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universität wien

NEMO Summer School Series

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

Become a digital leader!

BUILD
DIGITAL
TWINS OF THE
FUTURE

NEMO SUMMER SCHOOL SERIES

DIGITALISATION NEEDS HIGH POTENTIALS,
THAT'S WHAT THE NEMO SUMMER SCHOOL PRODUCES.

INITIATORS OF THE **NEMO SUMMER SCHOOL**

Prof. Dr. Dimitris Karagiannis

Prof. Dr. Heinrich C. Mayr

At the NEMO Summer School you:

create with the help of "Design Thinking"
design with the help of "Conceptual Modelling"
engineer with the help of "Digital Twin"

your disruptive Ecosystem.

The BENEFITS

WHO?

NEMO graduates represent a large international network striving towards academic and professional excellence, who are connected by a common experience and cooperation platform.

WHY?

NEMO enables participants to meet a large number of international renowned academics, discuss current research topics with them and actively participate to an international community of peers.

HOW?

The NEMO Summer School provides a highly-interactive experimental environment where students and teachers focus on conceptual modelling for digital innovation ecosystems.

WHAT?

Students work in multicultural teams to create practical solutions to real world problems. They use the Digital Innovation Environment *(DiEn)* powered by OMiLAB to access open community artefacts and co-design their solutions.

The FOCUS

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Conceptual Modelling in the Digital Age

Tomorrow's students will work in and for digitized organizations where smart devices, digital artefacts, intelligent machines and robots, data streams and connectivity are ubiquitous. In their work, they will face human challenges (e.g. human-machine/system interaction), lifecycle challenges (e.g. ICT embedded in the lifecycle of consumer products like cars, industry machinery, and energy provision systems etc.), business challenges (e.g. new business models to exploit value from new applications and domains), and regulatory challenges (e.g. privacy, security etc.). Additionally, a higher level of automated processing of digital information as well as the "end-to-end" integration of processes across multiple organizations and customers will be required by users. NEMO provides a vertical overview across different application domains in preparation for all dimensions of digital transformation.

One way to manage such complex ecosystems is by means of conceptual modelling, both in the form of theory and practice. How to define and combine modelling methods with the adequate level of abstraction and how to engineer corresponding modelling tools is at the center of conceptual modelling education.

The NEMO Summer School Series brings renowned researchers and academics together with students to explore current research challenges and future development of conceptual modelling with focus on the design and implementation of Enterprise Digital Twins and Ecosystems.

NEMO exposes students to a wide diversity of lectures, covering manifold aspects of conceptual modelling, "Smart Models", Digital Ecosystems, Design Thinking, Digital Twins, as well as various cross-cutting issues. It facilitates peer exchange in working groups. Besides it supports networking in an international environment with colleagues and professors. And last but not least it encourages participants to enjoy culture and the beautiful city of Vienna.

NEMO Summer School Series

The CONTENT

WE USE ABSTRACTION TO REDUCE COMPLEXITY OF A DOMAIN FOR A SPECIFIC PURPOSE

Foundations of Conceptual Modelling

Abstraction is used to represent the real world in models for a specific purpose. This is necessary in order to reduce and manage complexity. Models incorporate, beyond syntax and notation, also the semantics of the domain they address. This stream deals with scientific and philosophical principles for modelling, fundamental notions of conceptual models, goals, as well as scoping of design methodologies for modelling languages and methods. In addition, it presents formal methods which are necessary in method engineering frameworks. Lastly the fundamentals of the creative conceptualization process are dealt with applying the AMME Conceptualization Lifecycle.

"Smart Models" for Humans and Machines

Agile Modelling Method Engineering (AMME) is used to develop model-based domain-specific applications as well as to derive increased value from such domain-specific models. This stream presents modelling languages for specific domains, like: capability management, enterprise information systems, health care management, immigration management, industrial management, model-driven software engineering, product-service-systems, production management, requirements engineering, service management, transportation as well as energy management, and, more generally, semantic-driven applications.

Semantics and technologies for Digital Ecosystems

Domain-specific tools support digitizing the relevant parts of the real world into conceptual models and applying processing mechanisms and algorithms on the models for problem resolution. Content discussed in this stream addresses advanced aspects of meta-modelling, ontologies, and generally semantic technologies focusing on domain-specific requirements. Technologies may range from lightweight modelling to formal algebra. Mechanisms and algorithms which enable processing of models by means of e.g., assessment, evaluation, prediction, planning, analysis and simulation are introduced. Advanced technologies increase model value and user interaction both, on enterprise and on individual level.

