




SHENGHUA HE

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Education

Washington University in St. Louis

St. Louis, MO

Ph.D. candidate in Computer Science, Visiting scholar in UIUC

Aug 2016 – Dec 2021 (Expected)

- GPA, 3.92/4.0

Advisors: Mark Anastasio (UIUC), Hua Li (UIUC)

Beijing University of Posts and Telecommunications (BUPT)

Beijing, China

M.E. in Electronics and Communications Engineering

Sep 2012 – Apr 2015

- GPA: 82/100

Advisor: Xiangming Wen

Wuhan University of Technology (WUT)

Wuhan, China

B.E. in Electronic Science and Technology

Sep 2008 – Jun 2012

- GPA: 90.4/100 (top 3.7%)

Expertises

Deep learning (DL) for biomedical image processing

- Skilled at building convolutional neural networks (CNN) for **image classification, segmentation, object detection and counting tasks**
- Developed models: EfficientNets, EfficientDet, ResNet, VGG, AlexNet, U-net, FCN, Attention U-net, EfficientNet U-net, and Mask R-CNN
- Skilled learning techniques: deep supervision, transfer learning, and adversarial learning

Machine learning (ML) for clinical applications

- Skilled at developing ML methods for feature selection, multimodal feature fusion, and classification model learning in cancer outcome prediction
- Supervised algorithms: linear regression, logistic regression, SVM, KNN, Evidential-KNN
- Unsupervised algorithms: K-mean, mRMR, PCA, Canonical correlation analysis (CCA)

Engineering skills

- Programming: Python: Numpy, Keras, Tensorflow, Pytorch; Matlab; Java
- Tools: Linux; HPC; Docker; Git; Jupyter Notebooks

Experience

University of Illinois Urbana-Champaign (UIUC)

Apr 2019 – Present

Visiting Scholar

Urbana, IL

- *White blood cell detection and classification*
 - Developed state-of-the-art one-stage CNN-based detection models to accurately detect and classify WBCs from different categories: neutrophils, bands, eosinophils, lymphocytes, and monocytes
- *Multi-class biomedical image segmentation*
 - Proposed and developed CNN models to accurately segment nuclei with different viability (live, injured and dead) and cell cycles (S1,G,S2 phases)
- *3D biomedical image modality translation*
 - Proposed and developed a CNN model to effectively translate 3D phase images to 3D fluorescent images

- *Cancer treatment outcome prediction*
 - Proposed a machine learning framework to select informative miRNA biomarkers and accurately predict patient survival
 - Proposed a hybrid ML/DL framework to fuse image data and miRNA biomarkers for predicting patient survival

Washington University in St. Louis

Research Assistant

Aug 2016 – present

St. Louis, MO

- *Object counting in biomedical images*
 - Proposed and developed a novel CNN model to accurately count high-density and occluded cells in microscopy images

Clemson University

Research Assistant

May 2015 – May 2016

Clemson, SC

- *Traffic redundancy elimination (TRE) for wireless networks*
 - Proposed and developed a cloud-assisted TRE system to improve the data transportation efficiency

Beijing University of Posts and Telecommunications

Research Assistant

Sep 2012 – Apr 2015

Beijing, China

- *Resource allocation in heterogeneous wireless networks*
 - Proposed novel algorithms to improve the efficiency in utilization of wireless frequency and channels

Publications

7 published peer-reviewed journal papers, including Medical Image Analysis (IF 11.148), Bioinformatics (IF 5.610), and Elife (IF 7.08); 17 published conference papers; 2 journal papers under review.

Under review

- Chenfei Hu*, **Shenghua He***, Young Jae Lee, Yuchen He, Edward Minjae Kong, Hua Li, Mark A. Anastasio, and Gabriel Popescu. "Label-free cell viability assay using phase imaging with computational specificity." *bioRxiv* (2020). (*Nature communications 2021 under review*)
- Xi Chen, Mikhail E. Kandel, **Shenghua He**, Chenfei Hu, Young Jae Lee, Kathryn Sullivan, Gregory Tracy, Hee Jung Chung, Hyun Joon Kong, Mark Anastasio, Gabriel Popescu. "Artificial confocal microscopy for deep label-free imaging." *arXiv:2110.14823* (2021). (*Submitted to Nature Photonics*)

