



Vienna Center for
Logic and Algorithms



Annual Report 2021/2022



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About VCLA



Vienna Center for Logic and Algorithms

The Vienna Center for Logic and Algorithms (VCLA) is a globally unique competence center in the field of logic and algorithm research.

It was founded in September 2011 and officially opened in January 2012 in the presence of the rector of the Technische Universität Wien (TU Wien) Sabine Seidler and Turing Award laureate Edmund M. Clarke. The Center was founded by Stefan Szeider and Helmut Veith and led by both until Helmut Veith passed away in March 2016.

In December 2017, Agata Ciabattoni became the new elected co-chair, and the VCLA board structure changed.

The VCLA was funded by TU Wien in association with the FWF - Doctoral College Logical Methods in Computer Science (LogiCS).

The Center aims at promoting international scientific collaboration in logic and algorithms and communicating Austria's excellence in these two areas



of computer science research, using a variety of channels.

These objectives are realized through various activities which include:

- The VCLA International Student Awards for Outstanding Theses
- The LogicLounge series
- The VCLA workshop series
- The VCLA series of winter and summer schools
- The VCLA visitor program
- Hosting talks by renowned international speakers
- Cooperations, and
- Educational outreach

With the restrictions of the COVID-19 pandemic gradually coming to an end, the majority of events and talks in 2021/2022 could again be held as physical events.

www.vcla.at

In Memoriam

VCLA co-chair Helmut Veith (1971-2016) passed away under tragic circumstances on March 12, 2016.

Helmut was a vital part of the rebirth of the Austrian logic scene, and it was a matter close to his heart to build bridges between the computer science expert and the layman. His vision is being carried on by the students who he mentored, and his colleagues have launched a number of activities in his honor that will keep his legacy alive.

Helmut studied Computational Logic at TU Wien, a *studium irregulare* with a curriculum he designed himself, together with Richard Zach. After appointments at TU Munich and TU Darmstadt, he returned to TU Wien for a full professorship in Computer Aided Verification.

Helmut's passion for logic led him to establish not only the VCLA together with Stefan Szeider, but also to bring to Austria the largest logic conference in history - the Vienna Summer of Logic. Helmut served as the speaker of the Doctoral College "Logical Methods in Computer Science" and as the deputy coordinator of the National Research Network Rigorous Systems Engineering (RiSE).



Photo (c) Nadja Meister

Posthumously, Helmut was awarded the ERC Advanced Grant - one of the highest academic distinctions in Europe - for his project HYDRA (Harnessing Model Checking for Distributed Algorithms).

In honor of Helmut's advocacy for women in computer science, the TU Wien, the Wolfgang Pauli Institute, and Helmut's friends and colleagues funded the Helmut Veith Stipend for Female Master's Students. Memorial site listing his achievements in academia and beyond:

www.vcla.at/2016/03/helmuth-veith-1971-2016

Organization

The VCLA is coordinated by the executive board in consultation with the local board while taking into account the strategic advice from the external advisory board.

Executive Board
Agata Ciabattoni (co-chair)
Thomas Eiter
Matteo Maffei
Reinhard Pichler
Stefan Szeider (co-chair)
Georg Weissenbacher

Local Board
Matthias Baaz
Pavol Cerny
Laura Kovács
Alexander Leitsch
Martin Nöllenburg
Magdalena Ortiz
Stefan Woltran

External Advisory Board	
Roderick Bloem (TU Graz)	Georg Gottlob (TU Wien/Oxford University)
Nadia Creignou (Université d'Aix-Marseille)	Anuj Dawar (University of Cambridge)
Fedor Fomin (University of Bergen)	Mirosław Truszczynski (University of Kentucky)
Moshe Y. Vardi (Rice University)	

PR and Project Management
Andrea Hackl

Collaborations

The VCLA frequently collaborates with the following co-funding institutions:

- Kurt Gödel Society (KGS)
- Austrian Rigorous Systems Engineering (ARiSE)
- Wolfgang Pauli Institute (WPI)
- Institute of Science and Technology Austria (IST Austria)

Logic and Algorithms Groups

The Center is hosted by six research groups at the Faculty of Informatics:

- Algorithms and Complexity Group
- Database and Artificial Intelligence Group
- Formal Methods in Systems Engineering Group
- Knowledge-Based Systems Group
- Theory and Logic Group
- Security and Privacy Group

Activities

The VCLA annual report summarizes our activities throughout the year. This report provides details on the events and activities between October 1, 2021 and September 30, 2022. We divide the activities presented in this report into the following subsections:

- [LogicLounges and Guest Talks \(p. 10\)](#)

The LogicLounge is a series of public lectures bringing together the general public and experts from the fields of logic, philosophy, mathematics, computer science, and artificial intelligence.

- [Conferences \(p. 19\)](#)

They are organized by the members of the research groups hosting the VCLA.

- [Educational Outreach and Science Communication \(p. 23\)](#)

The VCLA is raising awareness about the field of logic and algorithms by running educational outreach projects for teachers and students as well as science communication activities for the general public.

- [VCLA International Student Awards \(p. 27\)](#)

These annual awards aim to recognize and support students all over the world for their outstanding Master and Undergraduate Theses in the field of Logic and Computer Science.

- [Helmut Veith Stipend \(p. 31\)](#)

The Helmut Veith Stipend is awarded annually to excellent international female students who pursue (or plan to pursue) one of the master's programs in Computer Science at TU Wien.

- [Cooperations \(p. 34\)](#)

The VCLA cooperates with academic programs and initiatives, as well as with initiatives raising awareness for gender mainstreaming and diversity in the field.

Activities - LogicLounges

At LogicLounge 2022, leading AI researcher Stuart J. Russell talked about the potential of AI as well as the need for regulation.

On July 28, 2022, the popular public lecture “LogicLounge” was once more held at the restaurant/bar “Heuer am Karlsplatz”.

The LogicLounge with Stuart J. Russell took place during the International Joint Conference on Artificial Intelligence (IJCAI); the event was organized by the Vienna Center for Logic and Algorithms (VCLA) in cooperation with the Center for Artificial Intelligence and Machine Learning (CAIML).

Stuart J. Russell is a British computer scientist known for his contributions to artificial intelligence. He is a professor of computer science at the University of California, Berkeley, where he also holds the Smith-Zadeh Chair in Engineering, and adjunct professor of neurological surgery at the Univ. of California, San Francisco. He founded and leads the Center for Human-Compatible Artificial Intelligence (CHAI) at UC Berkeley. Together with Peter Norvig, Russell co-authored the most popular textbook in the field of AI: *Artificial Intelligence - a Modern Approach*, which is used at more than 1,500 universities in 135 countries.



