Vijay Rengarajan

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Summary

Research Scientist with extensive experience in working towards publications and products.

- *Computational Photography*: Motion rectification for rolling shutter mobile phone cameras; Video clip from image sequence using custom exposures; Fruit freshness using structured illumination; Motion estimation in compressed sensing.
- *Image Processing and Restoration*: Change detection and super-resolution in rolling shutter cameras; Spatio-temporal video upscaling; Image restoration in hyperspectral imaging.
- *Camera Imaging Pipeline*: On-device machine learning for local tone mapping and 3D color lookup table modules.
- *Deep Learning for AR/VR*: Biometric authentication for wearables; immersive text-to-360-image generation for VR.

Education

Ph.D. **Indian Institute of Technology Madras** — Chennai, India
Aug 2011–Nov 2017

- Thesis: *Rolling Shutter Imaging: Registration and Rectification.*
- Advisors: Prof. A.N.Rajagopalan and Prof. R. Aravind.

B.E. **Anna University (PSG College of Technology)** — Coimbatore, India
2004 – 2008

- Bachelor of Engineering in *Electronics and Communication Engineering*.

Work Experience

Meta Reality Labs, Senior Research Scientist — Bay Area, CA
Sep 2021 – now

On-Device AI for Camera Pipeline in Wearables.

- Delivered curve-based Local Tone Mapping and image-adaptive 3D Color Look-up Table modules.
- Worked on machine learning models for RAW Pixel Desaturation/Hallucination.

Biometric Authentication for Wearables.

- *No-touch Face-ID for Wearables:* Delivered machine learning models for periocular authentication in Head-Mounted Devices (HMDs).
- Developed cross-modal capabilities to authenticate and drive Codec Avatars.
- Conducted an exploratory work for the hand/palm-based authentication system for smartglasses; worked on synthetic data generation.

Immersive 360-image Generation for VR Devices.

- *Create personalized Quest Skybox:* Developed a LoRA-based generative-AI diffusion model to generate 360-images based on user-provided text for immersive experiences in virtual reality (VR) devices.

Carnegie Mellon University, Research Scientist/Post-doc — Pittsburgh, PA
with Prof. Aswin Sankaranarayanan
Dec 2017 – Sep 2021

Computational High-speed Videography.

- *High fps from low fps capture:* Developed a model to computationally render high speed video from pre-designed low-speed short-long exposure captures.

Fruit Freshness using Structured Illumination.

- *When does this strawberry go bad?* Mentored and worked on the development of a fruit freshness prediction model using subsurface scattering.

Deep Intermodal Video Analytics.

- Developed a surprise activity detection system which detects unknown ac-

tivities in unknown capture environments using only a few query example activities revealed at run-time as a surprise.

Motorola India Private Limited, Software Engineer — Bengaluru, India
2008 – 2011

- Worked on the development and testing of wireless communication modules: CDMA-EVDO and Bulk MCC-DO (Multi-channel Carrier Cards - Data Optimized) Simulator.

Awards

- **Travel Award** from Google India Pvt. Ltd. to travel to the IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2017 held at Honululu, USA.
- **Doctoral Consortium Participation and Travel Award** for the IEEE Conference on Computer Vision and Pattern Recognition (CVPR) 2016.
- **Institute Research Scholar Award** for excellence in research awarded by Indian Institute of Technology Madras in April 2015.

Professional Activities

Reviewer: CVPR, ECCV, AAAI, ICCV, WACV; Transactions on Image Processing, Multimedia, Computational Imaging.

Publications

1. [CVPR2023] Ziyu Wan, Christian Richardt, Aljaz Bozic, Chao Li, *Vijay Rengarajan*, Seonghyeon Nam, Xiaoyu Xiang, Tuotuo Li, Bo Zhu, Rakesh Ranjan, and Jing Liao. "Learning Neural Duplex Radiance Fields for Real-Time View Synthesis" in International Conference on Computer Vision and Pattern Recognition (**CVPR**), 2023.

