He received a diploma (Dipl.-Inform.) and a PhD (Dr.-Ing.) in computer science from the Berlin University of Technology in 1988 and 1994, respectively. Furthermore, he received the Swedish degree as "Docent" (postdoctoral lecturing qualification) from Linköping University, Institute of Technology, in 2005. In 2002, Sandkuhl joined School of Engineering at Jönköping University and is responsible for the research group in Information Engineering. From 2003-2010, Sandkuhl was head of Fraunhofer ISST's project group in information engineering, which was located at Jönköping University. In 2010, Sandkuhl was appointed professor of business information systems at the University of Rostock (Germany). Sandkuhl's current research interests include the fields of digital transformation, enterprise modeling, ontology engineering, and model-based information systems engineering. He has published four books and more than 250 papers in enterprise modeling, enterprise architecture management, digital transformation, knowledge management, and related areas.

ABSTRACT

In many industrial sectors and service domains, enterprises change or extend their business models based on digital technologies. Examples are smart connected products allowing for monitoring and control of physical devices, services with customer journeys digitalized end-to-end, or platforms offering data-driven services as complement to product-service bundles. The resulting digital transformation of enterprises causes substantial changes in the operational processes and organizational structures, and in the way of working with partners, suppliers and customers. Enterprise modeling offers different techniques to support digital transformation. The lecture will examine the use of modeling in digital transformation projects from a practice perspective based on selected real-world cases.

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SECURITY AND AI: REGULATORY FRAMEWORKS PROPOSALS

Prof. Dr. Simon Tjoa, FH St. Pölten, Austria

ABSTRACT

Artificial intelligence is seen as the key technology for solving the grand societal challenges (e.g.: Sustainable Development Goals) in the future. Thus, it is no big surprise that the industry applications - including privacy & safety relevant domains (e.g. health, mobility) – increase rapidly. The accumulation of incidents (e.g.: profiling, machine learning bias) in the recent past and problems to understand complex artificial intelligences led the EU Commission to develop a proposal for the regulation of AI and high-risk AI. This talk highlights key aspects of this proposal and outlines current cyber security challenges and threats, which should be considered when developing, acquiring or running high risk artificial intelligence applications. Furthermore, current initiatives and approaches addressing this topic are presented.

BIO

Simon Tjoa is head of department "Computer Science and Security" at St. Pölten University of Applied Sciences and academic director of the master programs "Information Security" and "Cyber Security and Resilience". He received his doctoral degree in informatics from the University of Vienna and has been working for more than 15 years in the information security domain. He is secretary of the Austrian IEEE SMC chapter and holds various information security certifications, such as Certified Information Systems Auditor (CISA) or Certified Information Security Manager(CISM). His research interests include cyber resilience, information security management and AI security. He currently researches on the interdependencies of Blockchain technologies and security management at the "Josef Ressel Center for Blockchain Technologies & Security Management".

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HOW TO MODEL YOUR ECO-SYSTEM?

Prof. Dr. Jaap Gordijn, Vrije Universiteit Amsterdam, The Netherlands

BIO

Jaap Gordijn is founder and director of The Value Engineers (https://www.thevalueengineers.nl), a company designing peer-to-peer business models for technologies such as blockchain. Also, he is an associate professor of innovative e-business at the VUA, Amsterdam. He is the key developer of, and has internationally published on, the e3-value methodology, which comprises a graphical technique to design and evaluate networked business models (www.e3value.com). Earlier, he was a member of Cisco's International Internet Business Solution Group. As such, he was active as an e-business strategy consultant in the banking, insurance, and digital content industries for Fortune 500 companies.

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ABSTRACT

Many ecosystems such as Facebook, Google, Amazon, Uber, and many more are not considered as fair. This is amongst other demonstrated by the European Commission, who fines the dominant parties of these ecosystems regularly. We explain, in a model-based way why such ecosystems are unfair, and how the model can tell this. We also give some guidelines how to design fair ecosystems and the required decentralized information technology to accomplish these. We also give some examples of ecosystems that are from a structural point fairer than the well-known platform-oriented ecosystems.

