Yaoshen Yuan

2020 Summer Internship

Senior PhD candidate with skills in programming, GPU acceleration, image processing and data analysis. Professional experience includes interdisciplinary collaboration with doctors, real-world problem solving and public presentation.

Experience

PhD Research Assistant

2018-now

Implicit mesh-based Monte Carlo (MMC) algorithm for complex tissue structure

- Devise an algorithm using implicit mesh topology to improve conventional MMC
- Reduce the mesh complexity of complex vessel network by over 200-fold
- Achieve 20% speed improvement compared to conventional MMC method
- Accelerate implicit Monte Carlo method with GPU using OpenCL, improving speed by hundreds fold compared to CPU version.

2018-2019

Photobiomodulation (PBM) dosimetry across lifespan

- Study PBM (for Major Depressive Disorder treatment) dosimetry in two brain regions using Monte Carlo simulation for individuals of 1 to 89 years of age
- Report a general decrease of energy deposition and increase of exposure duration over age at different regions of interest
- Discover a strong correlation (R^2 >0.9) between the thickness of extra-cerebral tissue (ECT) of and energy deposition in brain

2016-2018

3D image denoising using GPU-accelerated adaptive nonlocal means (ANLM) filter

- Apply graphic processing unit (GPU) to accelerate filtering processing using CUDA with all features of ANLM filter preserved
- Achieve 3 to 4-fold speed-up compared to advance multi-thread CPU filter
- Apply filter to 3D Monte Carlo photon transport image to reduce stochastic noise
- Obtain 6 dB improvement in signal-to-noise ratio (SNR) which is equivalent to adding 3.5-fold more photons in Monte Carlo simulation

Master's Student Researcher

2015-2016

Multi-energy approach in Compton and PE reconstruction in CT imaging

- Use multi-energy bin to reconstruct the Compton and photoelectric images
- Introduce a weighted reconstruction method based on a quadratic approximation to the Poisson likelihood function that deemphasizes energy bins with low signal
- Use Cramer-Rao lower bound to compare the SNR between dual and multiple bins reconstruction methods
- Improve SNR of reconstructions by over 20 dB for the high attenuation phantom

Teaching Assistant

2015-2016

Introduction to Electrical Systems

- Complete work including grading, mentoring and holding office hour

Education

2016-now **PhD candidate, Northeastern University, Electrical and Computer Engineering**

- Lead research projects in the field of biomedical optics
- Develop algorithm and software maintenance for MC light transport simulator
- Organize workshop and trouble-shooting for in-house MCX software toolbox

2014-2016 **Master of Engineering, Tufts University, Electrical and Computer Engineering**

- Study linear algebra, image processing and computer vision
- Conduct research project on CT imaging for airport security with publications

2010-2014 **Bachelor of Engineering, Southeast University, China, Automation**

- Study signal processing and automation
- Participate in Electronic Design Competition with 2nd prize
- Collaborate with engineers to finish embedded system design for vending machine

Certifications and interests

Coursera certifications

Convolutional Neural Networks, Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization, Neural Networks and Deep Learning

Interests

Image processing, computer vision, GPU acceleration, deep learning, machine learning, signal processing

Personal Info

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Language

- C/C++
- CUDA
- MATLAB
- Java
- Python

Soft skills

- Communication
- Independence
- Problem-solving
- Presentation
- Time-management