

David M. Cerna

Curriculum Vitae

pod vodárenskou věží 271/2

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Education

- Apr. 2015 **PhD in Computer Science**, *TU Wien*, Vienna, Austria.
Computational Proof Theory and automated deduction (Supervisor: Alexander Leitsch)
- Aug. 2010 **Master of science, Computer Science**, *Rensselaer Polytechnic Institute (RPI)*, Troy, New York, USA.
Network security and Cryptography (Supervisor: Bülent Yener)
- May 2010 **Bachelor of science**, *RPI*, Troy, New York, USA, Mathematics.
- May 2010 **Bachelor of science**, *RPI*, Troy, New York, USA, Computer Science.

Funded Grant Proposals

- July 2022 – **22-06414L**, (*PANDAFOREST*) *Proof analysis AND Automated deduction FOR RE-cursive Structures*, Hosts: CAS ICS, Prague, Czechia, and TU VIENNA, Vienna, Austria, Funding provided by FWF and GACR, Bilateral International Project.
June 2025
Funding: 395,000 Euros
- Currently **LIT-2019-7-YOU-213**, (*Math_{LP}*) *Learning to Prove by MATHEMATICAL Induction: Running Invariant Discovery Aided by Modern Machine Learning Technology*, Host: RISC, JKU, Linz, Austria, Funding provided by Upper Austrian Government.
Funding: 160,500 Euros

Employment History

- Sept. 2020 – **Scientist**, Czech Academy of Science, Institute of Computer Science.
Current Details: Tenure-track research position
- Aug. 2020 – **Principal Investigator**, Research Institute for symbolic computation (RISC), Johannes Kepler University (JKU), Linz, Austria.
Current Details: Leading the Math_{LP} project.
- Sept. 2018 – **Postdoc**, *Logic Technology for Computer Science Education (LOGTECHEDU)*.
Aug. 2020 Institute for Formal Methods and Verification (FMV), JKU, Linz, Austria
- Mar. 2017 – **Postdoc**, *Generalization Algorithms and Applications (GALA)*.
Aug. 2018 RISC, JKU, Linz, Austria
- Feb. 2015 – **Postdoc**, *The Optimized Checking of Time-Quantified Logic Formulas with Applications in Computer Security (LogicGuard II)*.
Mar. 2017 RISC, JKU, Linz, Austria

Media Presence

- Nov. 4th 2019 **Interview for Radiokolleg Ö1 ORF**, *Logic Puzzles: History and use in Education*,
Journalist: Mariann Unterluggauer.

Research Visits

- Sept.2022 – **Andrew Cropper**, *University of Oxford, United Kingdom.*, 2 week visit funded by Oct. 2022 Math_{LP}.
- Sept.2021 – **Cezary Kaliszyk**, *University of Innsbruck, Innsbruck, Austria.*, Funded by the CAS Dec. 2021 ICS outgoing Junior Researcher Fellowship.
- Feb. 2018 **Sorin Stratulat**, *University of Lorraine, Metz, France.* Member of *Calcul, graphes et logique* research team at LITA, Visiting as part of the Erasmus+ HE Staff Mobility Agreement for teaching program.
- Feb. 2014 **Nicolas Peltier**, *CNRS CAPP team - Laboratory of Informatics of Grenoble*, Visit part of the joint ASAP project.

Research Group Members

- May.2022 – **Michal Buran**, *Research Institute of Symbolic Computation, JKU, Linz, Austria*, Feb. 2023 Postdoc funded by Math_{LP}.

Participation within Professional Organizations

CLAIRE: Confederation of Laboratories for Artificial Intelligence Research in Europe, *Institute Representative for CAS ICS within the CLAIRE Network of research laboratories.*

<https://claire-ai.org/network/>

EUROPROOFNET: European Research Network on Formal Proofs, *Management Committee member representing Czechia, Cost action CA20111.*

<https://www.cost.eu/actions/CA20111/>

Conference Organization

- Aug. 2022 **Chair**, *36th International Workshop on Unification (UNIF 22)*, Haifa, Israel.
<https://www.cs.cas.cz/unif-2022/>
- Aug. 2022 **PC**, *International Workshop on Theorem Prover Components for Educational Software (ThEdu'22)*, Haifa, Israel.
- Sept. 2022 **PC**, *15th Conference on Intelligent Computer Mathematics (CICM 22)*, Tbilisi, Georgia.
- Sept. 2021 **PC**, *International Symposium on Symbolic Computation in Software Science (SCSS 21)*, Linz, Austria.
- July 2021 **PC**, *International Workshop on Unification (UNIF 21)*, Buenos Aires, Argentina.
- July 2021 **PC**, *International Workshop on Theorem Prover Components for Educational Software (ThEdu'21)*, Pittsburgh, USA.
- June 2020 **PC**, *International Workshop on Theorem Prover Components for Educational Software (ThEdu'20)*, Paris, France.
- March 2020 **PC**, *ACM Special Interest Group on Computer Science Education Technical Symposium (SIGCSE)*, paper track: CS-Education Research, Portland, USA.
- Jan 2020 **PC**, *11th International Conference on Applied Informatics (ICAI)*, Eger, Hungary.
- June 2019 **PC**, *International Workshop on Structures and Deduction*, Dortmund, Germany.