DATA ASSET MONETIZATION AS A MODELING CONCERN

Prof. Dr. Matti Rossi, Aalto University, Finland

ABSTRACT

Although data as a new sellable good has been under discussion for years, selling and monetizing data assets has not been given proper thought in IS modeling and development This aspect is of relevance given recent concerns about data privacy and security and the simultaneous explosion in the use of data for marketing and service-development purposes. We show how this aspect can be considered in IS development through constraints (organization type, business type, data characteristics, privacy, and security) that companies should address to move from the internal use of data and supporting existing customers to generating new business through selling data. These concerns need to be linked to data production processes within the organization and analyzed against regulations (e.g. GDPR and new European DMA and DSA acts). We also demonstrate how business models can be used to analyze what parts of the data assets can be monetized and what kind of relationships and partnerships have to be formed.

BIO

Matti Rossi is a professor of information systems at Aalto University School of Business. He is currently a visiting scholar at NYU Stern School of Business. He is the current president of the Association for Information Systems. He has been the principal investigator in several major research projects funded by the technological development center of Finland and Academy of Finland. He was the winner of the 2013 Millennium Distinction Award of Technology Academy of Finland for open source and data research. His research papers have appeared in journals such as MIS Quarterly, Journal of AIS, Information and Management and Information Systems. He has been a senior editor of JAIS and Database, and an associate editor for MIS Quarterly, and he is the past editor in chief of Communications of the Association for Information Systems. He is a member of IEEE, ACM and AIS.

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BUSINESS PROCESSES AS DRIVER FOR DIGITAL TRANSFORMATION WITHIN BUSINESS COMMUNITIES

Prof. Dr. Andreas Oberweis, Karlsruhe Institute of Technology, Germany

BIO

Andreas Oberweis is professor at the Karlsruhe Institute of Technology (KIT), Institute of Applied Informatics and Formal Description Methods. He is Research Director and Member of the Board of FZI Research Center for Information Technology Karlsruhe. He is co-founder of several companies in the field of Business Process and Software Engineering.

ABSTRACT

Business processes in the age of the internet are typically not restricted to single organizations but cross organizational borders to customers, suppliers and other organizations. The design of business processes for these business communities is a complex collaborative task, which requires special methodological support. This course introduces Horus, which includes a set of modelling methods and languages to support the whole life cycle of business processes within business communities. Horus is based on high-level Petri Nets for procedure modelling and provides additional modelling support for objects, resources, organizational structures, business goals and business rules. Simulation based concepts are provided to evaluate models. Besides describing the basic concepts of Horus, the course also gives an overview about ongoing research work.

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MODELLING KNOWLEDGE ACTION AND TIME: ACTION THEORIES AND THEIR APPLICATION IN DYNAMIC DOMAINS

Prof. Dr. Dimitris Plexousakis, University of Crete, Greece
Dr. Theodore Patkos, FORTH-ICS, Greece

ABSTRACT

The modelling of knowledge, action and time is a topic of current research within the broader domain of knowledge representation and reasoning. The course will focus on declarative approaches for modelling and reasoning with change, paying particular attention to the integration of knowledge and action. As time is inherent in any type of activity and process, the course will also deal with the representation of temporal properties that characterize the occurrence of actions and the knowledge they generate. Practical aspects of reasoning about knowledge, action and time will be discussed in the context of solving constraint satisfaction problems for business process optimization. The ECAVI Event Calculus modelling tool, developed on top of the ADOxx metamodelling platform, will also be presented. ECAVI assists knowledge engineers in the process of axiomatizing causal domains.

BIO

Dimitris Plexousakis is a Professor of Computer Science at the Univ. of Crete and Head of the Information Systems Lab. He obtained a PhD in Computer Science from the Univ. of Toronto in 1996. His research interests lie in the areas of Conceptual Modeling, Knowledge Representation and Reasoning; Formal models and query languages for the Semantic Web; process and service modelling. He has extensive experience in coordinating and participating in National and European Projects and over 150 publications in peer-reviewed journals and conferences.

