SURYANSH KUMAR

Computer Vision Laboratory, Sternwartstrasse 7
ETH Zentrum CH - 8092 Zürich, Switzerland
sukumar@vision.ee.ethz.ch

EMPLOYMENT

- **ETH Zürich, Switzerland.** [Nov. 2019 - To date.]
  Senior Researcher in Computer Vision.
  Advised and Directed by: Luc Van Gool.
  Advisor at Google: Vittorio Ferrari.
  [*Declined PostDoc offer by University of Oxford.]
- Google **New York, USA.** [May 2019 - Aug. 2019.]
  Topic: Geometric Learning
- **INRIA, e-Motion, Grenoble-France.** [Sept. 2013 - Feb. 2014.]
  Visiting Scientist.
  Host: Dizan Vasquez, Christian Laugier.
  Topic: Autonomous Driving
- **IIIT-Hyderabad, India.** [Jan. 2011 - Aug. 2013.]
  Research Assistant.
  Topic: Robot Vision
- **IIT-Hyderabad, India.** [Aug. 2010 - Dec. 2010.]
  Project Associate.
  Topic: Pervasive Sensor Networks

EDUCATION

- **Australian National University (ANU).** [Sept. 2015 - Mar. 2019.]
  Ph.D. in Engineering and Computer Science. «Awarded on 10th of Dec. 2019»
  Thesis: Non-Rigid Structure from Motion.
  Supervisory Panel: Yuchao Dai, Hongdong Li, Richard Hartley.
  «*Nominated for J. G. Crawford Prize at ANU for Best Interdisciplinary Ph.D. Thesis 2019*»
  «*Winner of Non-Rigid Structure from Motion Challenge, Awarded by Disney Research*»
  «*Recipient of HDR Merit Scholarship. (Highly competitive scholarship at ANU)*»

- **IIIT-Hyderabad, India** [July 2013.]
  M.S. in Computer Science and Engineering.
  Research Area: Robot Vision.
  Full-Time Scholarship Student (Robotics Research Lab, Advisor: K Madhava Krishna).

AWARDS AND ACHIEVEMENTS

[1] Nominated for J. G. Crawford Prize for Best Interdisciplinary Ph.D. Thesis 2019 at ANU.
[2] Awarded Australian National University Vice-Chancellor Travel Grant for the year 2018.
[3] «Winner» of NRS*f*M Challenge at CVPR 2017, Prize awarded by Disney Research.
[4] Student funding to attend ICML 2017, Sydney Australia and ICCV 2017, Venice Italy.
[5] Student funding to attend Robot Vision Summer School 2016, Kiola, Australia.
[6] Recipient of "Australian National University Higher Degree Research" Merit Scholarship Award.
[7] Recipient of "Best Innovative Group 2014", by Uurmi Systems Private Limited, India.
[8] Fully funded by Campus France to do research at INRIA, Grenoble-France.
[9] Full-Time Scholarship Student for MS program at IIIT-Hyderabad, India.
[10] «Winner» of "8085 Programming" and "Project Demonstration" contest at TITIKSHA 2008.

Google logo is a registered trademark of Google LLC.

Publications

Top International Conferences

[1] Multi-View Photometric Stereo Revisited.
Authors: Berk Kaya, Suryansh Kumar, Carlos Oliveira, Vittorio Ferrari, Luc Van Gool.
IEEE Winter Conference on Applications of Computer Vision **(WACV)**, 2023, USA.

[2] Organic Priors in Non-Rigid Structure from Motion.
Authors: Suryansh Kumar, Luc Van Gool.
European Conference on Computer Vision **(ECCV)**, 2022, Tel-Aviv, Israel. « **Oral Presentation** »

[3] Learning Online Multi-Sensor Depth Fusion.
Authors: Erik S, Martin Oswald, Suryansh Kumar, Silvan W, Fisher Yu, Cristian S, Luc Van Gool.
European Conference on Computer Vision **(ECCV)**, 2022, Tel-Aviv, Israel.