Abstract:

As AI advances in capabilities and moves into the real world, its potential to benefit humanity seems limitless. Stuart Russell’s book “Human Compatible” (2019) explains why the creation of a superintelligent artificial intelligence could be humanity’s final act. The blinks call to attention the potential catastrophe that humanity is heading towards, and discusses what needs to be done to avoid it. If we are to ensure that AI remains beneficial to humans in the long run, we may need to radically rethink its design.

The event and subsequent Q&A session was moderated by science journalist Sarah Kriesche, who works for a local radio station (Ö1).

Activities - LogicLounges

... continuation from page 10

About LogicLounge:

Initiated in 2014 at the Vienna Summer of Logic, the LogicLounge has since become an event travelling between Vienna and the venue of the CAV conference, where it has become a regular event in memoriam of Prof. Helmut Veith (1971 - 2016).

More information is available at:

<http://www.vcla.at/logiclounge>

<http://www.vcla.at/events/logiclounge-2022-with-stuart-j-russell-free-public-event/>



Details of talk:

Date: July 28, 2022

Time: 4pm CET (Vienna)

Speaker: Prof. Stuart J. Russell
(University of California, Berkeley)

Title: AI and the Problem of Control



Activities - LogicLounges

The program of FloC2022 in Haifa included two LogicLounges held by Francesca Rossi and Shai Shalev-Shwartz.

FLoC2022, the 8th Federated Logic Conference, was held at Technion-Israel Institute of Technology campus on top of Mount Carmel in Haifa from July 31 - August 12, 2022 (cf. page 19). Part of the conference program were two LogicLounges that were moderated by VCLA board member Georg Weissenbacher.

The first LogicLounge was held by **Francesca Rossi** (IBM Research) on August 2.

Thinking Fast and Slow in AI

Current AI systems lack several important human capabilities, such as adaptability, generalizability, self-control, consistency, common sense, and causal reasoning. We believe that existing cognitive theories of human decision making, such as the thinking fast and slow theory, can provide insights on how to advance AI systems towards some of these capabilities. In this talk, I will present the work done by IBM and collaborators in this space, including the definition of a general architecture that is based on fast/slow solvers and a metacognitive component. I will then present experimental results on the behavior of an instance of this



Photo (c) FLoC - Nitzan Zohar

architecture, for AI systems that make decisions about navigating in a constrained environment. The results will show how combining the fast and slow decision modalities allows the system to evolve over time and gradually pass from slow to fast thinking with enough experience, and that this greatly helps in decision quality, resource consumption, and efficiency.

Francesca Rossi is an IBM Fellow and the IBM AI Ethics Global Leader. She is a computer scientist with over 30 years of experience in AI research. Before joining IBM, she has been a professor of computer science at the University of Padova, Italy, for 20 years. She is a fellow of both AAAI and of EurAI and she has been president of IJCAI and the Editor in Chief of the Journal of AI Research.

Activities - LogicLounges

... continuation from page 12

The second LogicLounge consisted of a panel of experts with a keynote by [Shai Shalev-Shwartz](#) (Mobileye and The Hebrew University of Jerusalem) that took place on August 7.

Future of Autonomous driving

In this LogicLounge, experts discussed the challenges involved in assuring the safety of autonomous vehicles. The future of autonomous driving is contingent on the safety of self-driving cars; yet, there is no consensus in industry on what it means for an autonomous vehicle to drive safely. In his keynote, [Shai Shalev-Shwartz](#) presented a framework designed to answer this question by proposing five rules of Responsibility-Sensitive Safety. [Gila Kamhi](#), Chief AI Officer at Wireless & Connectivity Solutions of Intel Corporation, highlighted the aspects of trust and acceptance of humans (in and outside the car) in autonomous driving. [Sanjit Seshia](#), Professor at the University of California, Berkeley, presented his vision towards verified Artificial Intelligence in the context of autonomous driving.

[Shai Shalev-Shwartz](#) is a professor at the School of Computer Science and Engineering at the Hebrew University of Jerusalem, Israel. He is also the CTO of Mobileye, where he works on autonomous driving. Shalev-Shwartz received his PhD from the Hebrew University in 2007 and was a research assistant professor at the Toyota Technological Institute at Chicago until June 2009. His work focuses on Machine Learning algorithms.

The recordings of the LogicLounges are available at:

<https://www.youtube.com/watch?v=b-bxpTYzDzlo>

<https://www.youtube.com/watch?v=t-VhTSt7SXQ4>

More information is available at:

<https://www.floc2022.org/logiclounge>



Photo (c) FLoC - Nitzan Zohar

Activities - Guest Talks

Vienna Logic Day Lecture 2022 - Moshe Y. Vardi: From Greek Paradoxes to Political Paradoxes

Every year on January 14, we celebrate the World Logic Day. Its main aim is to bring the intellectual history and practical implications of logic to the attention of interdisciplinary science communities. The day also celebrates the idea that logic, as reasoning, is a central quality of human beings.

The second Vienna Logic Day Lecture at VCLA was an online event offering the possibility for worldwide participation. For the special occasion of World Logic Day 2022, we managed to present a guest talk by renowned logician Moshe Y. Vardi (Rice University, Texas), who took our participants on a fascinating journey from Greek paradoxes of ancient times to contemporary political paradoxes.

Abstract:

The ancient Greeks invented logic as a tool to discover eternal truths. They also invented paradoxes, as a tool to sharpen the mind. Famous Greek paradoxes are the Liar's Paradox, Zeno's Paradox, and the Sand-Heap Paradox. The Liar's Paradox led, at the start of the 20th Century, to a foundational cri-

sis of mathematics, which led to the development of computability theory in the 1930s, as well as the unsolvable mathematical conundrum of Gödel's Incompleteness Theorem.

Computing technology, which also emerged in the 1930s, ultimately led, at the start of the 21st century, to the emergence of social media. Today, our society is struggling with the adverse societal effects of social media. These adverse effects can also be understood in terms of the Greek paradoxes, as well as their political versions, known as the Popperian Paradoxes. In fact, one can say that the Greek myths of Prometheus and Pandora already told us that technology does not come without adverse



Activities - Guest Talks

... continuation from page 12

consequences, which is why John von Neumann, one of the most prominent computing pioneers, in 1955 asked the question “Can we survive technology?”