Theodore Patkos is a postdoctoral researcher at FORTH-ICS. He holds a PhD in Computer Science from the University of Crete since 2010 studying formal methods for commonsense reasoning in dynamic environments and their application to Ambient Intelligence and Social Robotics domains. His research interests include knowledge representation and non-monotonic reasoning with emphasis on action languages, contextual and commonsense reasoning, multi-agent systems, argumentation and formal knowledge representation models for the Semantic Web.

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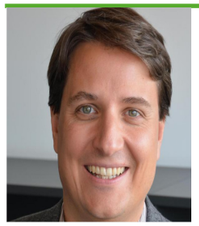
ENTERPRISE MODELING AND BLOCKCHAINS: RECENT FINDINGS AND FUTURE PROSPECTS

Prof. Dr. Hans-Georg Fill, Fribourg University, Switzerland

BIO

Hans-Georg Fill is full professor at the University of Fribourg, Switzerland and head of the Research Group Digitalization and Information Systems. He holds a PhD and a habilitation from the University of Vienna in business informatics. He was a visiting researcher at Stanford University, USA, Karlsruhe Institute of Technology, DE and Ecole Nationale Supérieure des Mines at St. Etienne, FR. His research activities focus on the development of IT-based modelling tools, distributed ledger technologies, visualization, and the alignment of conceptual modelling and semantic technologies.



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ABSTRACT

Blockchains constitute a technology that became popular through the success of Bitcoin and other cryptocurrencies. Besides these applications, the underlying technologies provide interesting opportunities for new types of business models and applications that benefit from transparency and decentralization in potentially untrusted environments. In this lecture we will explore how enterprise modeling can be used in this context. In particular we will review recent approaches for combining enterprise models and blockchain technologies and how such combinations may be realized technically.

CAPABILITY ORIENTED REQUIREMENTS ENGINEERING

Prof. Dr. Evanghelia Kavakli, University of the Aegean, Greece

ABSTRACT

The lecture concerns an approach to the application of conceptual modelling known as the Capability Oriented Requirements Engineering (CORE) approach. The conceptual modelling framework applied in CORE employs a set of complimentary and intertwined modelling paradigms based on enterprise capabilities, goals, actors, and information objects. The lecture will define the foundational concepts of CORE as well as the way of working from capturing textual descriptions from stakeholders, progressing to formally defining models of early requirements, based on the CORE meta-model, and in a stepwise refinement define functional and non-functional requirements of desired systems. The theory will be supplemented by examples from a real application of CORE on a Cyber Physical Production System.

BIO

Evanghelia Kavakli is an Associate Professor at the Department of Cultural Technology and Communication of the University of the Aegean. She obtained her PhD in Computation from the University of Manchester, Institute of Science and Technology in 1999. She is in charge of the Cultural Informatics Laboratory of the University of the Aegean. Her research on the topics of goal oriented requirements engineering, enterprise knowledge modelling, information systems privacy and cultural informatics, has been supported in the context of national and EU funded projects. Her current research focuses on requirements engineering for Big Data applications and the design of socio-cyber-physical systems. She has published over 60 peer-reviewed papers in reputed international journals and conferences and edited books. She is member of the editorial board of the Requirements Engineering Journal and has served in the program committee of a substantial number of international conferences in the field of information systems.

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DESIGN AND MODELING OF DIGITAL VALUE NETWORKS, BUSINESS MODELS AND ARCHITECTURES IN THE ENERGY DOMAIN OF THE FUTURE

Prof. Dr. Dieter Hertweck, Reutlingen University, Germany
Philipp Küller, Technical University München

BIO

Dieter Hertweck is Professor for Service Science at the Faculty of Computer Science at Reutlingen University. Prior to this position, he held the professorship for business informatics and was head of the Electronic Business Institute at Heilbronn University. Before that, he was head of the BPEM department at the KIT Research Center for Information Technology (FZI). Dieter Hertweck received his doctorate in business informatics under the supervision of Prof. Helmut Krcmar. His research focuses include service science, IT management, process and knowledge management.

Philipp Küller graduated in business informatics and is completing his PhD at the chair of Prof. Dr. Krcmar at the Technical University of Munich. As Competence Lead Automation at the Japanese IT provider FUJITSU, he is currently involved in consulting on the digitization and automation of business processes, business models and enterprise architectures. Previously, as a researcher and project lead at the Electronic Business Institute at Heilbronn University, he was responsible for various research and transfer projects at national and international level.