[4] Uncertainty-Aware Deep Multi-View Photometric Stereo.
Authors: Berk Kaya, Suryansh Kumar, Carlos Oliveira, Vittorio Ferrari, Luc Van Gool.
IEEE Conference on Computer Vision and Pattern Recognition **(CVPR)**, 2022, USA.

[5] Generative Flows with Invertible Attentions.
Authors: Rhea Sukthanker, Zhiwu Huang, Suryansh Kumar, Radu Timofte, Luc Van Gool.
IEEE Conference on Computer Vision and Pattern Recognition **(CVPR)**, 2022, USA.

[6] Trilevel Neural Architecture Search for Efficient Single Image Super-Resolution.
Authors: Yan Wu, Zhiwu Huang, Suryansh Kumar, Rhea Sukthanker, Radu Timofte, Luc Van Gool.
Third Workshop on Neural Architecture Search: 2nd Lightweight NAS Challenge.
IEEE Conference on Computer Vision and Pattern Recognition **(CVPR)**, 2022, USA.

[7] MV-3DT: Panoramic 3D Object Tracking via Cross-Camera 3D Fusion.
Authors: Yung-Hsu Yang, Tobias Fischer, Suryansh Kumar, Min Sun, Fisher Yu.
Conference on Robot Learning **(CoRL)**, 2022, Auckland, New Zealand.

[8] Robustifying the Multi-Scale Representation of Neural Radiance Fields.
Authors: Nishant Jain, Suryansh Kumar, Luc Van Gool.
British Machine Vision Conference **(BMVC)**, 2022, London, UK.

[9] A Real-Time Online Learning Framework for Joint 3D and Semantic Seg. of Indoor Scenes.
Authors: Davide Menini, Suryansh Kumar, Martin Oswald, Erik S, Cristian S, Luc Van Gool.
IEEE International Conference on Robotics and Automation **(ICRA)**, 2022, USA.

[10] Neural Radiance Fields Approach to Deep Multi-View Photometric Stereo.
Authors: Berk Kaya, Suryansh Kumar, Francesco Sarno, Vittorio Ferrari, Luc Van Gool.
IEEE Winter Conference on Applications of Computer Vision **(WACV)**, 2022, USA.

[11] Neural Architecture Search for Efficient Uncalibrated Deep Photometric Stereo.
Authors: Francesco Sarno, Suryansh Kumar, Berk Kaya, Zhiwu H, Vittorio Ferrari, Luc Van Gool.
IEEE Winter Conference on Applications of Computer Vision **(WACV)**, 2022, USA.

[12] Uncalibrated Neural Inverse Rendering for Photometric Stereo of General Surfaces.
Authors: Berk Kaya, Suryansh Kumar, Carlos Oliveira, Vittorio Ferrari, Luc Van Gool.
IEEE Conference on Computer Vision and Pattern Recognition **(CVPR)** 2021, USA.

[13] Neural Architecture Search of SPD Manifold Networks.
Authors: Rhea Sukthanker, Zhiwu Huang, Suryansh Kumar, Erik G. Endsjo, Yan Wu, Luc Van Gool.
International Joint Conference on Artificial Intelligence **(IJCAI)** 2021, Canada.

[14] Non-rigid Structure from Motion: Prior-Free Factorization Method Revisited.
Author: Suryansh Kumar.
IEEE Winter Conference on Applications of Computer Vision **(WACV)**, 2020, USA.

Google logo is a registered trademark of Google LLC.

[15] Jumping Manifolds: Geometry Aware Dense Non-Rigid Structure from Motion.
Author: Suryansh Kumar.
IEEE Conference on Computer Vision and Pattern Recognition **(CVPR)**, 2019, USA.
Also invited for a talk at DynaVis 2019. « **Oral Presentation** »

[16] Scalable Dense Non-rigid Structure from Motion: A Grassmannian Perspective.
Authors: Suryansh Kumar, Anoop Cherian, Yuchao Dai, Hongdong Li.
IEEE Conference on Computer Vision and Pattern Recognition **(CVPR)**, 2018, USA.