Invited Talk

- July 12th 2022 **KIU Annual Conference on Math and Computer Science, *Inductive Logic Programming: the Basics, and Modern Approaches to Symbolic Learning***, Karakoram International University Gilgit-Baltistan, Tbilisi, Georgia.
- Feb. 8th-12th 2021 **XIII Summer Workshop in Mathematics, *Session on Theoretical Computer Science***, University of Brasilia, Brasilia, Brazil.

Contributed Talks

- Sept. 8 2022 **David Cerna, Cezary Kaliszyk and Stanislaw Purgal, 7th Conference on Artificial Intelligence and Theorem Proving**, Abstract, Sifting through a large hypothesis space: Revisiting differentiable learning through satisfiability.
Buenos Aires, Argentina
- August 12 2022 **Chad Brown, David M. Cerna, 36th International Workshop on Unification**, Abstract, Higher-Order Unification with Definition by Cases.
Haifa, Israel
- July 18 2021 **David M. Cerna, 35th International Workshop on Unification**, Abstract, When First-order Unification Calls itself.
Buenos Aires, Argentina
- Oct. 23th-25th 2019 **David M. Cerna, Proof Theory for Automated Deduction, Automated Deduction for Proof Theory**, Abstract, An ordering for flexible and finite representation of infinite sequences of proofs.
University of Vienna, Vienna, Austria
- July 25th-27th 2019 **David M. Cerna & Anela Lolic, Kurt Gödel's Legacy: Does Future lie in the Past?**, Abstract, On Herbrand's Theorem.
University of Vienna, Vienna, Austria
- Apr. 7th-12th 2019 **David M. Cerna, Artificial Intelligence and Theorem Proving (AITP) 2019**, Abstract, Towards A New Type of Prover: On the Benefits of Discovering Sequences of "Related" Proofs .
University of Innsbruck, Obergurgl, Austria
- Sept. 6th-7th 2018 **David M. Cerna, First Workshop of the Proof Society**, Abstract, A Formalism for Proof Transformation in the Presence of Induction.
University of Ghent, Ghent, Belgium
- July 19th-20th 2018 **David M. Cerna, Workshop on Proof, Computation, Complexity**, Extended Abstract, Proof Schema and the Refutational Complexity of their Cut Structure.
Hausdorff institute mathematics Bonn, Germany
- July 7th-8th 2018 **David M. Cerna and Michael Lettmann, Programming And Reasoning on Infinite Structures**, Extended Abstract, Towards the Automatic Construction of Schematic Proofs.
FLOC 2018, Oxford England
- July 7th 2018 **David M. Cerna and Temur Kutsia, 32nd International Workshop on Unification**, Extended Abstract, Towards Generalization Methods for Purely Idempotent Equational Theories.
FLOC 2018, Oxford England
- June 1st-3rd 2018 **David M. Cerna and Temur Kutsia, Arbeitstagung Allgemeine Algebra (AAA) 96**, Presentation, Term Generalization for Idempotent Equational Theories.
Darmstadt, Germany

Oct. 9th 2014 **Conference on Challenges of Identifying Integer Sequences**, *Poster*, Integer Sequences, Recursive Cut Elimination and Combinatorics.

Journal Publications

- June 2021 **David M. Cerna, Alexander Leitsch, Anela Lolic**, *Schematic Refutations of Formula Schemata*, *Journal of Automated Reasoning* volume 65, pages 599–645.
DOI: <https://doi.org/10.1007/s10817-020-09583-8>
- Dec. 2020 **David M. Cerna**, *Journal of Theoretical Computer Science (TCS)*, Anti-unification and the Theory of Semirings, Volume 848: 133-139.
DOI: <https://doi.org/10.1016/j.tcs.2020.10.020>
- May 2020 **David M. Cerna and Temur Kutsia**, *Mathematical Structures in Computer Science (MSCS)*, Higher-Order Linear Pattern Generalization with Unit and other theories, Volume 30, issue 6: 627-663.
DOI: <https://doi.org/10.1017/S0960129520000110>
- Nov. 2019 **David M. Cerna and Temur Kutsia**, *ACM Transactions in Computational Logic (TOCL)*, Idempotent Anti-Unification, Volume 21, issue 2:1-32.
DOI: <https://doi.org/10.1145/3359060>
- Oct. 2017 **David M. Cerna, Alexander Leitsch, Giselle Reis, and Simon Wolfsteiner**, *Annals of Pure and Applied Logic (APAL)*, Ceres in Intuitionistic Logic, Volume 168, number 10.
DOI: <https://doi.org/10.1016/j.apal.2017.04.001>