Published Journal Papers

- Maliazurina Saad*, **Shenghua He***, Wade Thorstad, Hiram Gay, Su Ruan, Xiaowei Wang, and Hua Li, "Learning-based Cancer Treatment Outcome Prognosis using Multimodal Biomarkers", (Accepted to IEEE Transactions on Radiation and Plasma Medical Sciences 2021)(* equal contribution)
- **Shenghua He**, Chunfeng Lian, Wade Thorstad, Hiram Gay, Yujie Zhao, Su Ruan, Xiaowei Wang, and Hua Li, "A novel systematic approach for cancer treatment prognosis and its applications in oropharyngeal cancer with microRNA biomarkers" *Bioinformatics*. 2021 Apr; **impact factor 5.610**
- Kyaw Thu Minn, Yuheng C. Fu, **Shenghua He**, Sabine Dietmann, Steven C. George, Mark A. Anastasio, Samantha A. Morris, and Lilianna Solnica-Krezel. "High-resolution transcriptional and morphogenetic profiling of cells from micropatterned human ESC gastruloid cultures." *Elife* 9 (2020): e59445., **impact factor 7.08**

- **Shenghua He**, Kyaw Thu Minn, Lilianna Solnica-Krezel, Mark A. Anastasio, and Hua Li. “Deeply-supervised density regression for automatic cell counting in microscopy images.” *Medical Image Analysis* 68 (2020): 101892., **impact factor 11.148**
- **Shenghua He***, Jian Wu*, Chunfeng Lian, H. Michael Gach, Sasa Mutic, Walter Bosch, Jeff Michalski, and Hua Li. “An Adaptive Low-Rank Modeling-based Active Learning Method for Medical Image Annotation.” *IRBM* (2020), **impact factor 1.022**.
- Yan Zhuang, Lei Yu, Haiying Shen, William Kolodzey, Nematollah Iri, Gregori Caulfield, and **Shenghua He**. “Data collection with accuracy-aware congestion control in sensor networks.” *IEEE Transactions on Mobile Computing* 18, no. 5 (2018): 1068-1082., **impact factor 5.112**
- Jun Zhao, Zhaoming Lu, Xiangming Wen, Haijun Zhang, **Shenghua He**, and Wenpeng Jing. “Resource management based on security satisfaction ratio with fairness-aware in two-way relay networks.” *International Journal of Distributed Sensor Networks* 11, no. 7 (2015): 819195. **impact factor 1.15**
- **Shenghua He**, Zhaoming Lu, Xiangming Wen, Zhicai Zhang, Jun Zhao, and Wenpeng Jing. “A pricing power control scheme with statistical delay QoS provisioning in uplink of two-tier OFDMA femtocell networks.” *Mobile Networks and Applications* 20, no. 4 (2015): 413-423., **impact factor 2.6**

