Zhe Li

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Education

Ph.D., Physics, Purdue University, West Lafayette, IN, USA   August 2015 – Present
- Focus in experimental biophysics and biomedical optics. GPA 3.91

B.S., Physics, Nanjing University, Nanjing, Jiangsu, China   September 2011 – June 2015
- GPA 3.81

Experience

Research Assistant, Nolte Group, Purdue University   May 2016 – Present
- "PBSTracker" computing job monitoring system for Portable Batch System (PBS)
    - Implemented a web server with React/Axios as the Ajax-based frontend and MongoDB/Express as the backend to support job management and serve APIs
    - Implemented a Python-based Linux client to allow job submission and status reporting
    - Integrated the system with OneSignal APIs to support universal notifications delivered to email/web browsers/mobile devices
    - Published source code on GitHub and deployed a demo website on Google Cloud Platform
- Sample management website with Django/Vue.js/MySQL
    - Implemented an Ajax-based frontend with Vue.js to enable browsing and quick editing of experimental records
    - Implemented a backend with Django to provide OAuth 2.0 authentications and RESTful APIs for data fetching in MATLAB and Python
- CUDA-enabled digital holography image acquisition, processing and monitoring system
    - Implemented a PyQt5-based desktop GUI app for instrument control, real-time digital holography image acquisition and reconstruction with Nvidia CUDA libraries
    - Created a framework for connecting lab instruments and asynchronously executing experiment sequence
    - Implemented an experiment status monitoring and error handling system
- Machine learning classifier to predict porcine parthenote viability
    - Collected dynamic light scattering data from about 200 samples
    - Selected 13 biomarkers that are most relevant to biological viability
    - Developed a classifier based on an SVM with a quadratic kernel that identifies parthenote with high developmental potential; Achieved a binary accuracy of around 80% with five-fold cross-validation
    - Published a peer-reviewed paper in the biomedical optics journal *The Journal of Biomedical Optics* (JBO)

- Functional imaging of chemotherapy drug response
  - Proposed a protocol to create spatial mapping of drug strengths with biodynamic imaging
  - Designed and evaluated 2D colormaps based on sRGB and L*a*b* color spaces
  - Correlated bivariate response images with tissue features and drug mechanisms
  - Created time-lapse drug response images
- Photon Monte Carlo simulations to model tissue dynamics imaging based on digital holography
  - Conducted parameter studies on light source properties and tissue features
  - Proposed a model for drug mechanisms and investigated effects on tissue dynamics
- Theoretical framework to interpret dynamic light scattering fluctuation spectrum
  - Established the hypothesis with a "persistent walk" model for intracellular transport
  - Validated the transport model with Monte Carlo simulations
  - Supported the hypothesis with experimental data
  - Published a peer-reviewed paper in the optics journal *Journal of the Optical Society of America A* (JOSA A)

Skills

- C++, Java, Python, MATLAB and JavaScript
- React, Vue.js, Django, CUDA, Qt, numpy, matplotlib, pandas and scikit-learn
- Arduino and Raspberry Pi

Publications

- Zhe Li, Shadia Jalal, John Turek, David Nolte, "Intracellular Doppler Spectroscopy of Anticancer Cytoskeletal Drug with Contrasting Mechanisms of Action" (in preparation)
- Zhe Li, Shadia Jalal, John Turek, David Nolte, "Tissue Dynamics Spectroscopic Imaging: Functional Imaging of Heterogeneous Sample Responses" (in preparation)
- Zhe Li, Natalie Ehmke, Ilka M. Lorenzo, Zoltan Machaty, David Nolte, "Biodynamic optical assay for embryo viability," *J. Biomed. Opt.* 24(6) 060502 (25 June 2019)
- Zhe Li, Hao Sun, John Turek, Shadia Jalal, Michael Childress, and David D. Nolte, "Doppler fluctuation spectroscopy of intracellular dynamics in living tissue," *J. Opt. Soc. Am. A* 36, 665-677 (2019)
- Honggu Choi, Zhe Li, Hao Sun, Dan Merrill, John Turek, Michael Childress, and David Nolte, "Biodynamic digital holography of chemoresistance in a pre-clinical trial of canine B-cell lymphoma," *Biomed. Opt. Express* 9, 2214-2228 (2018)
- Zhe Li, John Turek, David D. Nolte, "Common-path biodynamic imaging for dynamic fluctuation spectroscopy of 3D living tissue," *Proc. SPIE 10063, Dynamics and Fluctuations in Biomedical Photonics XIV*, 100631G (3 March 2017)

Awards

- Bilsland Dissertation Fellowship (2019)