Conference Publications

- 23th – 29th, July 2022 **Stanislaw J. Purgal, David M. Cerna, Cezary Kaliszyk**, *Learning Higher-Order Programs From Failures*, 31st International Joint Conference on Artificial Intelligence, *IJCAI-22*.
DOI: [10.24963/ijcai.2022/378](https://doi.org/10.24963/ijcai.2022/378)
- 7th – 10th, Dec. 2021 **David M. Cerna**, *A Special Case of Schematic Syntactic Unification*, 23rd International Symposium on Symbolic and Numeric Algorithms for Scientific Computing (SYNASC 2021).
DOI: <https://doi.org/10.1109/SYNASC54541.2021.00024>
- June 29th – July 6th, 2020 **David M. Cerna and Temur Kutsia**, *Unital Anti-Unification: Type and Algorithms*, 5th International Conference on Formal Structures for Computation and Deduction (FSCD 2020).
DOI: <https://doi.org/10.4230/LIPIcs.FSCD.2020.26>
- June 29th – July 6th, 2020 **Lee P. Barnett, David M. Cerna, Armin Biere**, *Covered Clauses Are Not Propagation Redundant*, 10th International Joint Conference Automated Reasoning (IJCAR 2020).
DOI: https://doi.org/10.1007/978-3-030-51074-9_3
- 15th–20th, June 2020 **David M. Cerna, Martina Seidl, Wolfgang Schreiner, Wolfgang Windsteiger, Armin Biere**, *Aiding an Introduction to Formal Reasoning Within a First-Year Logic Course for CS Majors Using a Mobile Self-Study App*, 25th Innovation and Technology in Computer Science Education (ITICSE 2020).
DOI: <https://doi.org/10.1145/3341525.3387409>

- 2nd–4th
May 2020 **David M. Cerna, Martina Seidl, Wolfgang Schreiner, Wolfgang Windsteiger, Armin Biere**, *Computational Logic in the First Semester of Computer Science: An Experience Report*, 12th International Conference on Computer Supported Education (CSEDU 2020).
DOI: <https://doi.org/10.5220/0009464403740381>
- 28th Feb.
2020 **David M. Cerna and Rafael P.D. Kiesel and Alexandra Dzhiganskaya**, 8th *International Workshop on Theorem proving components for Educational software (ThEdu 2019): Post-Proceedings (EPTCS 313)*, A Mobile Application for Self-Guided Study of Formal Reasoning.
DOI: <https://doi.org/10.4204/EPTCS.313.3>
- 24th–30th
June 2019 **David M. Cerna and Temur Kutsia**, *A Generic Framework for Higher-Order Generalizations*, 4th International Conference on Formal Structures for Computation and Deduction (FSCD 2019).
DOI: <https://doi.org/10.4230/LIPIcs.FSCD.2019.10>
- 9th–12th
July 2018 **David M. Cerna and Temur Kutsia**, *Higher-Order Equational Pattern Anti-Unification*, 3rd International Conference on Formal Structures for Computation and Deduction (FSCD 2018).
DOI: <https://doi.org/10.4230/LIPIcs.FSCD.2018.12>
- 25th–28th
Sep. 2017 **David M. Cerna and Michael Lettmann**, *Integrating a Global Induction Mechanism into a Sequent Calculus*, 26th International Conference on Automated Reasoning with Analytic Tableaux and Related Methods (Tableaux 2017).
DOI: https://doi.org/10.1007/978-3-319-66902-1_17
- 21th–24th
Sep. 2017 **David M. Cerna and Michael Lettmann**, *Towards a Clausal Analysis of Proof Schemata*, 19th International Symposium on Symbolic and Numeric Algorithms for Scientific Computing (SYNASC 2017).
DOI: <https://doi.org/10.1109/SYNASC.2017.00029>
- 6th–9th
Apr. 2017 **David M. Cerna and Wolfgang Schreiner**, *Measuring the Gap: Algorithmic Approximation Bounds for the Space Complexity of Stream Specifications*, 8th International Symposium on Symbolic Computation in Software Science (SCSS 2017).
DOI: <https://doi.org/10.29007/t3jg>
- 23th–30th
Sep. 2016 **David M. Cerna, Wolfgang Schreiner, and Temur Kutsia**, *Predicting Space Requirements for a Stream Monitor Specification Language*, 16th International Conference on Runtime Verification (RV 2016).
DOI: https://doi.org/10.1007/978-3-319-46982-9_9
- June 27th–
July 2th 2016 **David M. Cerna and Alexander Leitsch**, *Schematic Cut elimination and the Ordered Pigeonhole Principle*, 8th International Joint Conference Automated Reasoning (IJCAR 2016).
DOI: https://doi.org/10.1007/978-3-319-40229-1_17
- 28th–30th
Mar. 2016 **David M. Cerna, Wolfgang Schreiner, and Temur Kutsia**, *Space Analysis of a Predicate Logic Fragment for the Specification of Stream Monitors*, 7th International Symposium on Symbolic Computation in Software Science (SCSS 2016).
DOI: <https://doi.org/10.29007/jnj2>
- 7th–12th
July 2014 **David M. Cerna**, *A tableau based decision procedure for multi-parameter propositional schemata*, Conferences on Intelligent Computer Mathematics (CICM 2014).
DOI: https://doi.org/10.1007/978-3-319-08434-3_6