<https://logicday.vcla.at/vienna-logic-day-lecture/>



Moshe Y. Vardi is University Professor, Karen Ostrum George Distinguished Service Professor in Computational Engineering at Rice University, where he is leading an Initiative on Technology, Culture, and Society. His interests focus on automated reasoning, a branch of Artificial Intelligence with broad applications to computer science, including machine learning, database theory, computational-complexity theory, knowledge in multi-agent systems, computer-aided verification, and teaching logic across the curriculum. He is also a Faculty Scholar at the Baker Institute for Public Policy at Rice University.

Details of talk:

Date: January 14, 2022

Time: 8am PST | 11am EST |
1pm GMT-3 | 5pm CET
(Vienna)

Speaker: Prof. Moshe Y. Vardi
(Rice University)

Title: From Greek Paradoxes to
Political Paradoxes

Moderators:

Prof. Agata Ciabattoni
Prof. Stefan Szeider

Recording available on Youtube channel of Vienna Center for Logic and Algorithms:

https://www.youtube.com/watch?v=NBNH0_gLDZg

In addition to the Vienna Logic Day Lecture, the VCLA decided to set up a new website dedicated to this special day - logicday.vcla.at - **which includes quotes from our “Ambassadors of Logic” (cf. pages 36-37)**

Activities - Guest Talks

Lutz Straßburger: **Combinatorial Proofs and Decomposition Theorems for First-order Logic**

Abstract:

In this talk I will discuss the problem of proof identity, and then give a gentle introduction to combinatorial proofs for first-order logic. I will also investigate the relationship between combinatorial and syntactic proofs. Whereas syntactic proofs are formalized in a deductive proof system based on inference rules, a combinatorial proof is a syntax-free presentation of a proof that is independent from any set of inference rules. We will see that the two proof representations are related via a deep inference decomposition theorem that establishes a new kind of normal form for syntactic proofs. This yields (a) a simple proof of soundness and completeness for first-order combinatorial proofs, and (b) a full completeness theorem: every combinatorial proof is the image of a syntactic proof.

Biography: Lutz Straßburger is head of the team PARTOUT at the Inria research center in Saclay. He received his PhD in 2003 from TU Dresden. After that he held postdoc positions at

Inria in Nancy and in the Programming Systems Lab in Saarbrücken. In 2005 he joined Inria as junior research scientist in the PARSIFAL team. Lutz Straßburger obtained his HDR in 2011 from Université Paris Diderot.

His main research contributions were the development of the deep inference formalism during his PhD and the investigation of Boolean categories during his habilitation. He also made contributions to the proof theory of classical and intuitionistic modal logics, developing various kinds of proof systems with applications to decision problems. Currently he is working on efficient proof presentations using combinatorial methods.

Date: Wednesday, October 20, 2021

Venue: Seminarraum FAV 01,
Favoritenstraße 9-11

Speaker: [Lutz Strassburger](#)

Research Director at Inria Research Centre Saclay – Île-de-France and Laboratoire d'Informatique (LIX)

Activities - Guest Talks

Manfred Scheucher: **A Brief Introduction to Combinatorial Geometry**

Abstract:

Point, lines, and circles are some of the fundamental entities from geometry. In this talk we discuss the underlying combinatorics of point configurations and their dual structures: arrangements of lines and arrangements of great-circles. By slightly relaxing the geometric restrictions (“lines” don’t have to be straight and “circles” don’t have to be round), we obtain so-called pseudopoint configurations, arrangements of pseudolines and (great-) pseudocircles, respectively. While the original settings cannot be axiomized via finitely many forbidden subconfigurations, we can indeed find such a purely combinatorial description for the relaxed “pseudo” setting which allows us to make investigations using computer assistance, and in particular, using SAT attacks. Last but not least, we discuss so-called simple topological drawings, which have the same combinatorial properties as straight-line drawings. Since on top of each point set, we can place a straight-line drawing of the complete graph, simple topological drawings can be seen as a

further generalization of point configurations (they indeed also generalize pseudopoint configurations).

Date: Tuesday, April 5, 2022

**Venue: Seminarraum FAV 02,
Favoritenstraße 9-11**

Speaker: Manfred Scheucher

(TU Berlin)

Manfred Scheucher is a postdoctoral researcher in the group of Stefan Felchner at TU Berlin (Discrete Mathematics).



Manfred Scheucher
(TU Berlin website)

Activities - Guest Talks

Hans van Ditmarsch (Open University, The Netherlands): Reasoning about Gossip

Abstract: A well-studied phenomenon in network theory since the 1970s are optimal schedules to distribute information by one-to-one communication between nodes that are connected in the network. One can take these communicative actions to be telephone calls, and protocols to spread information this way are known as gossip protocols or epidemic protocols. A common abstraction is to call the information of each agent its secret, and that the goal of information dissemination is that all agents know all secrets: that is the termination condition of gossip protocols. Following investigations assuming a global scheduler, it is now typically assumed that gossip protocols are distributed in some way, where the only role of the environment is to ensure randomization. Statistical approaches to gossip have taken a large flight since then, where-in network topology is an important parameter.

In epistemic gossip protocols, an agent (node) will call another agent not because it is so instructed by a

scheduler, or at random, but based on its knowledge or ignorance of the distribution of secrets over the network and of other agents' knowledge or ignorance of that. One such protocol requires that an agent may only call another agent if it does not know the other agent's secret. Epistemic features of gossip protocols may affect their termination, the (order of complexity) expectation of termination, their reachability (what distributions of secrets may occur before all agents know all secrets), and so on. Variations involve agents exchanging telephone numbers in addition to agents exchanging secrets (which results in network expansion), or agents exchanging knowledge about secrets; we may also assume common knowledge of the protocol; further generalizations would involve multi-casts. We present a survey of distributed epistemic gossip protocols.

Date: Wednesday, May 25, 2022

Venue: Seminarraum Gödel

Speaker: Hans van Ditmarsch

Activities - Conferences

FLoC2022, the 8th Federated Logic Conference, and VardiFest in honor of Moshe Vardi

FLoC2022, the 8th Federated Logic Conference, was held at Technion-Israel Institute of Technology campus on top of Mount Carmel in Haifa from July 31 - August 12, 2022.

