Curriculum Vitae

PERSONAL INFORMATION

Zuzana Kúkelová

Assistant Professor
Visual Recognition Gropup
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HIGHLIGHTS OF PROFESIONAL EXPERIENCE

- Recipient of **GAČR JUNIOR STAR - (**EX8 - Technical Sciences, Informatics). Project Title: New generation of camera geometry solvers (~1M EUR)
- **Winner of the 2015 Cor Baayen Young Researcher Award -** an annual award given to a promising young researcher in computer science and applied mathematics by ERCIM
- **Best paper award** - Asian Conference on Computer Vision (ACCV) 2018
- **Best paper award - honourable mention** - Asian Conference on Computer Vision (ACCV) 2014
- **Post-doctoral Researcher** at **Microsoft Research Cambridge**, UK
- **General Chair** of International Conference on 3D Vision (3DV) 2022**, Program Chair** of European Conference on Computer Vision (ECCV) 2026, 3DV 2020
- **Co-author of the first automatic generator of efficient minimal solvers** - used especially in the computer vision community to solve many previously unsolved camera geometry problems

EDUCATION

2013 **Ph.D. in Mathematical Engineering**, Faculty of Electrical Engineering (FEE), Czech Technical University (CTU) in Prague, Czech Republic. Thesis title: **Algebraic Methods in Computer Vision**, defended 21/10/2013, PhD Supervisor: Tomas Pajdla, Reviewers: Andrew Fitzgibbon (Microsoft Research Cambridge), Rekha R. Thomas (University of Washington), Fredrik Kahl (Lund University)

2005 **Doctor of Natural Science (RNDr.) in Mathematics**, Specialisation: **Computer Graphics and Geometry**, Comenius University, Bratislava, Slovakia

2005 **MSc in Mathematics,** Specialisation: **Computer Graphics and Geometry**, Faculty of Mathematics, Physics and Informatics, Comenius University, Bratislava, Slovakia

EMPLOYMENT

2020 – now **Assistant Professor**, FEE, Department of Cybernetics, CTU in Prague, Czech Republic, Research topics: Computer Vision, Camera geometry problems, Algebraic methods in Computer Vision, Combining algebraic and machine learning methods for camera geometry estimation. Maternity leave 09/2021-03/2022

2016 – 2020 **Senior Research Fellow**, FEE, Department of Cybernetics, CTU in Prague, Czech Republic, Research topics: Algebraic methods in Computer Vision, Camera geometry problems.

2014 – 2016 **Post-Doctoral Researcher**, Microsoft Research Cambridge, UK, Manager: Andrew Fitzgibbon (2x Marr Prize Winner)

2005 – 2014 **Research Assistant**, FEE, Department of Cybernetics, CTU in Prague, Czech Republic

AWARDS AND DISTINCTIONS

2021 **Winner** of a Meta Research Labs research award under project call City-Scale 3D Map Making with Mapillary Metropolis

2018 Saburo Tsuji Best Paper Award - at the 14th Asian Conference on Computer Vision (ACCV) 2018, Perth, Australia, for the paper: J. Pritts, Z. Kukelova, V. Larsson, O. Chum. Rectification from Radially-Distorted Scales. **The best paper** from 978 submitted papers

2015 **Winner of the 2015** Cor Baayen Award - an annual award given to a promising young researcher in computer science and applied mathematics by ERCIM – The European Research Consortium for Informatics and Mathematics

2014 Best paper honourable mention award at the Asian Conference on Computer Vision (ACCV) 2014, for the paper: Z. Kukelova, M. Bujnak, J. Heller, T. Pajdla. Singly-Bordered Block-Diagonal Form for Minimal Problem Solvers

2013 Antonín Svoboda Award for the Best Ph.D. Thesis - awarded by the Czech Society for Cybernetics and Informatics

2013 Dean prize **for prestigious PhD thesis**

2012 **Spotlight Paper** for the July 2012 issue of the IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI), paper: Z. Kukelova, M. Bujnak, T. Pajdla. Polynomial Eigenvalue Solutions to Minimal Problems in Computer Vision

SELECTED INVITED TALKS AND LECTURES

2022 Methods for Generating Efficient Algebraic Solvers for Computer Vision Problem – **Invited talk** at the AI Czechia Seminar, virtual

2022 Recent solutions to interesting camera geometry problems – **Invited talk** at the **Mixed Reality Seminar** organized by Microsoft, virtual