ABSTRACT

Since Germany's nuclear phase-out, the EU's New Green Deal and the Ukraine conflict, the energy industry has been undergoing a profound change that is bringing about a change in market structures and a redesign of business models and supply chains. Due to the dynamic further development of business models, related enterprise architectures and information systems, the energy transition is of particular relevance for IS research. The lecture gives a clear overview of the current situation and highlights the role of conceptual modeling for the coupling of circular economy systems, value creation networks, business models and enterprise architectures.

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ARCHITECTING THE ENTERPRISE – A DESIGN SCIENCE APPROACH

Prof. Dr. Markus Helfert, Maynooth University, Ireland

ABSTRACT

The presentation will provide an overview of our ongoing research related to Data Governance and Digital Transformation, in which we apply the concept of Digital Transformation Paths within an open innovation community. It will present in overview some examples of Digital Transformation projects and aspects of the Smart City Lighthouse project +CityXchange (https://cityxchange.eu/), in which we collaborate with Limerick City and County Council to develop demonstration projects in climate-friendly and sustainable urban environments. The presentation will introduce the area of Digital Services Innovation. As a novel paradigm it follows the Service-Dominant Logic to enable architecting service ecosystems based on a Design Science approach.

BIO

Markus Helfert is Professor in Digital Service Innovation at Maynooth University, Innovation Value Institute (Ireland) and the Director of the Innovation Value Institute at Maynooth University. He is a Principle Investigator at Lero – The Irish Software Research Centre and at the Adapt Research Centre. His research is centred on Digital Service Innovation, Smart Cities and IoT based Smart Environments and includes research areas such as Service Innovation, Smart Services, Building Information Management, Data Value, Enterprise Architecture, Technology Adoption and is an expert in Data Governance Standards and is involved in European Standardisation initiatives leading the SFI co-funded Programme on Data Governance - EMPOWER. Markus Helfert has authored more than 200+ academic articles, journal and book contributions and has presented his work at international conferences. Helfert has received national and international grants from agencies such as European Union (FP7; H2020), Science Foundation Ireland and Enterprise Ireland, was project coordinator on EU projects, and is the Project coordinator of the H2020 Projects: PERFORM on Digital Retail.

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CHALLENGING THE DESIGN OF DIGITAL PRODUCTS AND SERVICES WITH MODELLING APPROACHES AND THE OMILAB@HILTI

Dr. Martin Nemetz, HILTI AG

BIO

Martin Nemetz holds a PhD in Business Informatics from the University of Vienna and has worked for the Hilti Corporation since 2008. Initially, he was a Project Manager for diverse ERP-driven projects. In 2012, Martin was appointed the Head of the Competence Center for on Demand and on Device Services. Martin led his team in defining the way forward for IT in Hilti by evaluating the latest technologies and IT trends such as mobility, cloud services, and social media while checking their applicability for business support and usage. Since 2012, Martin became part of the Hilti IT Leadership Board. In 2015, Martin relocated to Malaysia to further expand and develop the Asia talent hub in Kuala Lumpur - Hilti Asia IT Services as one of the three strategic Global IT locations in Hilti. In this role, his portfolio covers the people, landscape, applications, technologies and the resulting digital transformation. Together with his team, Martin focuses hereby on two-dimensional growth - team size as well as technological and business competence.

ABSTRACT

Hilti is providing products, system solutions and software-based services that contribute to make work on construction sites simpler, faster and safer. While Hilti is proud of its leading construction tools and consumables, it has started to engage itself in building digital products and solutions for its customers. In our presentation at NEMO Summer School, we describe how modelling approaches help us in building software solutions that satisfy the needs of our customers. Relevant questions herein are: (1) How do we reduce the variations and hence complexity of provided software features so that we can deliver them fast and in a reliable manner without compromising customer needs? (2) How can we consider future scaling and performance needs in our software architecture? (3) How can we achieve an architecture model that allows for identifying potential issues (or improvement needs) before they impair our software solutions? We work on trying to answer these and other questions by (also) applying modelling approaches in a pin-pointed and efficient way. Additionally, we have started to experiment in our OMiLAB to evaluate future use cases for our software offerings.