[17] Monocular Dense 3D Reconstruction of a Dynamic Scene from Two Perspective Images.
Authors: Suryansh Kumar, Yuchao Dai, Hongdong Li.
IEEE International Conference on Computer Vision **(ICCV)**, 2017, Italy.

[18] Multi-body Non-rigid Structure from Motion.
Authors: Suryansh Kumar, Yuchao Dai, Hongdong Li.
IEEE International Conference on 3D Vision **(3DV)** 2016, USA.

[19] Markov Random Field based Small Obstacle discovery over Images.
Authors: Suryansh Kumar, Siva Karthik M, K. Madhava Krishna.
IEEE International Conference on Robotics and Automation **(ICRA)** 2014, China.

[20] Small object discovery and recognition using actively guided robot.
Authors: Sudhanshu Mittal, Siva Karthik M, Suryansh Kumar, K. Madhava Krishna.
IEEE International Conference on Pattern Recognition **(ICPR)**, 2014, Sweden.

Journal Publications

[1] Uncertainty Guided Policy for Active Robotic 3D Reconstruction using Neural Radiance Fields.
Authors: Soomin Lee, Le Chen, Jiahao Wang, Alexander Liniger, Suryansh Kumar†, Fisher Yu.
IEEE Robotics and Automation Letter **(RAL)**, 2022. **Impact Factor: 4.30**

[2] A Real-Time Online Learning Framework for Joint 3D and Semantic Seg. of Indoor Scenes.
Authors: Davide Menini, Suryansh Kumar†, Martin Oswald, Erik S, Cristian S, Luc Van Gool.
IEEE Robotics and Automation Letter **(RAL)**, 2022. **Impact Factor: 4.30**

[3] Superpixel Soup: Monocular Dense 3D Reconstruction of a Complex Dynamic Scene.
Authors: Suryansh Kumar, Yuchao Dai, Hongdong Li.
IEEE Transactions on Pattern and Machine Intelligence **(T-PAMI)**, 2021. **Impact Factor: 17.86**

[4] Spatio-Temporal Union of Subspaces for Multi-body Non-rigid Structure-from-Motion.
Authors: Suryansh Kumar, Yuchao Dai, Hongdong Li.
Elsevier Pattern Recognition Journal **(PR)**, 2017. **Impact Factor: 7.19**

[†Corresponding Author]

Other International and National Conferences

[1] An open framework for human-like autonomous driving using Inverse RL.
Authors: Dizan Vasquez, Yufeng Yu, Suryansh Kumar, Christian Laugier.
IEEE Vehicle Power and Propulsion Conference **(VPPC)** 2014, Portugal.

[2] CRF Based Frontier Detection using Monocular Camera.
Authors: Sarthak Upadhyay, Suryansh Kumar, K. Madhava Krishna.
ACM **(ICVGIP)**, 2014, IISc Bangalore, India. « **Oral Presentation** »

[3] A Bayes filter based adaptive floor segmentation with homography and appearance cues.
Authors: Suryansh Kumar, Ayush Dewan, K. Madhava Krishna.
ACM **(ICVGIP)**, 2012, IIT-Bombay, India. « **Oral Presentation** »

Workshop Paper and Technical Report

[1] Dense Non-Rigid Structure from Motion: A Manifold Viewpoint.
Authors: Suryansh Kumar, Luc Van Gool, Carlos O, Anoop Cherian, Yuchao Dai, Hongdong Li.
arXiv Preprint 2020.

[2] Dense Depth Estimation of a Complex Dynamic Scene without Explicit 3D Motion Estimation.
Authors: Suryansh Kumar, Ram Srivatsav Ghorakavi, Yuchao Dai, Hongdong Li, Luc Van Gool.
arXiv Preprint 2019.

Ph.D. Thesis

[1] Non-rigid Structure from Motion.
Suryansh Kumar.
Ph.D. Thesis, Australian National University.