The CONTENT

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AN INTERACTIVE COMBINATION OF THEORY AND PRACTICE

Digital Design Thinking

Digital Design Thinking is a concept through which a disruption of business models is achieved and its transformation is realized with technological and organizational changes. The content of this stream deals with Digital Design Thinking tools, which are employed for switching the working environment limitations into remote collaboration environments, which is especially useful when it comes to geographically diffused teams or sessions taking place at different times.

Enterprise Digital Twins

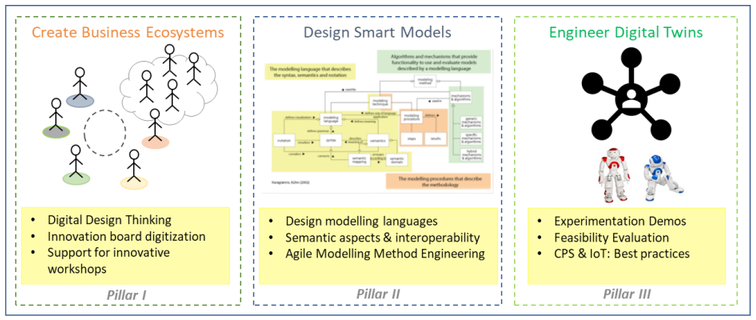
Enterprise Digital Twins present a virtual counterpart to an enterprise's assets and their static and dynamic features as a next step of digitalization. This stream addresses the concepts and technologies relevant for realization of Enterprise Digital Twins, their data and behavior along its lifecycle. The Digital Twins can be employed with their counter-part from the physical layer for activities like analysis, simulation or verify feasibility among others.

Cross-Cutting Issues

A key challenge in conceptual modelling is the design process in which real world artefacts are abstracted into concepts of a modelling language. This process is based on creativity, human interpretation of the real world and the capability to transform this knowledge into a conceptual model representation. Content included in this stream deals with issues like interaction and abstraction required to create and manipulate models, to verify models, to incorporate possible processing of models in form of algorithms into modelling methods, to evolve and migrate models and modelling languages, to integrate model processing in service-oriented tool chains as well as to perform knowledge interpretation.

OMiLAB - a Digital Innovation Environment

The Digital Innovation Environment *(DiEn)* of OMiLAB enables experimentation, training and engineering activities for organisations pursuing Digital Transformation initiatives. Stakeholders from a multi-disciplinary background are supported to develop innovative ideas as digital business models, to materialize them in proof-of-concept implementations and to evaluate their feasibility in a laboratory setting, within a corporate or academic context focusing on Digital Innovation.



Approach

Business Ecosystems, Design Thinking, Digital Twins, Conceptual Modelling, Artificial Intelligence

Technology

ADOxx · bee-up · Olive · Scene2Model · Text2Model · CoChaCo · ADOScript in Visual Studio · ROS Robot Operating System · Raspberry Pi · Semantic Web · Microservices

The Digital Innovation Environment *(DiEn)* of OMiLAB builds on the notion of digital business models. A digital business model uses a Digital Twin as a conceptual representation of an intelligent offering that:
a) must be co-designed by domain experts and innovators from different backgrounds,
b) must provide an adequate virtualization of reality, considering domain-specificity and the value to be created, and
c) must enable experimentation and evaluation of the novel business model.

VISIT: WWW.OMILAB.ORG

OMiLAB is a space to:

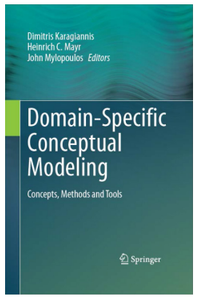
Collaborate – with peers, academics and experts from all over the world on topics related to conceptual modelling and modelling tool engineering.

Innovate – ideas, extend existing concepts, methods and tools, apply modelling knowledge to new domains and innovative designs or technologies.

Engineer – modelling methods, tools and design models using the OMiLAB technological environment. An industry-grade meta-modelling platform, i.e. ADOxx, is available as well as a wide-variety of open-source services.

Domain-Specific Conceptual Modelling
Concepts, Methods and Tools

Volume II will be published soon.