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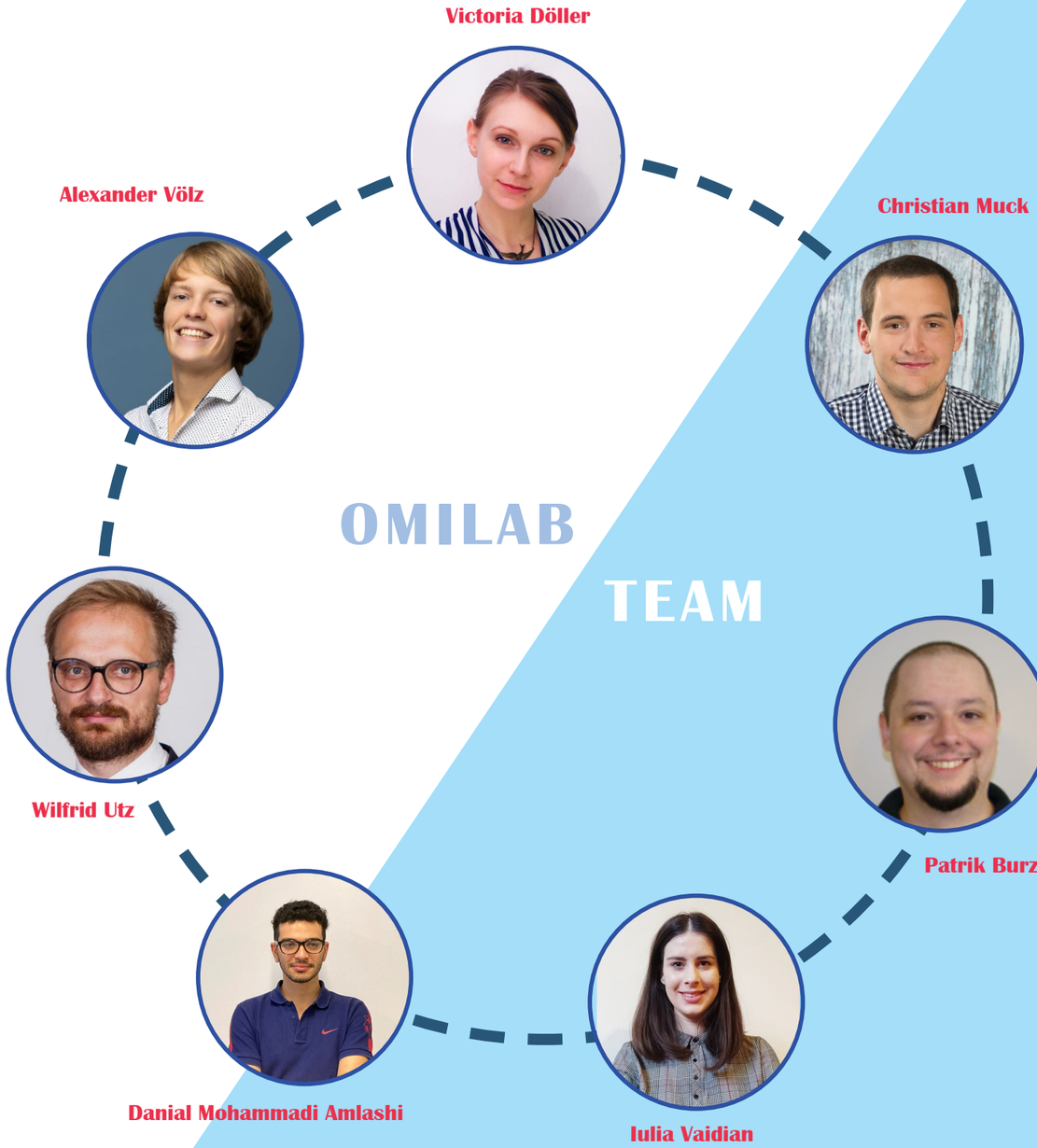