Part of the program of FLoC-2022 were **two LogicLounges** (cf. pages 12-13) as well as a **Workshop on Logic-Based Methods in Machine Learning (LMML)** that was co-organized by VCLA Co-Chair Stefan Szeider on July 31. The workshop consisted of invited talks and contributed spotlight talks of 10 minutes.

VardiFest, a workshop in honor of **Moshe Y. Vardi** with the topic **“On the Not So Unusual Effectiveness of Logic”**, took place from July 31 - August 1 as part of FLoC2022. VCLA acted as a sponsor of this event that was advertised with the following text:

Twenty-three years ago, the seminal symposium titled “On the Unusual Effectiveness of Logic”, co-organized by Prof. Moshe Y. Vardi, sought to explore the unusual effectiveness of logic in computer science at that time. Since then, logic’s centrality in computer sci-

ence has only been further enhanced. Therefore, with the hindsight of twenty three years, today’s researchers will not be faulted to conclude that the logic’s effectiveness is not so unusual after all. Vardi has been a leader guiding the community in enabling the ongoing revolution fueled by logic.

This workshop is planned to celebrate the pioneering role of Vardi and will bring together researchers from diverse communities, representing both the diversity of the role played by logic and the breadth and depth of Vardi’s contributions.

<https://www.floc2022.org/>

<https://vardifest.github.io/>



Photo (c) Rice University

Activities - Conferences

IJCAI-ECAI 2022: 31st Int. Joint Conference and the 25th European Conference on Artificial Intelligence

IJCAI-ECAI was held at Messe Wien in Vienna, Austria, from July 23-29, 2022. The event was advertised as “the premier international gathering of researchers in Artificial Intelligence”. Following the COVID-19 pandemic, the event was again held in person, with only a limited online component (e.g., pre-recorded videos).

The LogicLounge (cf. page 10-11) was held at a bar near TU Wien towards the end of the conference and attracted some visitors from the event. Stuart Russell, the speaker at the LogicLounge, was the recipient of the IJCAI-22 Award for Research Excellence. The recipient of the 2022 IJCAI Computers and Thought Award was Bo Li (Univ. of Illinois); this award is presented to outstanding young scientists in AI.

The program included talks by keynote speakers Gerhard Widmer, Tim Miller, Pete Wurman, Jérôme Lang, Sumit Gulwani, Turing Award winner Judea Pearl, Mihaela van der Schaar, and Ana Paiva. They talked about topics ranging from causality, explainable AI, health, social choice and engineering sociality to AI-assisted programming, the best Gran Turismo racer and human-machine piano co-performances.



Date: July 23-29, 2022

Venue: Messe Wien, Vienna, Austria

Conference Chair

Rina Dechter (UCI)

Program Chair

Luc De Raedt (KU Leuven & Örebro U.)

Local Arrangements Committee Co-Chairs

Stefan Woltran (TU Wien)

Magdalena Ortiz (TU Wien)

EurAI President

Carles Sierra (IIIA-CSIC)

IJCAI Executive Director and Secretary

Vesna Sabljakovic-Fritz (TU Wien)

https://ijcai-22.org/wp-content/uploads/2022/07/IJCAI_ECAI_Online_Brochure.pdf

Activities - Conferences

KR 2021: 18th International Conference on Principles of Knowledge Representation and Reasoning

The KR conference series is the leading forum for timely in-depth presentation of progress in the theory and principles underlying the representation and computational management of knowledge. KR 2021 was scheduled to take place in Hanoi, but due to the ongoing pandemic, it was eventually held online from November 3-12, 2021 (with workshops and tutorials scheduled during November 3-7, and the main conference from November 8-12). However, there was also a live gathering in Rome that was limited to 50 people.

The VCLA acted as a sponsor of the Mystery Adventure, which was an online social event that took place on Zoom. Participants could sign up for one of three groups on Nov 10 or 11. The motivation was to give the participants a chance to meaningfully interact and have fun together at the peak of the pandemic, as there were students that had not had any chance to network with colleagues from other countries. This way, they could get to know other participants that they had never met before. The activity was very well received, especially by the younger participants who were significantly

affected by the isolation at that point.

The conference program included invited talks by [Uli Sattler](#) (Univ. of Manchester), [Jochen Renz](#) (Australian National Univ.), [Francesca Toni](#) (Imperial College), [Josh Tenenbaum](#) (MIT), and [Martin Grohe](#) (RWTH Aachen University).

<https://kr2021.kbsg.rwth-aachen.de/>



Date: November 3-12, 2021

Venue: online

Conference Chair

[Esra Erdem](#) (Sabanci University, Turkey)

Program Chair

[Meghyn Bienvenu](#) (CNRS & University Bordeaux, France)

[Gerhard Lakemeyer](#) (RWTH Aachen University, Germany)

Activities - Conferences

MFCS and MATCH-UP 2022 at TU Wien: Mathematical Foundations of Computer Science & Matching under Preferences

In August 2022, two conferences were co-located at TU Wien: MFCS, the 47th international symposium on Mathematical Foundations of Computer Science (Aug 22-26), and MATCH-UP, the 6th workshop on Matching Under Preferences (Aug 24-26).

MFCS was drawing participants to Vienna with an exciting line-up of **invited speakers**:

Fedor V. Fomin (Univ. of Bergen)

Monika Henzinger (Univ. of Vienna)

Thomas Henzinger (IST Austria)

Marta Kwiatkowska (Univ. of Oxford)

Vijay Vazirani (Univ. of California)

Program Committee Chairs:

Stefan Szeider (TU Wien, general chair)

Robert Ganian (TU Wien, co-chair)

Alexandra Silva (Cornell Univ., co-chair)

In addition to the academic program, a conference dinner was held at Heuriger Fuhrgassl-Huber.

<https://www.ac.tuwien.ac.at/mfcs2022/pc/>

Vijay Vazirani was also an invited speaker at MATCH-UP, as was **Sophie Bade** (Royal Holloway College, University of London).

MATCH-UP: Matching problems with preferences occur in widespread applications such as the assignment of school-leavers to universities, junior doctors to hospitals, students to campus housing, children to schools, kidney transplant patients to donors and so on. The purpose of this workshop was to explore matching problems with preferences from the perspective of algorithms and complexity, discrete mathematics, combinatorial optimization, game theory, mechanism design, and economics.



MFCS 2022 - Best Student Paper Award

Activities - Education

Project ADA: Algorithms Think Differently (Algorithmen Denken Anders) www.ada.wien

ADA was a 3-year educational outreach program of the VCLA that was concluded in June 2022. The project was named after Ada Lovelace (1815 – 1852), who is generally considered to be the first computer programmer.