Published Conference papers

- Zong Fan, **Shenghua He**, Ethan Chen, Su Ruan, Xiaowei Wang, and Hua Li, “Multi-class classification based on multi-loss strategy and auxiliary deep learning network with applications in medical imaging.” *accepted to AAPM Annual Meeting 2021*.
- Xi Chen, Mikhail Kandel, **Shenghua He**, Young Jae Lee, Kathryn Sullivan, Hyun Joon Kong, Mark Anastasio, and Gabriel Popescu. “Laser scanning GLIM (LS-GLIM) for label-free imaging of turbid samples.” *SPIE Photonics West BiOS 2021*.
- Chenfei Hu*, **Shenghua He***, Young Jae Lee, Yuchen R. He, Mark Anastasio, and Gabriel Popescu, “Label-free cell viability assay using phase imaging with computational specificity (PICS)”, *SPIE Photonics West BiOS 2021*.
- Yuchen R. He*, **Shenghua He***, Mikhail E. Kandel*, Young Jae Lee, Nahil Sobh, Mark Anastasio, and Gabriel Popescu, “Cell cycle detection using phase imaging with computational specificity (PICS)”, *SPIE Photonics West BiOS 2021*.
- Zong Fan, **Shenghua He**, Su Ruan, Xiaowei Wang, and Hua Li, “Deep learning-based multi-class COVID-19 classification with x-ray Images”, *SPIE Medical Imaging 2021*.
- Fu Li, Umberto Villa, Seonyeong Park, **Shenghua He**, Mark A. Anastasio, “A framework for ultrasound computed tomography virtual imaging trials that employs anatomically realistic numerical breast phantoms”, *SPIE Medical Imaging 2021*.
- **Shenghua He**, Weimin Zhou, Kaiyan Li, Mark Anastasio, and Hua Li, “Quantitative Performance Analysis of Supervised Transfer Learning and Unsupervised Domain Adaptation Methods Employed in Medical Imaging Applications.” *2020 Joint AAPM/COMP Meeting*.
- Kaiyan Li, Weimin Zhou, **Shenghua He**, Hua Li, and Mark Anastasio, “Supervised Learning-Based Ideal Observer Approximation for Joint Detection and Estimation Tasks.” *2020 Joint AAPM/COMP Meeting*.
- Maliazurina Saad, **Shenghua He**, Wade Thorstad, Hiram Gay, Xue Wu, Su Ruan, Yujie Zhao, Xiaowei Wang, and Hua Li, “Multimodal Biomarkers for Cancer Treatment Outcome Prediction by Use of Deep Learning and Canonical Correlation Analysis.” *2020 Joint AAPM/COMP Meeting*
- Maliazurina Saad, **Shenghua He**, Wade Thorstad, Hiram Gay, Xue Wu, Su Ruan, Yujie Zhao, Xiaowei Wang, and Hua Li, “Leveraging Incomplete Multimodal Biomarkers for Cancer Treatment Outcome Prediction.” *2020 Joint AAPM/COMP Meeting*.
- **Shenghua He**, Weimin Zhou, Hua Li, and Mark A. Anastasio, “Learning numerical observers using unsupervised domain adaptation,” *SPIE Medical Imaging 2020*.
- **Shenghua He**, Kyaw Thu Minn, Lilianna Solnica-Krezel, Hua Li, and Mark Anastasio. “Automatic microscopic cell counting by use of unsupervised adversarial domain adaptation and supervised density regression”, *SPIE Medical Imaging 2019*.
- **Shenghua He**, Ziyao Yi, Su Ruan, Mark Anastasio, Sasa Mutic, Hiram Gay, Wade Thorstad, Xiaowei Wang, Hua Li, “MicroRNA-Based Survival and Relapse Prognosis for Oropharyngeal Cancer Treatment by Use of Cox Regression and Belief Function Theory”, *AAPM 2019*

- **Shenghua He**, Kyaw Thu Minn, Lilianna Solnica-Krezel, Mark Anastasio, and Hua Li. “Automatic microscopic cell counting by use of deeply-supervised density regression model,” *SPIE Medical Imaging 2019*.
- **Shenghua He**, Jie Zheng, Akiko Maehara, Gary Mintz, Dalin Tang, Mark Anastasio, and Hua Li. “Convolutional neural network based automatic plaque characterization for intracoronary optical coherence tomography images”, *SPIE Medical Imaging 2018*.
- **Shenghua He**, Haiying Shen, Vivekgautham Soundararaj, and Lei Yu. “Cloud Assisted Traffic Redundancy Elimination for Power Efficiency in Smartphones.” *In 2018 IEEE 15th International Conference on Mobile Ad Hoc and Sensor Systems (MASS)*, pp. 371-379. *IEEE, 2018*.
- **Shenghua He**, Ling Zhang, Xiangming Wen, Zhicai Zhang, Zhaoming Lu, and Yong Sun. “Price-based power control with statistical delay QoS guarantee in two-tier femtocell networks.” *In 2014 21st International Conference on Telecommunications (ICT)*, pp. 318-322. *IEEE, 2014*.

Honor and Awards

- Honors Award (top 15-20%) in annual Periodic Review of Doctoral Students, WashU CSE department, 2020-2021
- National Scholarship for Graduates (top 5%), Ministry of Education, P.R.China, Oct 2014
- Outstanding Graduate Award (top 5%), Wuhan University of Technology, Sep 2011
- National Scholarship of Encouragement (top 10%), Ministry of Education, P.R.China, Sep 2011
- Excellent Student Work Award, School of Information Engineering, WUT, Sep 2011
- National Scholarship of Encouragement (top 10%), Ministry of Education, P.R.China, Sep 2010
- Excellent Student Work Award (top 10%), School of Information Engineering, WUT, Mar 2010
- National Scholarship of Encouragement (top 10%), Ministry of Education, P.R.China, Sep 2009
- 3-A student award, Wuhan University of Technology, Mar 2009