This book draws new attention to domain-specific conceptual modelling by presenting the work of thought leaders who have designed and deployed specific modelling methods. All domain-specific methods described in this volume have a tool implementation available in the OMiLAB, making these advances accessible and usable to a wide community of developers and users.

VISIT: OMILAB.ORG/ACTIVITIES/BOOKS.HTML

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... From Conceptual Modelling ... ... to Digital Environments ... and back

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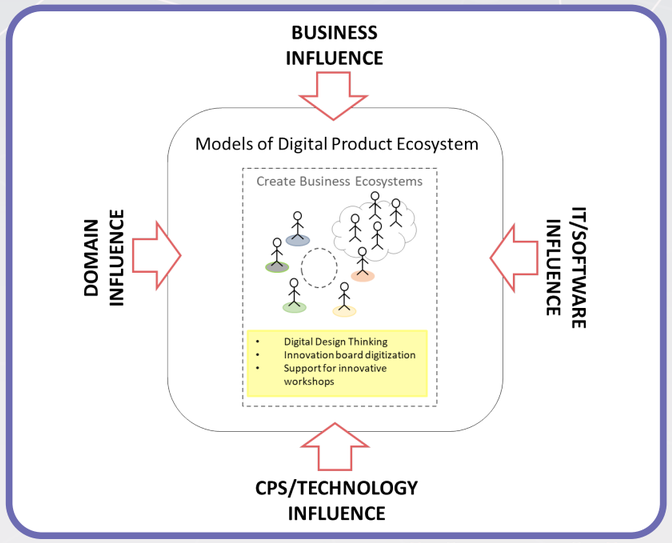
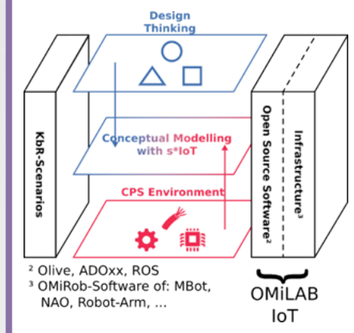
Digital Innovator

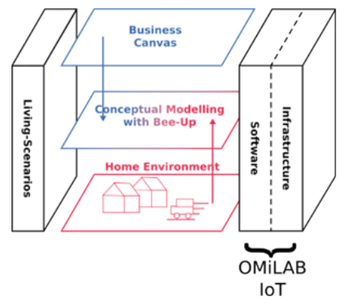
Creates new disruptive Business Ecosystems.



Knowledge-based Robotics



Smart Environment



Digital Engineer

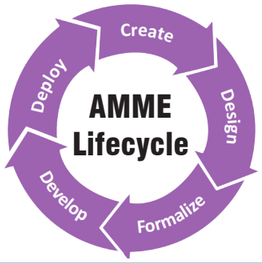
Experiences the Digital Twin in the lab environment.

Digital Laboratory: Materialization

Modelling Method Engineer

Uses AMME to build method artefacts and design Digital Twins.

AMME - Agile Modelling Method Engineering

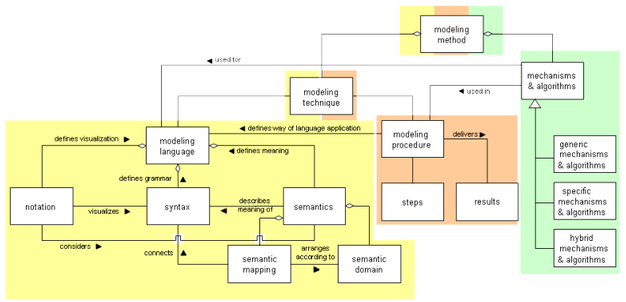


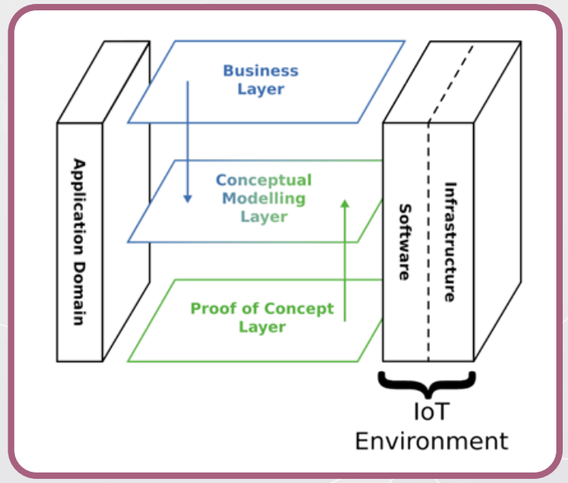
Digital Laboratory: Configuration

Meta-model Designer

Responsible for the modelling language definition and usage.