The project aimed to engage pupils aged 8 to 18 years with unplugged computer science as well as programming activities. These activities foster creative computational thinking, which shapes all areas of digitalization that are crucial for innovation, growth, employment, and competitiveness.

For some decades now – made popular by the American computer scientist Jeannette Wing - it has been recognized that people who deal with computer science develop computational thinking. It is a kind of thinking that is algorithmic and process-oriented, in which abstraction and efficiency play a special role.



The project ADA was made possible by the funding of the Vienna Business Agency and the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (former BMVIT). The cooperation partners of the project were Informatik Austria, Austrian Computer Association (OCG), eEducation Austria, Future Learning Lab of PH Wien, and EIS – Education Innovation Studios of Federal Ministry for Education (BMB).

The following activities were organized within the framework of project ADA:

- **Workshop - Introduction to Scratch** as part of EU Code Week
- **Hackathon for good Artificial intelligence** as part of EU Code Week & DigiEduHack
- **Science communication events** Digital Days, eEducation Austria, Praxistage, Hexagonal Debate
- **Diary of a computer scientist** Nationwide workshop series for girls led by female computer scientists

www.ada.wien

Activities - Education

Project ADA: Algorithms Think Differently Hackathon #4GoodAI 2022

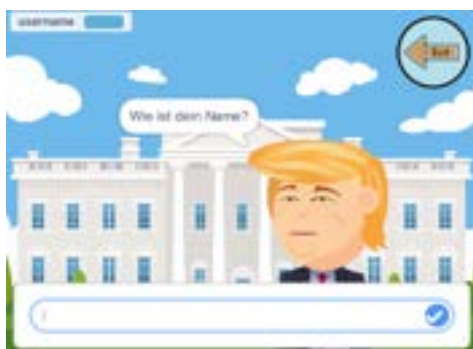


The Hackathon #4GoodAI2022 was held online from March 2-16, 2022. The participants were asked to create a chatbot that would help family and friends to uncover **Fake News** using Scratch or another programming language. In total, there were 26 submissions from various Austrian counties. The jury then chose 7 winners in two categories - junior and senior grade - that came from Vienna, Lower Austria, Upper Austria, and Tyrol. The winners received cash prizes from the award fund of EUR 4,000.

Winner Teams Senior Grades

1st place: Team 1bk Superstars
HAK and Handelsschule Ybbs

Ronald Swamp and Fakebot explain what Fake News is, and this knowledge is then tested by a quiz.



2nd place: Team SyntaxError
Wiedner Gymnasium & Rainergymn.

This chatbot gives advice and examples for uncovering Fake News.

3rd place: Team JA!
Sir-Karl-Popper-Schule & HTL
Mödling

A bat answers questions related to fake news, followed by a quiz.

Winner Teams Junior Grades

1st place: Team Orang-Utans
Schulzentrum Friesgasse

A creature called Schiek answers questions about fake news.

2nd place: Team Intelligentbot
Schule für IT | Schulen des BFI Wien

This chatbot provides information on fake news in a neutral way.

3rd place: Team Borg-Telfs 1 and 3

These chatbots answer a number of pre-determined questions.

Jury

Barbara Buchegger (saferinternet.at)

Agata Ciabattoni, Jiehua Chen, Jan Dreier, Stefan Szeider (TU Wien)

<https://www.ada.wien/hackathon-4-good-ai/hackathon-4goodai-2022/>

Activities - Education

Project ADA: Algorithms Think Differently Diary of a Female Computer Scientist in Vienna and Styria



The Diary of the Computer Scientist is an activity that was designed to present girls aged 11-16 with female role models in computer science, and to give them a realistic insight into the daily work of a computer scientist. To accomplish this, a successful female computer scientist visits a school and answers the girls' questions directly in the classroom.

In April 2022, the activity could again be held in person (following a virtual format called SpeedMentoring that took place via Zoom). In Styria, Katarina Pavlovskaya and her colleague, both students of health informatics at FH Joanneum in Graz, visited two

schools and reported that they managed to spark interest in computer science, even though there were still many prejudices with regard to working in this field. After the workshop, 8 out of 20 girls could envision a career in STEM (as opposed to 1 out of 20 prior to attending the workshop).

In Vienna, Ivana Bocevska (TU Wien) visited the Piaristengymnasium in the eighth district. The girls were surprised to learn how they were already subconsciously using algorithms in everyday life, e.g., when baking a cake.

<https://www.ada.wien/tagebuch-der-informatikerin/>



"Diary of a Female Computer Scientist" at the Piaristengymnasium in Vienna

Activities - Education

Vienna Science Festival at the City Hall



The Vienna Science Festival took place at Vienna's city hall from September 9-11, 2022. At station 33 in the hall's courtyard, VCLA Co-Chair Stefan Szeider and a group of TU Wien volunteers were welcoming visitors of all age groups with a fun activity.

The **sorting network** works in the following way: Every participant steps on one of the orange squares (the input nodes) and receives a card with a random number on it. They then go on to the nearest sorting node (the gray circles in the picture) and compare numbers with the other person who steps on it. The person with the lower number follows the blue line, while the person with the higher number follows the red line. This process is then repeated until everyone arrives at another orange square (the output node). In this way, all the numbers will be sorted correctly in ascending order, and this works with letters (or other input) as well!

Here is a link to a video (in German) which illustrates the process:

<https://www.ac.tuwien.ac.at/ff22/>

The activity is a great way to understand how **algorithms** work, and it has been designed to foster computational thinking. On the weekend of the Vienna science festival, more than 1,000 visitors participated in the activity, thereby contributing to making the station of VCLA and project ADA a great success!



Activities - Distinction

VCLA International Student Awards: Award Ceremony

The VCLA International Student Awards are presented annually. The winners are invited to attend the award ceremony, and they receive a cash prize from an award fund of EUR 2,000. Since 2016, the awards have been dedicated to the memory of Helmut Veith (1971-2016), the initiator of the awards.

Due to the pandemic, the award ceremony of the 2021 VCLA International Student Awards had to be postponed and ultimately took place in August 2022 during the conference MFCS (cf. page 22). The winners Tuukka Korhonen (Outstanding Master Thesis Award) and Jasper Slusallek (Outstanding Undergraduate Research Award) had both travelled to Vienna in order to present their work and answer the questions of the audience. They also received the award certificate from the co-chairs Robert Ganian and Magdalena Ortiz.

