Wentao **Shangguan**

Electronic Engineering · Boston University

PHO 401, 8 St Mary's St, Boston, MA 02215

wentaos@bu.edu | www.wshangguan.com | WtSg | wentao-shangguan-ba5197173

Education

Boston Unioversity — *Boston, MA*

PhD Candidate in Electronic EngineeringSignal — *Sep. 2022 - Present*

- Advisor: Prof. Vivek K. Goyal

Washington University in St. Louis — *St. Louis, US*

MSc in Electronic and System Engineering — *Jan. 2020 - Dec. 2021*

- Advisor: Prof. Ulugbek Kamilov

Research Projects

Time-Resolved Particle Beam Microscopy with Deep Learning-Based Jitter Mitigation — *STIR, BU*

Principal Researcher — *Jan 2023 - Present*

- **Overall Goal**: Segmented the exposure duration into small time bins to acquire numerous time-resolved samples, then dynamically merged them to effectively mitigate spatial sampling jitter. This approach leverages an efficient model to enhance the fidelity of particle beam microscopy images, surpassing traditional exposure integration methods.
- **Simulated Forward Model Development**: Developed a time-resolved simulated forward model for particle beam microscopy that incorporates sampling jitter and a precise physical noise model. It generates a set of time-resolved samples for each small time bin from a ground truth image. This is crucial for effectively training our deep learning algorithms to mitigate jitter.
- **Deep Learning for Sample Integration**: Implemented efficient DL models, including cross deformable transformers, to efficiently extracts and synthesizes information between individual time-resolved samples and and long-term aggregated data. This method maximizes the utility of a high volume of samples, enhancing the model's ability to discern and adjust for variations between individual and collective sample distributions, which is crucial for minimizing jitter effects.
- **Efficient Hybrid Transformer Architecture Development**: Designed a sophisticated hybrid transformer tailored for high-volume temporal data. This model combines local convolutional operations with efficient SWIN-based attention mechanisms, optimizing processing efficiency while maintaining high-quality image reconstruction with minimal jitter artifacts.

Absorption Assisted Stereo Hyperspectral Depth Imaging — *STIR, BU*

Lead Researcher: Unay Dorken — *Nov 2023 - Present*

- **Objective**: Create the first model that seamlessly integrates hyperspectral and stereo imaging techniques to enhance depth, temperature, material, and texture prediction under varying conditions, utilizing physical loss to increase prediction fidelity.
- **Model Architecture Development**: Develop a novel attention-based model that synergistically processes stereo hyperspectral image data. This approach leverages the strengths of both imaging modalities, with hyperspectral imaging providing detailed material information across diverse conditions and stereo imaging offering enhanced depth perception in closer ranges.
- **Integration of Physical Loss Functions**: Improved model accuracy by incorporating physical loss functions that consider comprehensive optical properties, including light absorption, emissivity, temperature, and depth, improving the model's applicability and reliability in diverse imaging scenarios.

Cross-Video Neural Representation for High-Quality Frame Interpolation (ECCV 2022) — *CIG, WUSTL*

Advisor: Ulugbek Kamilov, Yu Sun — *Sep. 2020 - Feb 2022*

Goal: Representation discrete video frames with Continuous Neural Field Based Network.

- Developed CURE, the first neural field (NF)-based model for continuously representing discrete video frames, marking a significant advancement in video processing technology.
- Introduced a novel NF model that conditions the neural network on input frames, improving space-time consistency, and showcasing its robust capabilities in video frame interpolation across diverse datasets.
- Validated CURE's superior performance through rigorous experimentation on several benchmark datasets, establishing its state-of-the-art capability in video interpolation. Published at ECCV 2022, showcasing CURE's advancements in the field of video processing

Adaptive Single Photon Compressed Imaging Based on Constructing a Smart Threshold Matrix (Sensors 2018) *Nanchang University*

Mentor: Professor Qiurong Yan

Goal: To propose an adaptive sampling algorithm for Single Photon Compressed Imaging, which improves its imaging quality *June. 2017 - Nov. 2018*

- Developed an adaptive sampling method for single-photon compressed sensing that enhances image quality and efficiency by using a dynamic measurement matrix. This adaptive matrix dynamically adjusts to the imaging scene, significantly improving the efficiency of compressed sensing.
- Demonstrated superior image quality and noise resistance, achieving similar outcomes with only 25% of typical measurements. Validated in simulations and experiments, it excels in low-light scenarios and high-sensitivity imaging like night vision and biomedical applications.
- Published findings in Sensors. [DOI: 10.3390/s18103449.], contributing significant advancements to the optimization of compressed sensing theory for practical imaging applications

Publications & Patents

Publications

- **Shangguan, W.**, Sun, Y., Gan, W. and Kamilov, U.S., 2022, October. Learning cross-video neural representations for high-quality frame interpolation. In *European Conference on Computer Vision* (pp. 511-528). Cham: Springer Nature Switzerland.
- **Shangguan, W.**; Yan, Q.; Wang, H.; Yuan, C.; Li, B.; Wang, Y. Adaptive Single Photon Compressed Imaging Based on Constructing a Smart Threshold Matrix. *Sensors* 2018, 18, 3449. DOI: 10.3390/s18103449.

Patents

- **Wentao Shangguan**, A Kind of Self-powered Intelligent Protective Case, Patent No.: 201720014838.5.(CN)
- **Wentao Shangguan**, Sule Zhang, An Intelligent Separating Soldering Station, Patent No.:201820251464.3.(CN), ZL 2018 1 0145334.6 (CN)

Working Experience

Shenzhen Institutes of Advanced Technology (SIAT), Chinese Academy of Science(CAS) *Shenzhen, China*

Center for Optoelectronic Engineering Technologies

Research Assistant *Advisor: Professor Jianping Li* *Mar. 2019 - Dec. 2019*

- Collaborated on the development of an advanced plankton imaging system for long-term, online, in situ monitoring and classification of plankton. This system, noted for its high integration, intelligence, and reliability, utilizes a 5G network for real-time data transmission, ensuring immediate accessibility of collected data.
- Assisted in creating a proprietary image database for zooplankton and phytoplankton in Daya Bay, Shenzhen, China. This database was instrumental in training neural networks for the accurate classification of various plankton species.
- Led the design and implementation of the hardware and software components for an online chemical oxygen demand (COD) sensor based on spectrophotometry. This innovative solution, utilizing a 5G network for remote monitoring, facilitated in situ monitoring of seawater quality, marking a significant contribution to environmental science.
- Successfully deployed the COD sensor in Daya Bay for a two-month pilot study, conducting regular maintenance and data collection. This hands-on experience highlighted the practical application of your engineering and research skills in a real-world setting.
- Presented the Underwater Plankton Imaging System and online COD sensor at the 2019 China Marine Economy Expo, showcasing the cutting-edge technology and its potential impact on environmental monitoring.

Skills & Research Interests

Skills PyTorch, Tensorflow, Python, Matlab, C/C++, Java, HTML, PHP, JavaScript, Django, Jekyll, Verilog HDL, Photoshop, Lightroom, Final Cut Pro, LaTeX

Research Interests Multiple Frame Integration, Large Vision Model, Generative Model, Video Processing, Optimization, Inverse Problem, Computational Imaging, Compute Vision