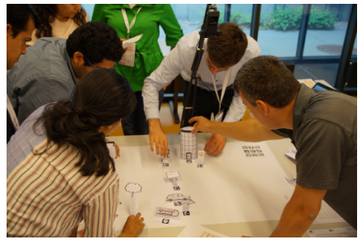
OMiLAB@UNIVIE in Action
Digital Design Thinking Workshop

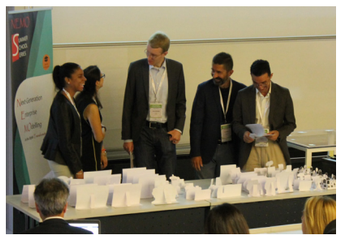
Innovation and transformation, as well as the emergence of disruptive business ecosystems have gained increasing significance. One approach to tackle this complex task is Design Thinking, which applies designer problem-solving techniques for agile, ideation, prototyping and testing in innovative processes through collaboration among stakeholders. The goal is to generate ideas by using different design thinking methods, based on tangible visualization of certain aspects of the problem within a developed solution space, where collaboration among stakeholders plays a central role.

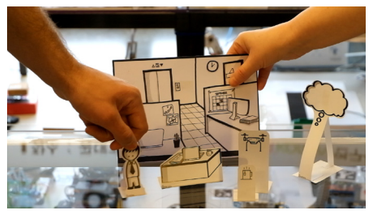
Design Thinking enables early exploration and validation of design(s) of new services, smart products, and disruptive business models, but it restricts to location and temporal availability of stakeholders. Absent stakeholders must be informed afterward, which is often not directly supported by the Design Thinking methods applied. Through the Scene2Model tool, a transformation of the physical visualization into digital conceptual models is enabled, so that they can be processed and used within modelling tools, further decomposed, and combined with available enterprise assets. This approach enables a location and time-independent collaboration of globally distributed networks and stakeholders, implied by the digital transformation and globalization of businesses. The interplay of Conceptual Modelling and Design Thinking establishes a connection between unrestrained design artefacts and more formal abstractions (e.g., business process models).

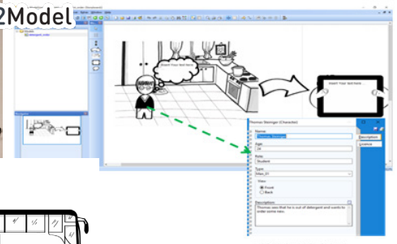
Following the introduction into Design Thinking, participants will experience hands-on the storyboards as a Design Thinking method. We will use the SAP Scenes as haptic figures to depict scenes, building the key momens of a storyboard, and exploring innovative and smart solutions in the context of a „Ski Resort“. Supported by the Scene2Model Tool, the participants will transform these scenes into diagramatic models while simultaneously semantically enriching them.

After the workshop session, a comprehensive overview of the Scene2Model tool functionality will be given, as well as insights into current work and a new project on the topic „Neural Networks for Design Thinking“.









OMiLAB@UNIVIE in Action
Digitalization in Smart Cities - A Case Study

The term Smart City describes a concept that is increasingly gaining the interest of city administrations, as more than 150 cities worldwide have formulated a strategy for becoming a Smart City. Nevertheless, a variety of definitions is used to describe different application areas within such cities and a widely accepted understanding of the concept has yet to be established. Commonly, sub-domains like Smart Mobility, Smart Environment, or Smart Governance are used to categorize present and potential Smart City applications.

In the introduction session, we propose and discuss an alternative approach for the categorization of Smart City applications by grouping them into infrastructure-related optimizations and profession-related disruptions. After showcasing that the majority of present Smart City solutions can be assigned to the infrastructure-related optimization category, a Drone Tour Guide case will be presented as an example of a profession-related disruption in the Smart City context.

In the following practice sessions, we will primarly focus on the aspects of the city infrastructure and the utilities. This will be a key element in realizing services such as smart parking, mobility, or the monitoring of the environment in terms of real-time alerts and safety management.

In this context, three building blocks have been designed to familiarize the participants with modeling concepts, model querying and model processing in an independent application domain.