In his paper “Finding Optimal Tree Decompositions”, Tuukka Korhonen (University of Helsinki, now a PhD student at the University of Bergen) addressed the question of how to effi-

ciently decompose graphs and hypergraphs, while Jasper Slusallek (Saarland University) studied the problem of subgraph isomorphism when the treewidth of the subgraph is bounded in “Algorithms and Lower Bounds for Finding (Exact-Weight) Subgraphs of Bounded Treewidth”.

Following the award ceremony, the VCLA hosted a small gathering with drinks and pastries to toast the 10-year anniversary of the center.



Photo (c) VCLA

Master Thesis Award Winner:
Tuukka Korhonen

Activities - Distinction

... Continuation from page 27



Outstanding Master Thesis Award

Tuukka Korhonen

Thesis: Finding Optimal Tree Decompositions

Supervisor: Matti Järvisalo (Helsinki University of Technology, Finland)

Outstanding Undergraduate Research Award

Jasper Slusallek

Thesis: Algorithms and Lower Bounds for Finding (Exact-Weight) Subgraphs of Bounded Treewidth

Supervisor: Karl Bringmann (Max Planck Institute for Informatics, Saarbrücken, Germany)

Award Committee

- Robert Ganian (chair)
- Magdalena Ortiz (chair)
- Revantha Ramanayake (co-chair)
- Shqiponja Ahmetaj
- Jan Dreier
- Ekaterina Fokina
- Anna Lukina
- Johannes Oetsch
- Xavier Parent
- Emanuel Sallinger
- Zeynep G. Saribatur
- Stefan Schupp
- Mantas Simkus
- Sebastian Skritek
- Friedrich Slivovsky
- Max Tschaikowski
- Johannes P. Wallner
- Jules Wulms

<http://www.vcla.at/2021/08/the-awardees-of-the-2021-vcla-international-student-awards/>

<http://www.vcla.at/vcla-awards/>

Activities - Distinction

VCLA 10-year anniversary celebration

The Vienna Center for Logic and Algorithms (VCLA) was founded in September 2011 and officially opened in January 2012. During the international symposium on Mathematical Foundations of Computer Science (MFCS) in August 2022, the center seized the opportunity to celebrate its 10-year-anniversary with the audience of the conference as well as VCLA board members.

The celebration started out with a presentation held by the center's co-chairs, Agata Ciabattoni and Stefan Szeider, who looked back on the past years and highlighted the most important events and projects, such as project *ADA – Algorithmen Denken An-*

ders and the world record achieved with the world's largest human sorting network. They also took the time to remember their colleague Helmut Veith, who had founded the VCLA together with Szeider, but passed away under tragic circumstances in 2016.

Subsequently, the winners of the VCLA International Student Awards of 2021 presented their work to the audience (cf. pages 27/28). In 2021, this had not been possible due to COVID-19. Following the presentations, the VCLA hosted a small gathering with drinks and pastries to toast the 10-year anniversary of the center.

<http://www.vcla.at/2022/09/vcla-celebrates-its-10-year-anniversary/>



Activities - Distinction

VCLA 10-year anniversary: Some impressions from the past years!



Vienna Summer of Logic*



Algorithm Video Contest*



Sorting Network - World Record*



Three Helmut Veith Stipend Winners



Vienna Ball of Sciences
(c) Roland Ferrigato



LogicLounge with Toby Walsh*
*(c) Nadja Meister

Activities - Distinction

Helmut Veith Stipend Winner 2022: Ana Vesic

Helmut Veith (1971-2016) was a strong advocate and mentor for women in computer science. To honor Helmut's efforts, a stipend for outstanding female students in computer science was established in 2017 with the financial support of TU Wien, the Wolfgang Pauli Institute, and generous donations of friends and colleagues of Prof. Veith.

The 6th recipient of the annually awarded Helmut Veith Stipend for outstanding female MA students in computer science is **Ana Vesic**, who received her Bachelor's degree in Software and Data Engineering in 2022 at Singidunum University in Belgrade and now studies Media and Human-Centered Computing at TU Wien.

Ana Vesic was awarded the Singidunum University stipend twice, being active and organizing extracurricular activities and professional internships for fellow students. During her studies, she published numerous scientific publications and was involved in research in the field of AI and web-based applications. Besides working within her profession, Ana developed a career as a corporate photographer and pursued

artistic endeavors, exhibiting paintings in group and independent exhibitions as well as artistic festivals. Topics of interest besides AI are media and human robot interaction, and integration of those fields with AI.

Students who are awarded a scholarship receive EUR 6,000 annually, and a waiver of all tuition fees at TU Wien. The annual deadline is November 30.

<http://www.vcla.at/2022/11/helmut-veith-stipend-award-ceremony-2/>



Photo (c) VCLA

Ana Vesic

Activities - Distinction

TU Women's Award: Lara Spendier

On 2 March 2022, **Lara Spendier** was honored with the seventh TU Women's Award, which was awarded to an exceptional woman in IT for the second time.

The TU Women's Award honors alumnae who strive for a social, economic, or scientific impact on society through their professional lives. Rector Sabine Seidler and Vice-Rector Anna Steiger presented the award to Lara Spendier in a small but atmospheric ceremony at TU Wien's Kuppelsaal, celebrating Spendier's professional achievements and her extensive social engagement for women in tech.

Lara Spendier studied software engineering and computational intelligence at TU Wien Informatics and further holds degrees in Linguistics and Dutch Studies. In 2011, she started her PhD in non-classical logics with Professor Agata Ciabattoni, working at the Department of Logic and Computation (Theory and Logic Group) employed in her START Prize ("Non classical proofs: Theory, Applications and Tools"). Since 2014, Lara has held various positions in industry, e.g., Head of Software

Architecture at PwC Advisory GmbH and Chief Enterprise Architect of Information & Data Management at ÖBB-Holding AG. She is a strong advocate for women in the technology sector, and besides founding women tech networks and organizing the conference "Women Techmakers Vienna", she has acted as a mentor for the Diary of a Computer Scientist of project ADA, thereby contributing to motivating young girls to pursue a career in computer science.