Generic Modelling Method Framework





Digital Product Designer

Applies the method for a selected domain.

Digital Laboratory: Conceptualization

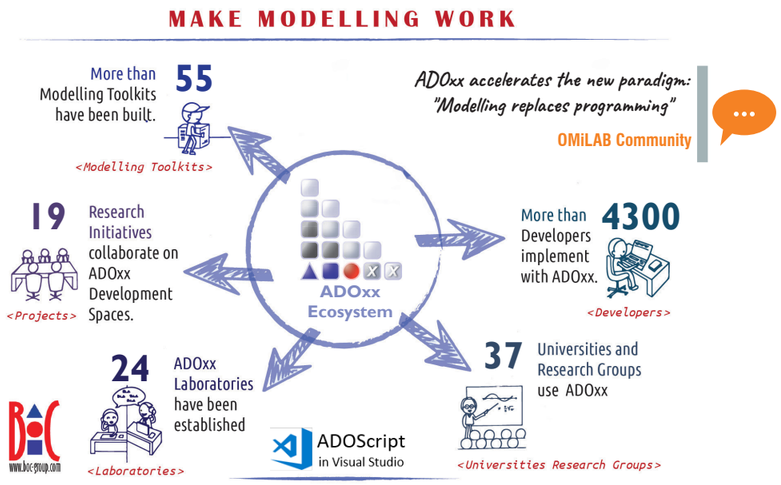
ADOxx – The open source Metamodelling Platform

www.adoxx.org

Practical work during NEMO is performed using ADOxx, the meta-modelling and development platform to realise 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
- **Integrate** or **Implement** Microservices encapsulating algorithms and mechanisms with the OLIVE Framework
- **Package** modelling tools for local or distributed software deployment



VISIT: WWW.ADOXX.ORG

ADOxx-based Modelling Tools realized by international research groups

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- For Enterprise Modeling (4EM)
- ArchiMate 3.0
- ADVISOR
- Hermxx
- Business Processes for Digital Transformation
- Bee-Up
- Business Engineering Navigator
- Business Process Feature Model
- Data Integration and Cleansing Environment
- Capability Oriented Enterprise Knowledge Modelling
- ComVantage
- Design&Engineering Methodology for Organizations Project
- Data Integration for Business
- Business Process Risk management – Integrated Method
- Decision Model and Notation
- MoSeS4eGov
- Evaluation Chains
- Electric Vehicle Testbed Modeler
- exemplarische Geschäftsprozess-modellierung
- DICER
- ENTERKNOW
- BD-DS
- Human Cognitive Model Language Modeler
- PSS Scenario Modeller
- eduWeaver
- ADOxx Horus Method
- iStar
- Japanese Creative Services
- KAMET
- Petrixx
- Knowledge Work Designer
- Learn PAd - Model-Based Social Learning for Public Administrations
- Enterprise Knowledge Development
- Large Scale Collaborative Processes
- Multi-Perspective Enterprise Modeling (MEMO)
- Probability Visualized
- Conceptual Design of Multi-View Modeling Tools
- Open Knowledge Models
- PetriNets
- MultiModal Interface Modeling Language
- Process-Goal Alignment modeling and analysis technique
- PRINTEPS modeling method
- Regensburg University Process Excellence and Reengineering Toolkit
- SAVE
- SIMchronization
- Secure Tropos
- User Story Mapping
- Scene2Model
- Semantic-based Modeling Framework for Information Systems
- TOGAF based Enterprise Architecture Management
- Semantic Database Design
- Modelling Framework for a Semantic Internet of Things
- Semcheck
- Structured Entity Relationship Modeling Method on ADOxx
- Semantic Object Model (SOM)

