

Yaoshen Yuan (internship, May-Aug 2020)

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EDUCATION

Northeastern University Boston, MA
Ph.D. Candidate, Electrical and Computer Engineering Expected 2021

Relevant Coursework: Biomedical Optics, Computer Vision, Numerical Optimization, Numerical Analysis

Tufts University Medford, MA
M.Sc., Electrical and Computer Engineering 2014-2016

Thesis: The Application of Multiple Energy Bins in Compton and Photoelectric Reconstructions of X-ray Computed Tomography

Relevant Coursework: Digital Image Processing, Signal Processing, Probability, Stochastic Process, Linear Algebra.

Southeast University Nanjing, China
B.S., Electrical and Computer Engineering 2010-2014

Thesis: Pedestrian Detection Using 5-layer Convolution Neural Network

Awards: Second Prize in Electronic Design College Competition.

RESEARCH EXPERIENCE

Northeastern University Boston, MA
Research Assistant September 2016

- Devised an innovative algorithm using implicit shapes-edge, node and face-in tetrahedral meshes to represent complex tissue structures such as vessel, pores and membrane in mesh-based Monte Carlo (MMC) method for light transport modeling, resulting in a 200-fold reduction in computer memory and 20% speed improvement compared to conventional MMC method.
- Applied the state-of-art Monte Carlo light transport simulation on accurate brain models from 5 to 89 years old to quantify the light dosage of transcranial photobiomodulation (t-PBM) across lifespan, discovering a decrease in energy deposition over age for all source positions and target regions and a strong correlation ($R^2 > 0.9$) between the thickness of extra-cerebral tissue (ECT) and energy deposition.
- Designed a memory-saving strategy for graphics processing unit (GPU) to accelerate 3D adaptive non-local means filter by using 3-D share memory to increase memory usage, reducing the GPU filtering kernel runtimes by 50% from the baseline. Applying the filter to Monte Carlo (MC) light modeling results brings 6 dB improvement in signal-to-noise ratio (SNR), which is equivalent to adding 3.5x photons in MC simulation.

Tufts University Boston, MA
Graduate Researcher May 2015

- Studied a multi-energy approach in Compton and PE reconstruction in CT imaging by introducing a weighted reconstruction method based on a quadratic approximation of Poisson likelihood function to deemphasizes energy bins with low signal, with the peak signal-to-noise ratio (PSNR) of reconstructions improved by over 20 dB for phantoms with high-attenuation such as metals.

PROFESSIONAL EXPERIENCE

Bioengineering Research Symposium Boston, MA
Presenter June 2018

- Presented a poster on the transcranial photobiomodulation dosimetry study across lifespan using the state-of-art Monte Carlo light modeling simulator.

OSA Biophotonics Congress Hollywood, FL
Presenter April 2018

- Presented a poster regarding 3D filtering on Monte Carlo light transport image using graphics processing unit (GPU) for acceleration.

Mathworks Day

Boston, MA

Presenter

March 2018

- Introduced various in-house MATLAB toolboxes for light modeling and mesh generation that are widely used in biophotonics community by presenting a poster.

TEACHING EXPERIENCE

Tufts University

Boston, MA

Graduate Teaching Assistant

December 2015

- Mentored undergraduate students for Introduction to Electrical Systems.
- Participated in homework grading and office hour.

LEADERSHIP AND SERVICE

MCX workshop

Boston, MA

Technical Assistant

August 2019

- Organized the workshop for in-house light propagation simulator MCX.
- Delivered a speech for software instruction and provided technical supports for workshop attendants.

PUBLICATIONS

"Transcranial Photobiomodulation with Near-Infrared Light from Childhood to Elderliness: Simulation of Dosimetry", **Yuan, Yaoshen**, Paolo Cassano, Matthew Pias, and Qianqian Fang, bioRxiv (2020).

"Graphics processing units-accelerated adaptive nonlocal means filter for denoising three-dimensional Monte Carlo photon transport simulations", **Yuan, Yaoshen**, Leiming Yu, Zafer Doğan, and Qianqian Fang, Journal of biomedical optics 23, no. 12 (2018): 121618.

"Selective photobiomodulation for emotion regulation: model-based dosimetry study", Cassano, Paolo, Anh Phong Tran, Husam Katnani, Benjamin S. Bleier, Michael R. Hamblin, **Yaoshen Yuan**, and Qianqian Fang, Neurophotonics 6, no. 1 (2019): 015004.

"The Application of Multiple Energy Bins in Compton and Photoelectric Reconstructions of X-ray Computed Tomography", **Yaoshen Yuan**, PhD diss., Tufts University, 2016.

CONFERENCE PROCEEDINGS

Yuan, Yaoshen, Leiming Yu, and Qianqian Fang. "Denoising in Monte Carlo photon transport simulations using GPU-accelerated adaptive non-local mean filter." In Optical Tomography and Spectroscopy, pp. JTh3A-41. Optical Society of America, 2018.

Yuan, Yaoshen, Brian Tracey, and Eric Miller. "Robust x-ray based material identification using multi-energy sinogram decomposition." In Anomaly Detection and Imaging with X-Rays (ADIX), vol. 9847, p. 98470V. International Society for Optics and Photonics, 2016.

Yu, Leiming, **Yaoshen Yuan**, Zhao Hang, David Kaeli, and Qianqian Fang. "Denoising in Monte Carlo Photon Transport Simulation Using Neural Networks."

AWARDS

SPIE Student Member

Second Prize in Electronic Design Competition, Southeast University

Course scholarship for Microcomputer Systems & Interfaces

Software patent of the PRC (2015SR137375)

SKILLS

Programming Languages: C, MATLAB, CUDA, Java, C++, Python, Latex

Software: Eclipse C++, Eclipse Java, Spyder, Microsoft Office, Overleaf, Keil, Qt4, Quartus II

Languages: Chinese, English, Cantonese