Building Blocks

I: Modelling Concepts

How to model concepts of a Smart City?

Basic metamodelling concepts required to realize a modelling language for a Smart City are taught. Tools of the OMiLAB, e.g., the GraphRep generator will be introduced and utilized to create graphical visualizations for the Smart City concepts.

How to analyze Smart City models using query techniques?

Basic model analysis techniques will be discussed, enabling the modeller to use the information captured in the models in order to e.g., answer non-trivial questions, or support decision makers. As illustrative scenarios, queries will be executed on Smart City models to determine e.g., the healthiest running tracks or the fastest route for an emergency car in case of an accident.

V: Processing, e.g., Simulation

How to process Smart City models using simulation?

Introduction to simulation algorithms and how they can be applied to process the knowledge codified in conceptual models. Afterwards, hands-on experience will be achieved by realizing and executing several simulation algorithms using the built-in functionality of the ADOxx platform and the Smart City models. Finally, further model processing possibilities will be showcased and discussed, e.g., stepwise car navigation in a Smart City model using AdoScript, Expressions, and event handling.

[1] Schaffers et al. (2011): Smart Cities and the Future Internet: Towards Cooperation Frameworks for Open Innovation, in: J. Domingue et al. (Eds.): Future Internet Assembly, pp. 431–446, Springer.
[2] Hernández-Muñoz, J.M. et al. (2011): Smart Cities at the Forefront of the Future Internet, in: J. Domingue et al. (Eds.): Future Internet Assembly, pp. 447–462, Springer.

ADOxx.org
The open source Metamodelling Platform

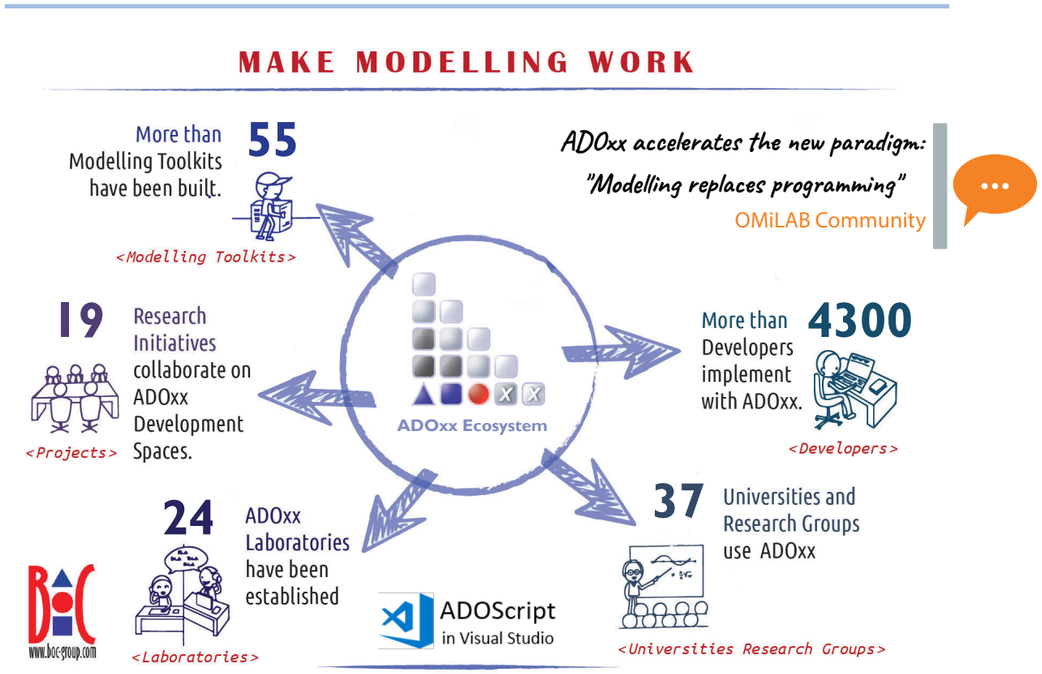
Practical work during NEMO is performed using ADOxx, the meta-modelling and development platform to realize modelling tools.