2021 Camera Pose Estimation – **Lecture** at the **ICCV 2021 tutorial** Large-Scale Visual Localization, virtual

2021 Methods for Generating Efficient Algebraic Solvers for Computer Vision Problem - SIAM Conference on Applied Algebraic Geometry (AG21), **Invited talk** at the **Algebraic Vision Minisymposium,** virtual

2021 Joint Camera Geometry and Radial Distortion Estimation – **Keynote talk** at the **CVPR 2021 workshop** – The Second OmniCV Workshop: Omnidirectional Computer Vision in Research and Industry, virtual

2019 Techniques for Improving Speed and Stability of Minimal Solvers – **Lecture** at the **CVPR 2019 tutorial** – The Art of Solving Minimal Problems, Long Beach, CA, USA

2018 Fast algebraic solvers for computer vision problems – **Invited talk** at the Real Algebraic Geometry and Optimization, ICERM Workshop, Providence, RI, USA

2018 Fast Gröbner basis solvers for computer vision problems, **Invited talk** at the Eastern European Computer Vision Conference (EECVC), Odesa, Ukraine

2018 Fast Gröbner basis solvers for computer vision problems – Invited talk at **NII, Tokyo**, Japan

2016 Algebraic Methods in Computer Vision – **Invited talk** at **INRIA**, Department of Computer Science at Ecole Normale Supérieure, France

2015 Tricks for fast and numerically stable solvers – **Lecture** at the **ICCV 2015 tutorial** – The Art of Solving Minimal Problems, Santiago de Chile, Chile

2015 Algebraic Methods in Computer Vision – **Invited talk** at the European Research Consortium for Informatics and Mathematics (ERCIM) meeting, Vienna, Austria

2014 Algebraic Methods in Computer Vision – **Invited talk** at the Computational Nonlinear Algebra, ICERM Topical Workshop, Providence, RI, USA

2014 Algebraic Methods in Computer Vision - Invited talk at **Microsoft Research Cambridge**, UK

SUPERVISION AND TEACHING

- **Supervision of 4 Ph.D. students**:
  - Charalampos Tzamos, Topic: Combining Algebraic and Learning-based Approaches for Camera Geometry Estimation. (2022-now)
  - Michal Polic (co-supervision 50%), Topic: Uncertainty in Structure from Motion Algorithms (submitted 2023),
  - James Pritts (co-supervision 50%), Topic: Rectification from coplanar repeats. (defended in 2020)
  - Čeněk Albl (co-supervision 50%), Topic: 3D reconstruction with time-variant geometry (defended in 2019).
- **Close collaboration with Ph.D. students:** Snehal Bhayani (Univ. of Oulu, 2018-now), Vojtěch Pánek (CTU in Prague, 2021-now), Yaqing Ding (Nanjing University of Science and Technology, 2019-2022)
- **More than 15 years of teaching experience** - Lectures and Labs at the Master and Bachelor degree level since 2006: Courses on Optimization; Processing of Digital Photography; Geometry of Computer

Vision and Graphics; Advanced Robotics; 3D Computer Vision; Theoretical Basics of Computer Vision, Graphics, and Interaction; Math of Continuous World; Intelligent Robotics; Computer Graphics. Places: Czech Technical University in Prague, and University of Ss. Cyril and Methodius in Trnava, Slovakia.

ORGANISATION OF SCIENTIFIC MEETINGS

2026 **Program Chair of ECCV 2026 -** European Conference on Computer Vision, Core A* conference

2023 **Co-organizer of the tutorial** – Large-Scale Visual Localization, The IEEE/CVF Conference on Computer Vision and Pattern Recognition 2023 (**CVPR 2023**), Vancouver, Canada

2022 **General Chair of 3DV 2022 -** International Conference on 3D Vision, Prague, Czech Republic – top international conference in the field of 3D computer vision

2021 **Co-organizer of the tutorial** – Large-Scale Visual Localization, International Conference on Computer Vision 2021 (**ICCV 2021**), Montreal, Canada

2020 **Program Chair of 3DV 2020 -** International Conference on 3D Vision, Fukuoka, Japan – top international conference in the field of 3D computer vision

2019 **Co-organizer of the tutorial** – The Art of Solving Minimal Problems, Conference on Computer Vision and Pattern Recognition 2019 (**CVPR 2019**), Long Beach, USA

2018 **Co-chair of the** 23rd Computer Vision Winter Workshop (**CVWW 2018**) Cesky Krumlov, Czech Republic (CR)