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The INTERNATIONALITY

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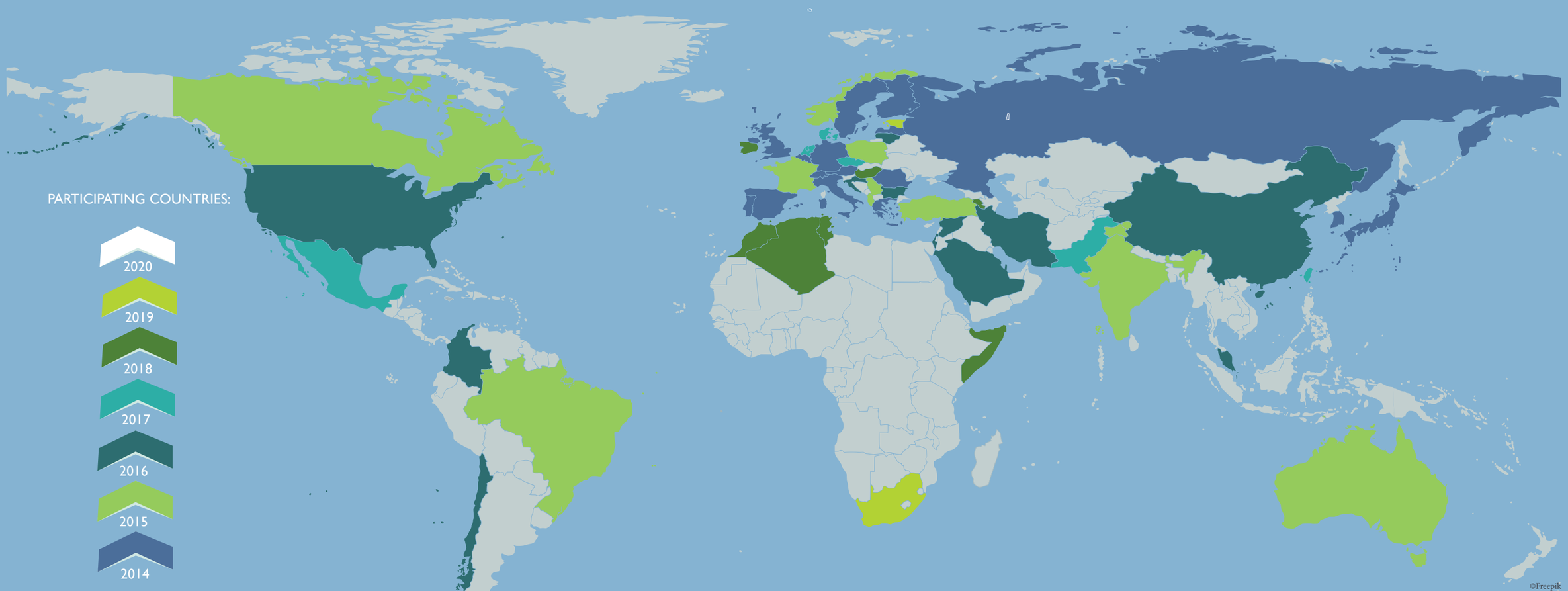
OMILAB FACILITATES A COMMUNITY WHICH SHARES KNOWLEDGE, TECHNOLOGIES, VALUES AND ENABLES US TO REALIZE OUR OWN IDEAS.