ADOxx enables to:

- Create full-fledged individual modelling tools using pre-build platform features
- Develop the notation, syntax, and semantic of a modelling language with a script-based approach
- Realize Microservices encapsulating algorithms and mechanisms with the OLIVE Framework
- Deploy modelling tools: local or distributed.

Access ADOxx at: https://www.adoxx.org/

Domain-specific modelling tools developed on ADOxx by the OMiLAB Community of Practice available at: https://www.omilab.org/activities/projects/



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OMiLAB Community of Practice

A Comprehensive Picture of the Results

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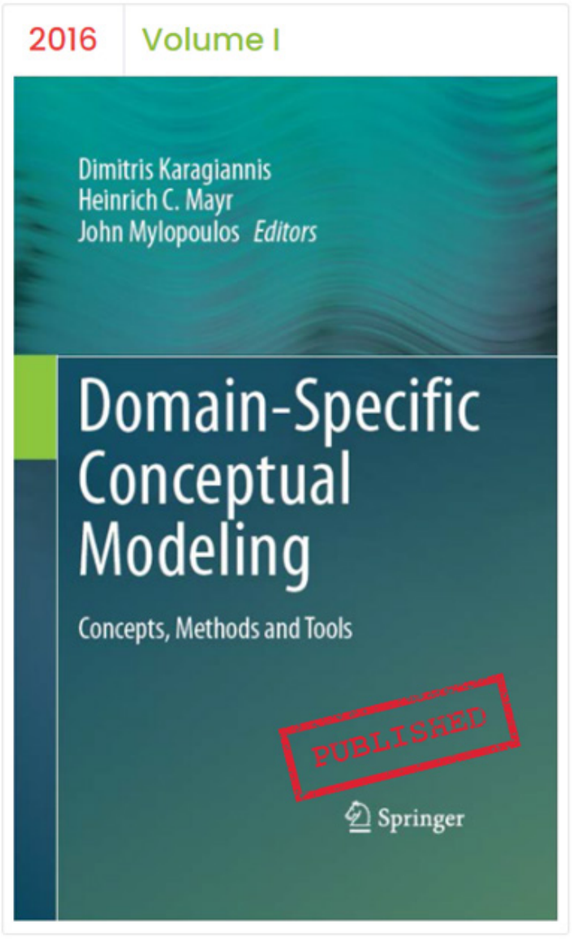

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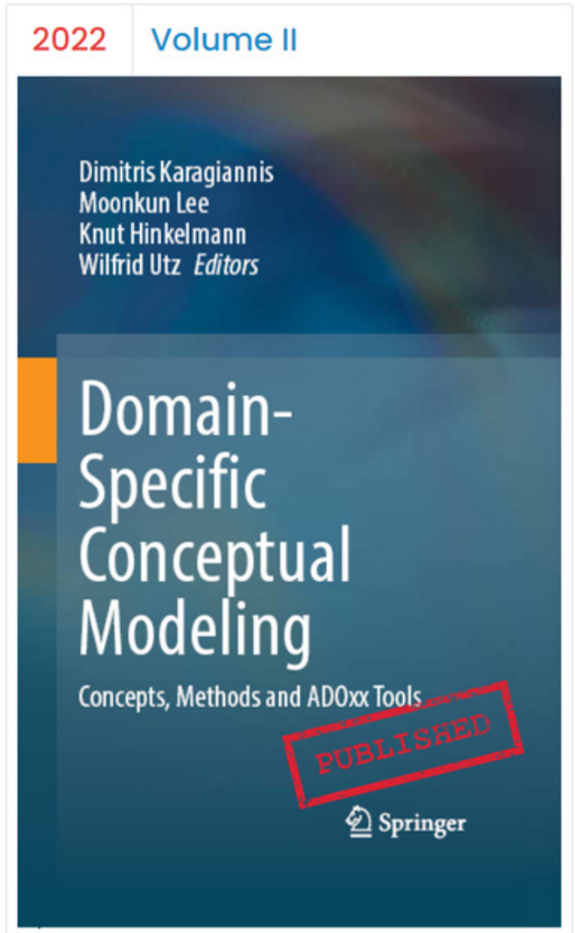

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