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Abhinau K Venkataramanan

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Education

The University of Texas at Austin — CGPA: **4.00/4.00**
Ph.D. in Electrical and Computer Engineering — Expected: *May 2024*

The University of Texas at Austin — CGPA: **4.00/4.00**
M.S. in Electrical and Computer Engineering — *Dec 2021*

Indian Institute of Technology Hyderabad, India — CGPA: **9.77/10.0**
B.Tech. in Electrical Engineering, **Silver medalist** — *May 2019*

Experience

Meta Platforms Inc., *ASIC Engineering Intern* — Summer '22

- Worked on developing novel adaptations for High Dynamic Range content in the AV1 video codec.
- Modeled and optimized memory architectures for hardware-accelerated compression. Led to 20% reduction in memory footprint with comparable performance.
- Improved robustness of video quality models for practical use.

Facebook Inc., *ASIC Engineering Intern* — Summer '21

- Worked on developing novel super-resolution methods for the AV1 video codec.
- Identified applications and demonstrated up to a 15% improvement in performance over the baseline.

LIVE, UT Austin, *Graduate Research Assistant* — Fall '19 - Present

- Guided by Prof. Alan Bovik.
- I work with Meta to develop new algorithms to improve the performance and efficiency of quality assessment models.
- I have been working on efficient quality assessment models for video-on-demand applications.
- I have also been working on understanding the impact of tone-mapping on HDR video quality.

Carnegie Mellon University, *Research Intern* — Summer '18

- Proposed a new Reinforcement Learning algorithm, based on a model of decision making in the brain.
- Demonstrated its advantages in a simulated environment, using PyTorch, where patience can be a virtue.
- Submitted as a paper to AAAI 2018 - preprint available online.

Uurmi Systems C/o Mathworks Inc., India, *Intern* — Summer '17

- Used CUDA to develop an efficient implementation of the Semi Global Matching on the GPU.
- Used by the company in their Autonomous Vehicle, as an alternative to LASER range finders.
- Integrated to MATLAB's Computer Vision system toolbox.

Projects

- **A Crowdsourced Database of User-Generated High Dynamic Range Videos**: Created a curated crowd-sourced database of HDR videos filmed by amateur iPhone users, and made it available freely to the community. Addresses the dearth of publicly available user-generated HDR videos.
- **FUNQUE: Fusion of Unified Quality Evaluators**: Developed FUNQUE - a fusion quality metric with explicit focus on computation sharing and perceptually relevant pre-processing, which is 10% more accurate than the state-of-the-art Visual Multimethod Assessment Fusion (VMAF) quality model, combined with over 8x speedup! Accepted at ICIP 2022.
- **Image Quality Assessment of Magnetic Resonance Images**: Generated a corpus of distorted magnetic resonance images using reconstruction algorithms applied to FastMRI data. Evaluated the performance of full-reference and no-reference image quality algorithms in predicting their quality.
- **Assessing the Impact of Image Quality on Object-Detection Algorithms**: Created a database to assess the impact of image quality on the performance of deep object-detection algorithms. Proposed a no-reference image quality metric to predict the accuracy of such algorithms. Winning entry to NIST Enhancing Computer Vision for Public Safety Challenge and published at Electronic Imaging 2022.
- **P2P Live Streaming with Recommender Systems**: Conducted a theoretical analysis of a peer-to-peer live streaming system that included a recommender. Derived "optimal recommenders" under this framework.
- **A Hitchhiker's Guide to Structural Similarity**: Conducted a comprehensive evaluation of design choices involved in deploying SSIM. Proposed Enhanced SSIM, which improved both performance and efficiency over the baseline SSIM. Created an open-source software release. Published in IEEE Access.