Prof. Dr. Moonkun Lee
Chonbuk National University, South Korea



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The STUDENTS

	STUDENTS	INSTITUTIONS	COUNTRIES
2014	44	25	16
2015	50	25	15
2016	63	42	26
2017	58	36	23
2018	47	37	21
2019	54	34	19

The CONTRIBUTORS

	CONTRIBUTORS	INSTITUTIONS	COUNTRIES
2014	31	22	14
2015	36	31	19
2016	43	34	16
2017	45	34	18
2018	48	36	19
2019	50	36	20

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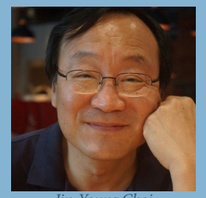
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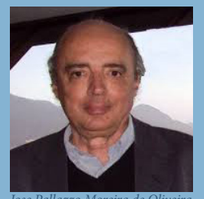
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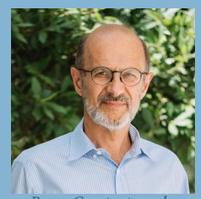
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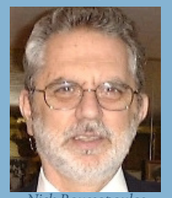
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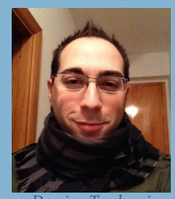
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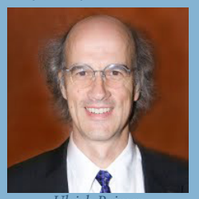
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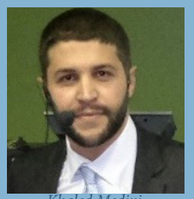
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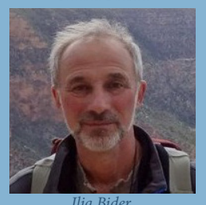
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HILTI

Hilti Group

As a leading-edge provider of solutions and services to the professional construction industry Hilti drives the digital transformation enabling Hilti customers to be more productive while observing highest health and safety standards.

Hilti IT is a key pillar of the digital activities of the Hilti group, running a single-instance global ERP system and providing with the Hilti Cloud a common application platform for all internal and customer-facing digital activities. Global IT is a valued business partner in the Hilti Group that is business driven, value focused and competitively strives for customer satisfaction, business and operational excellence in every area.

FOR MY SOLUTION ARCHITECTS AND ENTERPRISE ARCHITECTS IT IS INSPIRING TO EXCHANGE LATEST INSIGHTS IN ENTERPRISE MODELLING WITH OTHER PRACTITIONERS AND TALENTED STUDENTS PARTICIPATING IN THE NEMO SUMMER SCHOOL.

Martin Petry
CIO
Hilti AG

FUJITSU

Fujitsu

Fujitsu is a global ICT company originated in Japan with over 80-years history. We are the world's fifth-largest IT services provider and No.1 in Japan.

Today digital technology is transforming business, society and everyday lives of people. In this digital era, we want to be a trusted technology partner of enterprises and public institutions to help them drive their growth. To co-create new value with our customers, Fujitsu focuses on providing breakthrough digital technologies including AI and IoT, and works on shaping open-innovation ecosystems with enterprises, startup companies, academic institutions and governments. Through co-creation, we aim to realize a better future for everyone.

IT IS VERY IMPORTANT FOR US TO HAVE A GOOD PARTNERSHIP WITH WORLD-LEADING ACADEMIC INSTITUTIONS AND CONTRIBUTE TO DEVELOPING NEXT GENERATION TALENT.

Yoshikuni Takashige,
Vice President,
Marketing Strategy and Vision,
Fujitsu Limited

NEMO Summer School Series

The EVENTS

NEMO 2014

NEMO 2015

NEMO 2016

NEMO 2017

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The EVENTS

NEMO 2018

NEMO 2019

SAVE THE DATE

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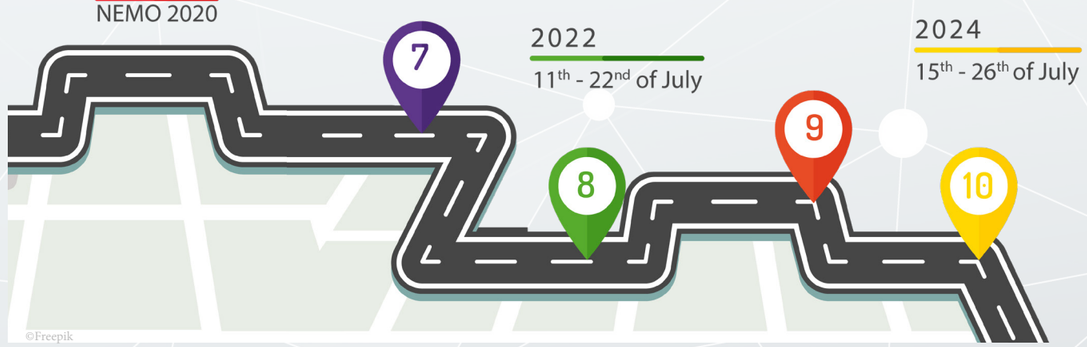
NEMO 2020



The LOCATION

UNIVERSITY OF VIENNA

universität wien

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YEARS OF ACADEMIC EXCELLENCE

9
NOBEL PRIZE LAUREATES

1st
UNIVERSITY IN AUSTRIA

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Founded in 1365 as Alma Mater Rudolphina Vindobonensis by Rudolph IV the University of Vienna is the oldest higher education institution in Austria and one of the oldest in Europe. In 1848 article 17 of the Austrian Basic Law, which is still valid today, was instituted stating that "Science and teaching are free." In 1897, 532 years after its foundation the University of Vienna permitted women to enrol, although initially only at the faculty of Philosophy.

