Suryansh Kumar

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## Employment

- **ETH Zürich, Switzerland.** Nov. 2019 - Till Date.
  Position: Professorship for Computer Vision.
  Funded by: ETH Zürich Foundation and Google for 3D vision projects.
  Advised and Directed by: Luc Van Gool.
  Advisor at Google: Vittorio Ferrari, Cristian Sminchisescu.
- 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.

- **IIIT-Hyderabad.** July 2013.
  M.S. in Computer Science and Engineering.
  Research Area: Robotic Vision.

## Awards and Achievements

- Awarded ANU 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

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

[2] Jumping Manifolds: Geometry Aware Dense Non-Rigid Structure from Motion.
Suryansh Kumar.
Conference on Computer Vision and Pattern Recognition (**CVPR**), IEEE, 2019, CA, USA.
⋆ Invited for oral presentation at Dynavis CVPR 2019.

[3] 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.

[4] 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.

[5] 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.
⋆ Conferred at IEEE Comm. Society MMTC Communications-Review Vol. 9, No.2, April 2018.
⋆ Presented at CMU RI VASC Seminar on 20$^{th}$ November 2017 by Prof. Hondong Li.

[6] 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.
⋆ Received Best Algorithm Award in NRSFM Challenge at (**CVPR**) 2017 by Disney Research.

[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] 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**)

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

[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.

**Under Preparation**

[12] Dense Depth Estimation of a Complex Dynamic Scene without Explicit 3D Motion Estimation.
Suryansh Kumar, Ram Srivatsav Ghorakavi, Yuchao Dai, Hongdong Li.
arXiv Preprint 2019. (Under Progress)

## 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." March 2019.
Host: Hongdong Li, Yuchao Dai.

- Samsung Research America, "Dynamic Scene 3D Reconstruction." Jan. 2019.
  Host: Shalini Ghosh.

## Academic Service

- **Technical Program Committee Member**: ACM MM 2019.
- **Reviewer**: T-PAMI, CVPR, ICCV, ICRA, 3DV, IEEE C.I Magazine, Pattern Recognition.
- **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

- **Students:**
  - Berk Kaya (Ph.D) (Co-advisors: Luc Van Gool, Vittorio Ferrari)
  - Eric Sandström (Ph.D) (Co-advisors: Luc Van Gool, Cristian Sminchisescu)
- **Collaborators:**
  - Dr. Zhiwu Huang (Topic: Application of Non-Euclidean Geometry Learning for Videos.)

## Research Interests

- **Computer Vision**: 3D Reconstruction, Depth Estimation and Motion Segmentation.
- **Robotic Vision**: Camera Calibration, SLAM and Visual SLAM.
- **Mathematics**: Mathematical Optimisation, Compressed Sensing, Topological Manifolds.
- **Machine Learning**: Deep Learning, Support Vector Machine, Probabilistic Graphical Models.
- **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.