Suryansh Kumar

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Employment

- **ETH Zürich, Switzerland.** [Nov. 2019 - To date.]
  Professorship for Computer Vision
  Funded by: ETH Zürich Foundation.
  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
- **Uurmi Systems, Hyderabad, India.** [July 2014 - June 2015.]
  Consultant Engineer.
  Position: Computer Vision Algorithm Developer
- **INRIA, e-Motion, Grenoble-France.** [Sept. 2013 - Feb. 2014.]
  Visiting Scientist.
  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.** [Sept. 2015 - July 2019.]
  Ph.D. in Engineering and Computer Science.
  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.** July 2013.
  M.S. in Computer Science and Engineering.
  Research Area: Robot Vision.
  Scholarship Student.

Awards and Achievements

- Nominated for J. G. Crawford Prize for Best Interdisciplinary Ph.D. Thesis 2019 at ANU.
- Awarded Australian National University Vice-Chancellor Grant.
- *Winner* of NRSfM Challenge at CVPR 2017, Prize awarded by Disney Research.
- Student funding to attend ICML 2017, Sydney Australia and ICCV 2017, Venice Italy.
- Student funding to attend Robot Vision Summer School 2016, Kiola, Australia.
- Recipient of "Australian National University Higher Degree Research" Merit Scholarship Award.
- Recipient of "Best Innovative Group 2014", by Uurmi Systems Private Limited, India.
- Fully funded by Campus France to do research at INRIA, Grenoble-France.
- Full-Time Scholarship Student for MS program at IIIT-Hyderabad, India.
- Winner of "8085 Programming" and "Project Demonstration" contest at TITIKSHA 2008.

Publications

3D Computer Vision

[1] **[WACV 22]** Neural Radiance Fields Approach to Deep Multi-View Photometric Stereo.
Berk Kaya, Suryansh Kumar, Francesco Sarno, Vittorio Ferrari, Luc Van Gool.
IEEE/CVF Winter Conference on Applications of Computer Vision, 2022, Hawaii, USA.

[2] **[WACV 22]** Neural Architecture Search for Efficient Uncalibrated Deep Photometric Stereo.
Francesco Sarno, Suryansh Kumar, Berk Kaya, Zhiwu Huang, Vittorio Ferrari, Luc Van Gool.
IEEE/CVF Winter Conference on Applications of Computer Vision, 2022, Hawaii, USA.

[3] **[CVPR 21]** Uncalibrated Neural Inverse Rendering for Photometric Stereo of General Surfaces.
Berk Kaya, Suryansh Kumar, Carlos Oliveira, Vittorio Ferrari, Luc Van Gool.
IEEE/CVF Conference on Computer Vision and Pattern Recognition, 2021, Tennessee, USA.

[4] **[TPAMI 21]** Superpixel Soup: Monocular Dense 3D Reconstruction of a Complex Dynamic Scene.
Suryansh Kumar, Yuchao Dai, Hongdong Li.
IEEE, Transactions on Pattern and Machine Intelligence, IEEE, 2019.

[5] **[WACV 20]** Non-rigid Structure from Motion: Prior-Free Factorization Method Revisited.
Suryansh Kumar.
IEEE/CVF Winter Conference on Applications of Computer Vision, 2020, Colorado, USA.

[6] **[CVPR 19]** Jumping Manifolds: Geometry Aware Dense Non-Rigid Structure from Motion.
Suryansh Kumar.
IEEE/CVF Conference on Computer Vision and Pattern Recognition, 2019, California, USA.

[7] **[CVPR 18]** Scalable Dense Non-rigid Structure from Motion: A Grassmannian Perspective.
Suryansh Kumar, Anoop Cherian, Yuchao Dai, Hongdong Li.
IEEE/CVF Conference on Computer Vision and Pattern Recognition, 2018, Utah, USA.

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

[9] **[PR 17]** Spatio-Temporal Union of Subspaces for Multi-body Non-rigid Structure-from-Motion.
Suryansh Kumar, Yuchao Dai, Hongdong Li.
Elsevier, Pattern Recognition Journal, 2017.