Co-supervision of Students (unofficial)

- 2021–2022 **Stanislaw Purgal**, *Neuro-symbolic Inductive Logic Programming*, PhD Student, Advisor: Cezary Kaliszyk.
- 2019–2020 **Lee Barnett**, *Computational complexity and development of SAT refinements*, PhD Student, Advisor: Armin Biere.
- 2019–2020 **Simone Atzwanger**, *Survey of Logic education software and games*, Master Student, Advisor: Martina Seidl.
- 2018–2020 **Anela Lolic**, *Schematic resolution calculi for induction and proof transformation*, PhD Student, Advisor: Alexander Leitsch.
- 2019 **Greog Schaubeger**, *Development of educational software for proofs as jig-saw puzzles*, Master Student, Advisor: Martina Seidl.
- 2016 **Andrea Condoluci**, *CERES in propositional proof schemata*, Master Student, Advisor: Alexander Leitsch.

Teaching Experience

- Mar. 2022 – **Assistant Lecturer**, *Formal Methods and Specification*, Czech Technical University
Jun. 2022 Prague, Leading Exercise session.
- Oct. 2021 **Guest Lecturer**, *Introduction to Answer Set Programming*, University of Innsbruck,
Special lecture on Answer Set Programming.
- Mar. 2021 – **Assistant Lecturer**, *Formal Methods and Specification*, Czech Technical University
Jun. 2021 Prague, Leading Exercise session.
- Dec. 2020 **Guest Lecturer**, *Introduction to Mathematical Logic*, Czech Technical University
Prague, Special lecture on automated deduction and formalization of mathematics.
- Oct. 2019 – **Assistant Lecturer**, *Introduction to Logic*, Johannes Kepler University, Linz, Austria,
Feb 2020 First semester course on formal reasoning, and problem encoding using SAT and SMT.
Approximately 300 students.
- Mar. 2019 – **Lecturer**, *Mathematical Logic II*, Johannes Kepler University, Linz, Austria, Selected
July 2019 topics in Mathematical logic such as consistency of Arithmetic as proven by Gentzen.
- Mar. 2018 – **Lecturer**, *Arithmetic, Recursion, and Types*, Johannes Kepler University, Linz,
July 2018 Austria, Introduction to fundamental logical calculi, formal arithmetic, basic recursion
theorem, Curry-Howard Isomorphisms for simple and polymorphic types.
- Mar. 2017 – **Lecturer**, *Practical software technology*, Johannes Kepler University, Linz, Austria,
July 2017 Course topics include the Java programming language, object oriented programming
and data structures.
- Mar. 2016 – **Lecturer**, *Practical software technology*, Johannes Kepler University, Linz, Austria,
July 2016 Course topics include the Java programming language, object oriented programming
and data structures.
- Jan. 2010 – **Teaching Assistant**, *Data Structures and Algorithms*, R.P.I, Troy, New York, USA,
May 2010 Core computer science course on Data Structures and Algorithms. Programming
assignments in C++.
- Sep.2009 – **Teaching Assistant**, *Introduction to Artificial Intelligence*, R.P.I, Troy, New York,
Dez. 2009 USA, Elective course introducing artificial intelligence and machine learning.
- Sep.2008 – **Teaching Assistant**, *Network Security I*, R.P.I, Troy, New York, USA, Elective
Dec. 2008 course introducing cryptography and network security.

Languages

English Fluent

German ÖSD B1

Mother Tongue

10 years experience in German-speaking country.