2015 **Co-organizer of the tutorial** – The Art of Solving Minimal Problems, International Conference on Computer Vision 2015 (**ICCV 2015**), Santiago de Chile, Chile

2014 **Co-chair of the 19th Computer Vision Winter Workshop** (**CVWW 2014**), Křtiny, CR

INSTITUTIONAL RESPONSIBILITIES

2013-2014 **Member of Academic senate AS FEL** – Faculty of Electrical Engineering, CTU in Prague

2007 **Member of Academic senate AS CVUT** – Czech Technical University in Prague

ACADEMIC MEMBERSHIPS

- **CVF Member** Computer Vision Foundation
- **Ellis Member** The European Laboratory for Learning and Intelligent Systems

PROFESSIONAL ACTIVITIES

- **General chair** 3DV 2022 - International Conference on 3D Vision, Fukuoka, Japan – top international conference in the field of 3D computer vision
- **Guest editor** International Journal of Computer Vision (IJCV) Special Issue on 3D Computer Vision - CORE A* journal (IF 5.698)
- **Program chair** ECCV 2026 - European Conference on Computer Vision, Core A* conference
  3DV 2020 - International Conference on 3D Vision, Fukuoka, Japan – top international conference in the field of 3D computer vision
- **Poster chair** ECCV 2024 - European Conference on Computer Vision, Milan, Italy
- **Area chair** CVPR 2023 – CVF/IEEE Computer Society Conference on Computer Vision and Pattern Recognition, Vancouver, Canada
  ACCV 2022 - Asian Conference on Computer Vision, Kyoto, Japan
  CVPR 2022 – CVF/IEEE Computer Society Conference on Computer Vision and Pattern Recognition, New Orleans, Louisiana, USA
  ACCV 2020 - Asian Conference on Computer Vision, Kyoto, Japan
  3DV 2019 - International Conference on 3D Vision, Quebec City, Canada
  3DV 2018 - International Conference on 3D Vision, Verona, Italy
- **Program committees of major conferences** in my field (from 2008) – CVPR, ICCV, ECCV, ACCV, 3DV
- **Reviewer for top-tier journals** - IEEE Transactions on Pattern Analysis and Machine Intelligence (IEEE TPAMI, CORE A*, IF 24.314), International Journal of Computer Vision (IJCV, CORE A*, IF 13.369), and Journal of Mathematical Imaging and Vision (JMIV, CORE B, IF 1.627)

ACADEMIC COLLABORATION

- **National Institute of Informatics (NII), Tokyo, Japan**: I visited NII in **2017-2019 (20 weeks -** four times, each time for 5 weeks). I am collaborating with Professor **Akihiro Sugimoto** and Associated

Professor **Yinqiang Zheng**. Topics: Absolute pose and rolling shutter camera solvers. This collaboration has led to joint publications at ICCV 2017, CVPR 2018, ACCV 2018, and ECCV 2020.

- **University of California, Berkeley, USA**: 2016-2017 - Collaboration with Professor **Bernd Sturmfels** (a well-known expert in algebraic geometry) and PhD student **Joe Kileel**. This collaboration has led to joint publications: CVPR 2017 and a journal publication in the mathematical journal FoCM 2018 (IF 2.829)
- **ETH Zurich, Switzerland**: I visited ETH Zurich in **2017** and **2018**. Collaboration with Professor **Marc Pollefeys** and Postdoc researcher **Daniel Baráth** (**still ongoing**). This collaboration has led to joint publications at ICCV 2019, ECCV 2020, CVPR 2021, 2x ICCV 2021, 3DV 2021, CVPR 2022, ECCV 2022
- **University of Lund, Sweden**: Our collaboration started in 2008 and **still continues**. I am (was) working with – Professor **Kalle Åström**, senior researcher **Magnus Oskarsson** and PhD students **M. Byröd, K. Josephson**. I have a close collaboration with assistant professor **Viktor Larsson** (14 joint publications, mostly published while Viktor was at ETH Zurich). The collaboration with the University of Lund has led to joint publications: CVPR 2008, CVIU 2010, ICCV 2017, 3x CVPR 2018, WACV 2023
- **University of Oulu, Finland**: I visited Oulu in **2018** (1-month stay). The collaboration with Professor **Janne Heikkilä** and PhD student **Snehal Bhayani**. Topic:Sparse resultants for efficient solvers. Our collaboration has led to joint publications at CVPR 2020, ICPR 2020, ICCV 2021, WACV 2023 and **still continues**
- **Chalmers University of Technology, Sweden:** In 2019 I started a collaboration with the Chalmers University. The colaboration with Professor **Fredrik Kahl** and PhD student **Kunal Chenali** led to a joint publication at CVPR 2023 and **still continues.**