The university's current main building was built between 1877 and 1884 by Heinrich von Ferstel in the city centre of Vienna. Currently the university distributes the activities of its 15 faculties and 5 centres as well as those of the central administration on more than 60 locations. A total of 9.900 employees work for the university, about 70% of them in research and teaching.

Nine scientists associated with the University of Vienna, through either research or teaching, have been awarded the most prestigious distinction in science: the Nobel Prize.

- Robert Bárány , otology - 1914: Nobel Prize for Medicine
- Julius Wagner-Jauregg, psychiatry - 1927: Nobel Prize for Medicine
- Hans Fischer, chemistry - 1930: Nobel Prize for Chemistry
- Karl Landsteiner, immunology - 1930: Nobel Prize for Medicine
- Erwin Schrödinger, physics - 1933: Nobel Prize for Physics
- Viktor Franz Hess, physics - 1936: Nobel Prize for Physics
- Otto Loewi, physiology and pharmacology - 1936: Nobel Prize for Medicine
- Konrad Lorenz, biology - 1973: Nobel Prize for Medicine
- Friedrich A. von Hayek, economics - 1974: Nobel Memorial Prize in Economic Sciences

Besides being Austria's oldest university, the University of Vienna is also the biggest one. More than 6.800 scientists research in 15 faculties and 5 centres, from humanities to computer science.

They teach more than 88.000 students in 178 different study programs. 26.600 or about 30% of all students enrolled at the University of Vienna come from abroad. About 9.600 of the total student population graduates each year from either Bachelor, Master or PhD studies.

The University of Vienna strives to be a top-research and teaching university. It promotes international research and teaching cooperation on the basis of strong disciplinary research and identifies cross-sectional topics that can be worked on beyond the boundaries of disciplines and faculties.

The CITY

VIENNA - AUSTRIA

no. 1
IN INTERNATIONAL QUALITY OF LIVING

no. 2
THE WORLD'S MOST REPUTABLE CITIES 2016

no. 3
INNOVATION CITIES WORLDWIDE 2015

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In 2019, for the 10th consecutive time, Mercer has again ranked Vienna first in its international quality of living survey as the city with the highest quality of living worldwide. The study compares 230 cities worldwide based on 39 criteria such as political, social, economic, and environmental factors.

The survey, which included a separate ranking of each city's infrastructure for the first time this year, called the category "pivotal" in determining overall quality of living for expats. Factors assessed included: reliable electricity; drinkable water; the availability of telephone and mail services, and international flights from local airports; traffic congestion; and access to public transportation.

Source: https://www.wien.gv.at/english/politics/international/comparison/mercer-study.html

The City RepTrak study from the global Reputation Institute ranks the world's 100 most reputable cities based on factors such as trust, esteem, admiration and respect. Among the attributes used for ranking, the two most important are whether the city is considered beautiful, and whether it is viewed as a safe place for visitors and residents.

A city's ranking is believed to be linked to the amount of support that a city can generate from its reputation in the form of business, travel, tourism and investment.

The Reputation Institute also tracks the reputations of global brands and companies across important international markets, interviewing 55,000 consumers across 15 countries.

Source: https://www.thelocal.at/20141128 vienna-has-worlds-best-reputation

The Innovation Cities Index measures the quantifiable drivers of innovation, which all form the pre-conditions for an innovation ecosystem. A total of 162 indicators is used for ranking 500 cities from all over the world. They are grouped in 3 main categories: Cultural Assets, Human Infrastructure and Networked Markets. This maps the process of innovation, from idea to implementation and communication. In 2015 Vienna was ranked the 3rd most innovative city in the world.

Source: https://placebrandobserver.com/insights-innovation-cities-index-2016-2017/

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The NOTES

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NEMO Summer School Series

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Editor
OMiLAB gGmbH (NPO)

DOI
10.5281/zenodo.3946677

Imprint

Media Owner and Publisher
OMiLAB gGmbH (NPO)

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