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

Conference Proceedings

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

[2] 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 (**IJCAI**), 2021, Montreal, Canada.

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

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

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

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

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

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

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

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

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

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

Journals and Thesis

[1] Superpixel Soup: Monocular Dense 3D Reconstruction of a Complex Dynamic Scene.
Suryansh Kumar, Yuchao Dai, Hongdong Li.
Transactions on Pattern and Machine Intelligence (**T-PAMI**), IEEE, 2019.

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

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

Preprints and Technical Report

[1] Trilevel Neural Architecture Search for Efficient Single Image Super-Resolution
Yan Wu, Zhiwu Huang, Suryansh Kumar, Rhea Sukthanker, Radu Timofte, Luc Van Gool.
arXiv Preprint 2021.

[2] 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.

[3] 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.

Academic Service

- **Journal Reviewer**: T-PAMI, IJCV, Pattern Recognition, TOR.
- **Conference Reviewer**: 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:**
  - Berk Kaya (Ph.D) [Nov. 19 -]
  - Erik Sandström (Ph.D) [Nov. 19 -]
  - Sarno Francesco (Intern) [May. 20 -]
  - Valentin Ibars (M.S) [Feb. 21 -]
  - Jiahao Wang (M.S) [May. 21 -]
  - Soomin Lee (M.S) [May. 21 -]
  - Guohao Li (KAUST visiting researcher) [May. 21 -]
- **Past Students:**
  - 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.]
- Martin Oswald [Topic: Dense depth estimation and 3D Reconstruction.]

· **External Informal Collaborators:**
- Yang Xiao, Dept. of Mathematics ETH.
- Nishant Jain, CSE IIT-Roorkee.

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.

Languages

English, Hindi.