Recent Talk

- Organic Priors in Non-Rigid Structure from Motion. Oct. 2022.
  Host: Fisher Yu, Visual Intelligence Group (VIS).
- Foundational Geometric Vision and its Role in Modern 3D Data-Acquisition Methods May. 2022.
  Host: Google Students Club, Zürich.
- Foundational Geometric Vision and its Role in Modern 3D Data-Acquisition Methods Feb. 2022.
  Warren Grundfest Lecture Series.
  Host: Achuta Kadambi (UCLA), Katie Bouman (Caltech), Pradyumna Chari (UCLA).
- ETH Zürich "Non-Rigid Structure-from-Motion." Dec. 2019.
  Host: Computer Vision Lab, D-ITET, ETH Zürich.
- Dynavis CVPR 2019, "Jumping Manifold." June 2019.
  Host: Armin Mustafa, Marco Volino, Michael Zollhöefer, Dan Casas, Adrian Hilton.
- Australian National University, "Non-Rigid Structure from Motion." Mar. 2019.
  Host: Hongdong Li, Yuchao Dai.
- Samsung Research America, "Dynamic Scene 3D Reconstruction." Jan. 2019.
  Host: Shalini Ghosh.

Academic Service and Professional Activities

- **Journal Reviewer**: T-PAMI, IJCV, RAL, Pattern Recognition, AURO.
- **Conference Reviewer**: CVPR, ECCV, ICRA, IROS, 3DV, ICCV.
- **Teaching Assitant, Computer Vision Course.** (ENGN4528/6528) [Feb. 2018 - July 2018.]
  Course Instructor: Hongdong Li.
- **Teaching Assitant, Individual Engineering Project Course.** (ENGN4200) [Feb. 2017 - July 2017.]
  Course Instructor: Yuchao Dai.
- **Teaching Assitant, Computer Vision Course.** (ENGN4528/6528) [Feb. 2017 - July 2017.]
  Course Instructor: Jonghyuk Kim.

Student Supervision and Research Collaborations

- **Current Students**: Yasaman Haghighi (M.S), Liu Pin-Tsen (M.S), Junting Chen (M.S), Stanhope Jackson (M.S), Choong Han Yao (M.S), Ozgür Fikrican (M.S), Guohao Li (External), René Zurbrügg (Ph.D), Tobias Fischer (Ph.D), Jelena Trisovic (Ph.D), Berk Kaya (Ph.D), Erik Sandström (Ph.D).

Google logo is a registered trademark of Google LLC.

- **Past Students**: Weirong Chen (M.S), Vincent Brugge (M.S), Timo Kleger (B.S), Noah Rothenberger (M.S), Choong Han Yao (M.S), Jiahao Wang (M.S), Soomin Lee (M.S), Valentin Ibars (M.S), Sukthanker Rhea (M.S), Sarno Francesco (M.S), Menini Davide (M.S), Serafino Samuele (M.S), Yan Wu (M.S), Erik E. Goron (M.S).
- **External Informal Collaborators**: Yang Xiao, ETH (Apr.-Jul. 21), Nishant Jain, IIT-R (Jul.- Nov. 21)
- **Collaborators.**
  - Fisher Yu [Topic: Visual Intelligence and Perception.]
  - Melanie Zeilinger [Topic: Robot Perception and Control.]
  - Radu Timofte [Topic: Deep-Learning for Image and Video Enhancement.]
  - Zhiwu Huang [Topic: Deep-Learning for Image and Video Enhancement.]

Research Interests

- **Computer Vision**: Structure from Motion, Photometric Stereo, Multiview Stereo.
- **Robotics**: State Estimation, Camera Calibration, Visual SLAM.
- **Mathematics**: Mathematical Optimisation, Compressed Sensing, Topological Manifolds.
- **Machine Learning**: Neural Architecture Search, Graph Neural Networks.
- **Others:** Discrete Differential Geometry.

Technical Skill Set

- **Programming Language:** C/C++, Python.
- **Scripting Language:** Matlab, Octave, Unix Shell Programming.
- **Libraries and APIs:** OpenCV, OpenGL, Open3D, ROS, Eigen, STL, Numpy, Scipy, Pangolin.
- **Deep Neural Network Framework:** PyTorch.
- **Web and Documentation:** HTML, CSS, LaTeX.
- **Others:** Embedded C, Unix System Programming.

Google logo is a registered trademark of Google LLC.

5