2. [ICCP2023] Vishwanath Saragadam, *Vijay Rengarajan*, Ryuichi Tadano, Tuo Zhuang, Hideki Oyaizu, Jun Murayama and Aswin C. Sankaranarayanan. "Programmable Spectral Filter Arrays using Phase Spatial Light Modulators" in International Conference on Computational Photography (**ICCP**) 2023.

3. [ECCV2022] Xiaoyu Xiang, Yapeng Tian, *Vijay Rengarajan*, Lucas Young, Bo Zhu, and Rakesh Ranjan. "Learning Spatio-Temporal Downsampling for Effective Video Upscaling" in European Conference on Computer Vision (**ECCV**) 2022.

4. [ICCVW2021] Jeremy Klotz, *Vijay Rengarajan*, and Aswin C. Sankaranarayanan. "Fine-Grain Prediction of Strawberry Freshness using Subsurface Scattering" in Large-Scale Fine-Grained Food Analysis Workshop at ICCV 2021.

5. [CVPRW2020] *Vijay Rengarajan*, Shuo Zhao, Ruiwen Zhen, John Glotzbach, Hamid Sheikh, and Aswin C. Sankaranarayanan. "Photosequencing of Motion Blur using Short and Long Exposures," in New Trends in Image Restoration and Enhancement workshop at CVPR 2020 (oral presentation).

6. [ICIP2018] Nimisha T M, *Vijay Rengarajan*, and A.N. Rajagopalan. "Semi-supervised Learning of Camera Motion from a Blurred Image," in International Conference on Image Processing (**ICIP**), October 2018 (oral presentation).

7. [CVPR2017] *Vijay Rengarajan*, Yogesh Balaji, and A.N. Rajagopalan. "Unrolling the Shutter: CNN to Correct Motion Distortions," in International Conference on Computer Vision and Pattern Recognition (**CVPR**), July 2017 (oral presentation).

8. [TPAMI2017] *Vijay Rengarajan*, A.N. Rajagopalan, R. Aravind, and Guna Seetharaman. "Image Registration and Change Detection under Rolling Shutter Motion Blur," IEEE Transactions on Pattern Analysis and Machine Intelligence (**PAMI**), November 2016.

9. [ICIP2016] *Vijay Rengarajan*, Abhijith Punnappurath, and A.N. Rajagopalan. "Rolling Shutter Super-resolution in Burst Mode," in International Conference on Image Processing (**ICIP**), September 2016.

10. [CVPR2016] *Vijay Rengarajan*, A.N. Rajagopalan, and R. Aravind. "From Bows to Arrows: Single Image Rolling Shutter Rectification," in International Conference on Computer Vision and Pattern Recognition (**CVPR**), June 2016.

11. [ICCV2015] Abhijith Punnappurath, *Vijay Rengarajan*, and A.N. Rajagopalan. "Rolling Shutter Super-resolution," in the Proceedings of IEEE International Conference on Computer Vision (**ICCV**), December 2015.

12. [SPIE2015] *Vijay Rengarajan*, Sheetal B. Gupta, A.N. Rajagopalan, and Guna Seetharaman. "Illumination Robust Change Detection with CMOS Imaging Sensors," in **SPIE** Defense + Security Symposium, International Society for Optics and Photonics, April 2015 (oral presentation).

13. [ECCV2014] *Vijay Rengarajan*, A.N. Rajagopalan, and R. Aravind. "Change Detection in the Presence of Motion Blur and Rolling Shutter Effect," in European Conference on Computer Vision (**ECCV**), Springer International Publishing, September 2014.

14. [ICPR2014] *Vijay Rengarajan*, A.N. Rajagopalan, and R. Aravind. "Motion Estimation and Classification in Compressive Sensing from Dynamic Measurements," in the Proceedings of IEEE International Conference on Pattern Recognition (**ICPR**), August 2014 (oral presentation).

15. [CVPRW2014] *Vijay Rengarajan*, Abhijith Punnappurath, A.N. Rajagopalan, and Guna Seetharaman. "Efficient Change Detection for Very Large Motion Blurred Images," in the Proceedings of IEEE Conference on Computer Vision and Pattern Recognition Workshop on Registration of Very Large Images, June 2014 (oral presentation).