<http://www.vcla.at/2022/03/lara-spendier-receives-2022-tu-womens-award/>



Lara Spendier

Photo (c) Klaus Ranger

Activities - Distinction

“netidee SCIENCE 2021” funding for Shqiponja Ahmetaj

Shqiponja Ahmetaj is among the recipients of the “netidee SCIENCE” funding of the year 2021, a cooperation between the Internet Foundation Austria (Internet Stiftung) and the Austrian Science Fund FWF. Shqiponja is a member of the research group Knowledge-Based Systems at TU Wien. She received her doctoral degree from TU Wien in 2019; Prof. Reinhard Pichler supervised her thesis *Rewriting Approaches for Ontology-Mediated Query Answering*.

Aim of the funding program “netidee” is the further development of the internet in Austria with open source projects.

From 114 applications, the jury chose 12 projects and 7 stipends for funding, among them Shqiponja Ahmetaj’s project “FRESH – Foundations of Reasoning in the Shape Constraint Language”. The project will explore new ways in which the internet can better understand new content as well as ways in which the quality of the data exchange in the Semantic Web can be improved.

Andreas Schildberger, Chairman of the Internet Foundation, awarded the “netidee SCIENCE” grant and was delighted with the project: “The Internet is developing at breakneck speed. This makes it all the more important, especially when it comes to essential developments such as the automated, semantic interpretation of content, to also follow up on the foundation at the scientific level. With netidee SCIENCE, we are consciously promoting open innovation in cooperation with the FWF.”



Photo (c) FWF

<https://www.fwf.ac.at/de/news-presse/news/nachricht/nid/20211125-2699>

<https://www.vcla.at/2021/11/shqiponja-ahmetaj-receives-fwf-internet-foundation-netidee-science-2021-funding/>

Activities - Cooperations

ADA Lovelace Day on October 12, 2021: Celebrating Women in STEM

The International Ada Lovelace Day celebrates the achievements of women in STEM (science, technology, engineering and maths) disciplines. The VCLA decided to use this special day on Oct 12 as an opportunity to celebrate women who work in STEM professions. Specifically, these women were:

- **Jiehua Chen**
Assistant Professor Algorithms & Complexity
- **Sophie Rain**
PreDoc Researcher Formal Methods in Systems Engineering (FORSYTE)
- **Thekla Hamm**
PreDoc Researcher Algorithms & Complexity
- **Pamina Georgiou**
PreDoc Researcher FORSYTE
- **Martina Lindorfer**
Assistant Prof. Security and Privacy
- **Agata Ciabattoni**
Full Professor Theory and Logic
- **Laura Kovács**
Full Professor FORSYTE

Each of these women answered a set of questions:

- What was your motivation to choose a STEM discipline?
- How would you explain your research work in a few words?
- What do you love about your job / research work?
- Did/do you have a female role model?

<https://www.vcla.at/2021/10/ada-lovelace-day-celebrating-women-in-stem/>



Activities - Cooperations

ADA Lovelace Day on October 12, 2021: Celebrating Women in STEM



Activities - Cooperations

World Logic Day - Ambassadors of Logic Creation of Website logicday.vcla.at

On 14 January, the world celebrates World Logic Day. It is the date of birth of Alfred Tarski as well as the date of death of Kurt Gödel, two of the most prominent logicians of the 20th century.

In addition to the **Vienna Logic Day Lecture** (cf. pages 14/15), the VCLA decided to set up a new website dedicated to this special day: logicday.vcla.at

The center also appointed renowned scientists as “Ambassadors of Logic” and asked them to provide short statements on the rationale for the celebration of World Logic Day.

These 22 ambassadors were [Arnon Avron](#) (Tel Aviv Univ.), [Johan van Benthem](#) (Univ. of Amsterdam), [Marcello D’Agostino](#) (Univ. of Milan), [Ron Fagin](#) (IBM Almaden Research Center), [Melvin Fitting](#) (Lehman College), [Dov Gabbay](#) (King’s College London), [Silvio Ghilardi](#) (Univ. of Milan), [Rosalie Iemhoff](#) (Utrecht Univ.), [Neil Immerman](#) (Univ. of Massachusetts Amherst), [Phokion Kolaitis](#) (UC Santa Cruz), [Robert Kowalski](#) (Imperial College London), [Dale Miller](#) (Inria Saclay - Île-de-France),

[Daniele Mundici](#) (Univ. of Florence), [Valeria de Paiva](#) (Topos Institute, Berkeley), [Catuscia Palamidessi](#) (INRIA), [Elaine Pimentel](#) (Univ. College London), [Graham Priest](#) (CU New York; Univ. of Melbourne), [Alexander Razborov](#) (Univ. of Chicago), [Alexandra Silva](#) (Cornell Univ.), [Sonja Smets](#) (Univ. of Amsterdam), [Moshe Vardi](#) (Rice Univ.), and [Martin Hyland](#) (Univ. of Cambridge).



A snapshot of the website logicday.vcla.at

Activities - Cooperations

...continuation from page 34

Here are a few sample quotations from our [Ambassadors of Logic](#):

That humans can reason is amazing; that reasoning can be captured by logical principles is intriguing; that logic can be used in many other ways is surprising. Thus logic amazes, intrigues, and surprises, among other things.
- [Rosalie Lemhoff](#)

Logic has made an impact in Mathematics by helping to organize its foundation and structure its proofs. However, logic and the theory of proofs have made a much broader impact within Computer Science, where it provides new designs and new languages as well as foundational results and far-reaching connections.
- [Dale Miller](#)

Logic plays an essential role in the modern world of information; but that is a distraction. The study of Logic leads not to easy technical answers but to hard questions about meaning which lie behind all our attempts at understanding.
- [Martin Hyland](#)

Logic rules the structure of the world, and if we only let it, also our actions in the world. Logic is our strongest ally in being coherent in reasoning, fair in criticizing, and clear-headed about the scope and limits of thinking.
- [Johan van Benthem](#)

When all is said and done, what's left, what stays, from being human, is Logic. Logic removes all the flesh and ornaments, and gives us the underlying bones of what we know. Whether it intends to do so or not, logic turns out to be a moral compass. We overlook it at our own peril, as Logic is even more inexorable than taxes and death.
- [Valeria de Paiva](#)

Logic is a cornerstone of rational thinking. The attempt to base mathematics on logic led in the first part of the 20th Century to a foundational crisis in mathematics. The insight that came out of this crisis was that a mathematical proof is evidence that can be checked computationally. And thus was born computer science.
- [Moshe Vardi](#)

Activities - Cooperations

MSCA COFUND Doctoral Program LogiCS@TUWien

The Doctoral College Logical Methods in Computer Science (LogiCS) is an interdisciplinary Marie Skłodowska-Curie COFUND doctoral program at TU Wien that educates 20 PhD students for 4 years on logical methods in Computer Science and their applications, in particular in Artificial Intelligence, Databases, Verification, Algorithms, Security and Cyber-Physical Systems.