SELECTED APPLICATION RESULTS AND INDUSTRIAL COLLABORATIONS

2022- **Meta, Switzerland** - joint PI (with T. Sattler) in the Multi-modal 6DOF visual relocalization in Mapillary Metropolis project

2021 C. Albl, Z. Kukelova, T. Pajdla, V. Larsson, K. Schindler. From two rolling shutters to one global shutter, **Patent CZ** 309023. 2021-10-20.

2013-2015 **Capturing reality,** Slovakia – Research consultant – Minimal problems in 3D reconstruction pipelines. The results of our research and our solvers are incorporated in a 3D reconstruction software – **RealityCapture**. This software is one of the most efficient software packages available and can reconstruct extremely precise 3D models from more than 100k images on a standard laptop within a few hours. Reality Capture was successfully used in many well-known cultural heritage projects (Cyark, Zamani Project, Factum Foundation)[1], award-winning movies (Garden Party, Ghost in the Shell), award-winning VR/AR applications (ArtOfCorner), VFX, game industry, and many research and industrial projects. Capturing Reality is now part of Epic Games.

GRANTS AND FUNDINGS

- **Principal researcher in grants**
  - 2023-2027: PI of **GAČR JUNIOR STAR grant (**EX8 - Technical Sciences, Informatics). Project Title: New generation of camera geometry solvers. GM22-23183M (~1M Eur)
  - 2021- : PI (together with T. Sattler from CTU) in the **Multi-modal 6DOF visual relocalization in Mapillary Metropolis project** sponsored by Meta as part of the City-Scale 3D Map Making with Mapillary Metropolis request for proposals (82K EUR)
  - 2018-2020: **International Mobility of Researchers MSCA-IF at CTU**, Reg.n. CZ.02.2.69/0.0/0.0/17_050/0008025, supported by EU, ESI Fund, OP RDE programme, reg. no. CZ.02.2.69/0.0/0.0/17_050/0008025 (93K EUR)
  - 2010 SGS10/072/OHK4/1T/13 – Algebraic Methods in Computer Vision, Student grant competition 2010, Czech Technical University in Prague
  - 2009 CTU grant No. CTU0806613 - Solving Systems of Polynomial Equations for Minimal Problems in Computer Vision, Czech Technical University in Prague
- **Contributor to EC funded projects:** PRoViDE FP7-SPACE-2012-312377, De-Montes FP7-SME-2011-285839, PRoVisG FP7-SPACE-2007-218814, DIRAC FP6-IST-027787
- **Key researcher:**
  - 2018-2023: Research Center for Informatics, supported by EU, ESI Fund, OP RDE programme, reg. no. CZ.02.1.01/0.0/0.0/16_019/0000765

[1] https://www.capturingreality.com/Industry-UseCases

PUBLICATION STATISTICS

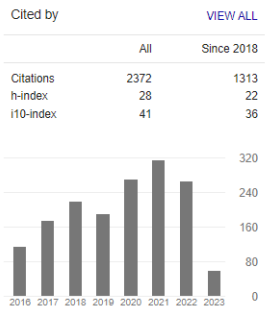
Most of my papers are published in the **top-tier impacted journals and conferences** (mostly in the field of Computer Vision, a subfield of Computer Science), such as

- IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI) – CORE A* journal, SCOPUS Highest Percentile 99%, #1/147 Computational Theory and Mathematics, #2/269 Artificial Intelligence, #1/590 Applied Mathematics, IF 24.314 (**4 papers**)
- International Journal of Computer Vision (IJCV) – CORE A* journal, SCOPUS Highest Percentile 97%, #3/94 Computer Vision and Pattern Recognition, IF 13.369, (**1 paper**)
- IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR) - CORE A* conference, SCOPUS Highest Percentile 99%, #1/94 Computer Vision and Pattern Recognition, #2/398 Software, (**21 papers**)
- IEEE/CVF International Conference on Computer Vision (ICCV) - CORE A* conference, SCOPUS Highest Percentile 94%, (**8 papers**)
- European Conference on Computer Vision (ECCV) - CORE A conference, (**6 papers**)

These conferences are highly competitive, with acceptance rates below 30% (5% for oral presentations).
The **CVPR conference, with an H5-index of 389, is the highest-ranking publication in Engineering and Computer Science and the 4th highest-ranking publication overall**, according to Google Scholar. The CVPR, ICCV, and ECCV conferences rank in the first three places among all publications in Computer Vision and Pattern Recognition, followed by the journal IEEE Transactions on Pattern Analysis and Machine Intelligence (TPAMI).