[10] **[3DV 16]** Multi-body Non-rigid Structure from Motion.
Suryansh Kumar, Yuchao Dai, Hongdong Li.
IEEE, International Conference on 3D Vision, 2016, Stanford University, California, USA.

Core Machine Learning and AI

[1] **[IJCAI 21]** Neural Architecture Search of SPD Manifold Networks.
Rhea Sukthanker, Zhiwu Huang, Suryansh Kumar, Erik G. Endsjo, Yan Wu, Luc Van Gool.
International Joint Conference on Artificial Intelligence, 2021, Montreal, Canada.

Robotics

[1] **[ICRA 14]** Markov Random Field based Small Obstacle discovery over Images.
Suryansh Kumar, Siva Karthik M, K. Madhava Krishna.
IEEE, International Conference on Robotics and Automation, 2014, Hong Kong, China.

[2] **[ICPR 14]** Small object discovery and recognition using actively guided robot.
Sudhanshu Mittal, Siva Karthik M, Suryansh Kumar, K. Madhava Krishna.
International Conference on Pattern Recognition, IEEE, 2014, Stockholm, Sweden.

[3] **[VPPC 14]** An open framework for human-like autonomous driving using Inverse RL.
Dizan Vasquez, Yufeng Yu, Suryansh Kumar, Christian Laugier.
IEEE, Vehicle Power and Propulsion Conference, 2014, Coimbra, Portugal.

[4] **[ICVGIP 14]** CRF Based Frontier Detection using Monocular Camera.
Sarthak Upadhyay, Suryansh Kumar, K. Madhava Krishna.
ACM, 2014, IISc Bangalore, India.

[5] **[ICVGIP 12]** A Bayes filter based adaptive floor segmentation with homography and appearance cues.
Suryansh Kumar, Ayush Dewan, K. Madhava Krishna.
ACM, 2012, IIT-Bombay, India.

Thesis

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

Preprints and Technical Report

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

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

Recent Talk

- 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.

Service and Professional Activities

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

Students and Collaborators

- **Current Students.**
  - Timo Kleger (B.S) [Sept. 21 -]
  - Noah Rothenberger (M.S) [Sept. 21 -]
  - Weirong Chen (M.S) [Sept. 21 -]
  - Guohao Li (KAUST visiting researcher) [May. 21 -]
  - Sarno Francesco (Intern) [May. 21 -]
  - Jiahao Wang (M.S) [May. 21 -]

- Berk Kaya (Ph.D) [Nov. 19 -]
- Erik Sandström (Ph.D) [Nov. 19 -]

· **Past Students.**
- Valentin Ibars (M.S) [Feb. 21 - Jun. 21]
- Sukthanker Rhea (M.S) [Oct. 20 - May. 21]
- Sarno Francesco (M.S) [Oct. 20 - Mar. 21]
- Menini Davide (M.S) [Oct. 20 - Mar. 21]
- Serafino Samuele (M.S) [Sep. 20 - Nov. 20]
- Yan Wu (M.S) [Aug. 20 - Oct. 20]
- Sukthanker Rhea (M.S) [Mar. 20 - Jun. 20]
- Erik Endsjo Goron (M.S) [Mar. 20 - Jun. 20]

· **Collaborators.**
- Fisher Yu [Topic: Visual Intelligence and Robotic Arm.]
- Radu Timofte [Topic: Deep-Learning for Image and Video Enhancement.]
- Zhiwu Huang [Topic: Deep-Learning for Image and Video Enhancement.]

· **External Informal Collaborators.**
- Yang Xiao, Dept. of Mathematics ETH. [Topic: Number Theory.]
- Nishant Jain, CSE IIT-Roorkee. [Topic: View Synthesis.]

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, ROS, Eigen, STL, Numpy, Scipy, Pangolin.
· **Deep Neural Network Framework:** PyTorch.
· **Web and Documentation:** HTML, CSS, LaTeX.
· **Others:** Embedded C, Unix System Programming.