LogiCS was established in March 2014 by Helmut Veith† and Stefan Szeider. The first two editions of this doctoral program were funded by the Austrian Science Fund (FWF) and run jointly with universities in Graz and Linz. LogiCS@TUWien is the third generation and was officially launched on October 1, 2021.



VCLA co-chair Stefan Szeider acts as Chair & Program Coordinator and Anna Prianichnikova as the Program Manager. In the months following the launch, 20 PhD students were recruited in three calls for application.

The faculty of LogiCS comprises renowned researchers with strong records in research, teaching and advising.

Among the successful graduates of LogiCS are Anna Lukina (now Assistant Prof. at TU Delft), Kees van Berkel (now a Post-Doc at Ruhr University Bochum), and Katalin Fazekas (now Hertha Firnberg Fellow at TU Wien).

<https://www.vcla.at/msca>



Media Coverage

The VCLA was present in the media through its members and activities.

September 22, 2022

TU Wien Informatics

What Algorithms and Twister Have In Common

<https://informatics.tuwien.ac.at/news/2281>

September 11, 2022

Radio Wien

Report/interview at the Vienna Research Festival

<https://radiothek.orf.at/wie/20220911/WWE1/1662887667160>

September 5, 2022

TU Wien Informatics

VCLA Celebrates 10th Anniversary

<https://informatics.tuwien.ac.at/news/2278>

September 2022

MEIN WIEN, edition 16, pages 11-14

Wiener Forschungsfest - Wissenschaft hautnah

August 24, 2022

TU Wien Informatics

VCLA Presents International Student Awards 2021

<https://informatics.tuwien.ac.at/news/2276>

August 26, 2022

TU Wien

Herzlichen Glückwunsch: Das Vienna Center for Logic and Algorithms (VCLA) feiert sein 10-jähriges Bestehen

(Congratulations: VCLA celebrates its 10-year anniversary)

<https://www.tuwien.at/tu-wien/aktuelles/news/news/herzlichen-glueckwunsch-das-vienna-center-for-logic-and-algorithms-vcla-feiert-sein-10-jaehriges-bestehen>

Media Coverage

July 28, 2022

TU Wien Informatics
LogicLounge with Stuart J. Russell
<https://informatics.tuwien.ac.at/news/2256>

May 4, 2022

MeinBezirk.at
Informatikerinnen ließen Mädchen ins Tagebuch schauen
(Female Computer Scientists open their diaries to young women)
https://www.meinbezirk.at/suedoststeiermark/c-lokales/informatikerinnen-lies-sen-maedchen-ins-tagebuch-schauen_a5319790

March 3, 2022

Extrajournal.net
TU-Frauenpreis für ÖBB-Managerin Lara Spendier
<https://extrajournal.net/2022/03/03/tu-frauenpreis-fuer-oebb-managerin-lara-spendier/>

March 2, 2022

TU Wien Informatics
Lara Spendier receives 2022 TU Women's Award
<https://informatics.tuwien.ac.at/news/2169>

February 18, 2022

oad.at
Tagebuch der Informatikerin – Workshops für Schülerinnen
(Diary of the Female Computer Scientist - Workshops for Pupils)
<https://oad.at/de/aktuelles/artikel/2022/02/tagebuch-der-informatikerin-workshops-fuer-schuelerinnen>

November 25, 2021

fwf.ac.at
Informatikerin Shqiponja Ahmetaj erhält „netidee SCIENCE“-Förderung 2021
(Computer Scientist Shqiponja Ahmetaj receives “netidee SCIENCE” grant 2021)
<https://www.fwf.ac.at/de/news-presse/news/nachricht/nid/20211125-2699>

VCLA Chairs



Agata Ciabattoni and Stefan Szeider, co-chairs of the VCLA since December 2017

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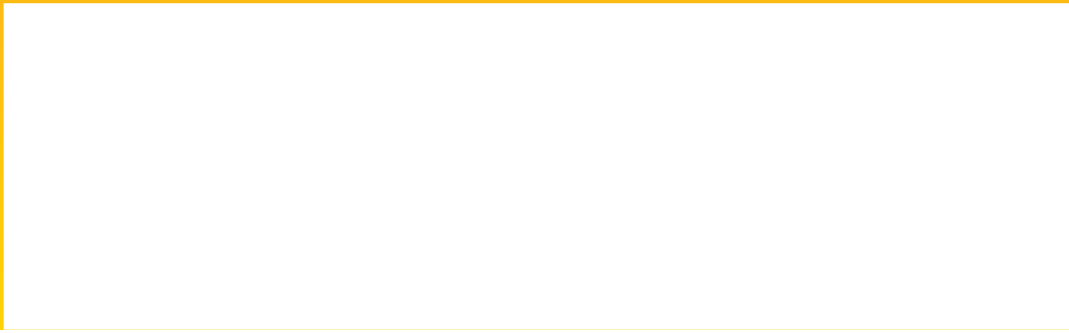
Agata Ciabattoni and Stefan Szeider are co-chairs of the Vienna Center for Logic and Algorithms. Stefan Szeider and Helmut Veith (1971-2016) founded the VCLA in 2011, assuming chair's strategic leadership over its activities.

Agata Ciabattoni is a full professor at TU Wien. In 2011 she has been awarded a START prize, the highest Austrian award for early career researchers, for her project “Non classical proofs: Theory, Applications and Tools”.

In her research, Ciabattoni focuses on non-classical logics (Deontic Logics, Fuzzy Logics, Substructural Logics...), investigating their proof theory and semantics, and applying them to various fields, including Artificial Intelligence, Legal Reasoning and Indian Philosophy.

Stefan Szeider is a full professor at TU Wien and head of the Algorithms and Complexity Group. He is also the co-chair of the MSCA COFUND Doctoral Program LogiCS@TUWien, and the scientific co-organizer of the Vienna Gödel Lectures.

In his research, Szeider combines algorithmic and logic-based methods for the efficient solution of hard problems that arise in Artificial Intelligence, Automated Reasoning, and Combinatorial Optimization, complemented by complexity-theoretic methods for establishing theoretical limits and lower bounds.



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Vienna Center for
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