I am the first author of **22** papers and I published **24** papers in the top journals and conferences without my PhD supervisor.

International journals		**9**	
International conferences		**46**	
International workshops		**3**	
	WoS	**SCOPUS**	**Google Scholar**
H-index	16	23	28
Publications	46	60	62
Citations	712	1330	2372



5 SELECTED JOURNAL PUBLICATIONS

TPAMI 2021 J. Pritts, Z. Kukelova, V. Larsson, O. Chum., Y. Lochman, Minimal Solvers for Rectifying from Radially-Distorted Conjugate Translations, *IEEE Transactions on Pattern Analysis and Machine Intelligence,* Vol. 43, pp. 3931-3948, DOI: 10.1109/TPAMI.2020.2992261 (**IF 24.314**).

IJCV 2020 J. Pritts, Z. Kukelova, V. Larsson, O. Chum., Y. Lochman, Minimal Solvers for Rectifying from Radially-Distorted Scales and Change of Scales, *International Journal of Computer Vision*, 128(4), 950–968 (2020), DOI:10.1007/s11263-019-01216-x. An extended version of our **ACCV 2018** paper that received the **Best Paper Award** (**IF 7.41**),

TPAMI 2020 C. Albl, Z. Kukelova, V. Larsson, T. Pajdla, Rolling Shutter Camera Absolute Pose, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, Volume: 42, Issue: 6, 1439-1452, 2020, DOI 10.1109/TPAMI.2019.2894395. 2019. **(IF 16.389)**.

TPAMI 2012 Z. Kukelova, M. Bujnak, and T. Pajdla. Polynomial eigenvalue solutions to minimal problems in computer vision. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 34(7):1381–1393, 2012. (**Spotlight paper, IF 4.795**)

TPAMI 2011 Z. Kukelova and T. Pajdla. A minimal solution to radial distortion autocalibration. *IEEE Transactions on Pattern Analysis and Machine Intelligence*,33(12):2410–2422, December 2011. (**IF 4.908**)

5 SELECTED CONFERENCE PUBLICATIONS

ICCV 2021 S. Bhayani, T. Sattler, D. Barath, P. Beliansky, J. Heikkila, Z Kukelova. Calibrated and Partially Calibrated Semi-Generalized Homographies. *In IEEE/CVF International Conference on Computer Vision (ICCV'21),* 2021. **CORE A*** conference. Z. Kukelova was the scientific leader of the research. (**Oral presentation, Acceptance rate 3%)**

CVPR 2020 C. Albl, Z. Kukelova, V. Larsson, M. Polic, T. Pajdla, K. Schindler; From two rolling shutters to one global shutter, In *IEEE Conference on Computer Vision and Pattern Recognition (CVPR'20),* 2020. **CORE A*** conference. (**Oral presentation, Acceptance rate 5.7%)**

ACCV 2014 Z, Kukelova, M. Bujnak, J. Heller, T. Pajdla. Singly-Bordered Block-Diagonal Form for Minimal Problem Solvers. *In 12th Asian Conference on Computer Vision (ACCV'14),* Singapore, 2014, **CORE B** conference. (**Oral presentation, Acceptance rate 3.9%, Best Paper Honourable Mention**).

ECCV 2008 Z. Kukelova, M. Bujnak, and T. Pajdla. Automatic Generator of Minimal Problem Solvers. In *10th European Conference on Computer Vision (ECCV'08)*, volume 5304 of L*ecture Notes in Computer Science*, pages 302–315, 2008. **CORE A*** conference. (Acceptance rate 27.9%), **285 citations** on Google Scholar. Z. Kukelova was the main author of the research. The paper presents the first automatic generator of efficient minimal problems that was later used by many researchers to solve previously unsolved camera geometry problems.

BMVC 2008 Z. Kukelova, M. Bujnak, and T. Pajdla. Polynomial eigenvalue solutions to the 5-pt and 6-pt relative pose problems. In *British Machine Vision Conference (BMVC'08),* 2008, (**Oral presentation, Best paper award candidate, acceptance ratio 12.5%, 121 citations**).