- **Analyzing Model Tradeoffs in Predicting Length of Stay (LOS) in eICU Patients**: Data Mining class project in which we analyzed the effect of using interpretable and Federated Learning models on performance. Used several data cleaning methods, statistical tests, Machine Learning models and Deep Neural Networks.
- **Quality Assessment of Low Framerate Videos**: Proposed a fusion metric to assess the decrease in video quality as a result of reduction in frame rate, using a fusion of DCT domain signal processing and statistical modelling of optical flow.
- **Generalization of VIF to Non-Pristine Sources**: Analyzed the mathematical behaviour of Visual Information Fidelity when relaxing statistical constraints on the source. Derived novel expressions for properties of Generalized Gaussian Distributions.
- **Video Integrity Testing Using Minimal Learning**: Proposed a method to detect near-static videos using transfer learning and demonstrated robustness to choices of pretrained models. This allows for computation sharing, leading to more efficient deployment at scale.
- **Optimizing Video Quality Estimation Across Resolutions**: Proposed an efficient method to estimate the quality of HD videos compressed at lower resolutions. This was achieved using Histogram Matching, Suport Vector Regressors, and Neural Networks. Accepted at IEEE MMSP 2020.
- **Perceptually Driven Conditional GAN for Fourier Ptychography**: Proposed a perceptually driven Boundary Equilibrium Conditional GAN, with application to supervised magnitude and phase reconstruction in Fourier Ptychography. Accepted at Asilomar 2019.
- **Better Safe than Sorry: Evidence Accumulation Allows for Safe Reinforcement Learning**: Proposed a new architecture for a Reinforcement Learning agent based on a model of decision making in the brain and showed its advantages in environments where patience can be a virtue. Submitted to AAAI 2019.
- **Deep learning for Unsupervised Voice Activity Detection**: Developed an unsupervised deep learning model that can detect voice activity in a speech signal. This is useful in VoIP systems where the cost of transmitting silence can be cut, leading to lower data usage and better performance in low bandwidth networks.
- **No-Reference Quality Assessment of HDR Images**: Proposed a no-reference deep learning model to estimate the Mean Opinion Score of tone-mapped HDR Images. Due to the small size of dataset, this was achieved using transfer learning and dimensionality reduction. Accepted at QOMEX 2017.

Programming Skills

- **Languages**: C/C++, CUDA, Python, MATLAB, LaTeX
- **Others**: PyTorch, Scikit-Learn, Scikit-Image, Scikit-Video, OpenCV

Publications

- A. K. Venkataramanan, C. Stejerean, A. C. Bovik. **FUNQUE: Fusion of Unified Quality Evaluators**. IEEE ICIP 2022.
- A. K. Venkataramanan, M. Facktor, A. C. Bovik. **Assessing the impact of image quality on object-detection algorithms**. Electronic Imaging 34, 2022.
- A. K. Venkataramanan, C. Wu, A. C. Bovik, I. Katsavounidis, Z. Shahid. **A Hitchhiker's Guide to Structural Similarity**. IEEE Access, vol. 9, 2021.
- A. K. Venkataramanan, C. Wu, A. C. Bovik. **Optimizing Video Quality Estimation Across Resolutions**. IEEE MMSP 2020.
- A. K. Venkataramanan, S. Gupta, S. S. Channappayya. **Perceptually Driven Conditional GAN for Fourier Ptychography**. Asilomar SSC 2019.
- A. K. Venkataramanan, S. Gupta, S. S. Channappayya. **No-reference quality assessment of tone mapped High Dynamic Range (HDR) images using transfer learning**. QOMEX 2017.

Accomplishments

- **First Place in "No-Reference" category at WACV 2023 Grand Challenge** - 2023.
- **Second Place in "Full-Reference" category at WACV 2023 Grand Challenge** - 2023.
- **Joint winners of NIST Enhancing Computer Vision for Public Safety Challenge** - 2020.
- **Institute Silver Medal** 2019, for highest CGPA in the EE department.
- **Academic Excellence Award** in 2017 and 2019.
- **SN Bose Scholar** - 2018.
- **KVPY Fellow** - 2014.