Mingren Shen

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Education

University of Wisconsin-Madison *Overall GPA: 3.9 / 4.0*

Ph.D. Materials Science, focus on machine learning for material informatics, expected December 2021

M.S. Computer Sciences, May 2019; M.S. Materials Science, December 2020

SelectedCourses: *Artificial Intelligence, Algorithm, Big Data Systems, Machine Learning, Data Science Principles*

University of Chinese Academy of Sciences M.S. Physics , July 2016 *Overall GPA: 3.8 / 4.0*

Nanjing University B.S. Physics, July 2013 *Overall GPA: 3.8 / 4.0*

SELECTED PROJECTS

Computing High-Fidelity PDE Solutions on Coarse Meshes using Machine Learning *June. 2021 - Present*

Internship with guidence from Rishikesh Ranade and Jay Pathak of Ansys Inc.

- Propose a machine learning strategy to calculate high fidelity solutions on coarse meshes.
- Design a convolutional neural network to correct the lower resolution 3D flow fields computed by PDE solvers to higher resolution ones with adding of small-scale features that are not contained in lower resolution simulations.
- The correction is predicted on each mesh element and is a function of the solution fields and their gradients on that element as well as its neighbors
- Initial results indicate the neural network can accelerate the CFD simulations with fewer resources and generate flow field that is comparable to higher resolution simulations.

Use of Machine Learning For Identification of Mucinous Pancreas Cancer *June. 2020 - Present*

- Examine the prediction potential of building pancreas cancer classifiers based on radiometric features
- Solved the imbalanced dataset problem with Synthetic Minority Oversampling Technique (SMOTE)
- Accepted in annual meeting of Society of Abdominal Radiology, 2021

Automated Defect Recognition in Electron Microscopy Images and Videos *March. 2018 - March. 2020*

- Automated identification of dislocation loops in irradiated steels
- Used Faster R-CNN (ChainerCV) for detecting material defects in microscopy images and YOLO(Keras+Tensorflow) for microscopy videos
- Improved performance **F1 from 0.65/0.78 to 0.91/0.95** which was faster and more stable than human experts

GAN for Super Resolution of Simulated STEM Images *September. 2018 - October. 2020*

- Developed Generative Adversarial Networks (pix2pix) model to convert lower resolution but fast generate simulated STEM images to the higher resolution but slower generated images.
- Reduced relative error **from 10% to 1%** and satisfied all physical requirements

Identifying Bleeding Sites on Blood Vessel X-ray Images *September. 2018 - Present*

- Developed a two-stage model to solve the bleeding site detection problem.
- The first stage (ResNet152) classifies bleeding and non-bleeding patients, **achieving 86% accuracy**
- The second stage (YOLO) finds the bleeding sites on the image, **identifying 13 of the 19 bleeding sites**.
- Accepted by a radiologist conference, CIRSE2019 and CIRSE2020.

Others *Course Projects*

- **Building Query Time Optimized Video Inference System by Feature Map Reusing**: Optimizing the latency of a video inference system by reusing the intermediate results of first CNN (ResNet50) to accelerate the calculation of second CNN (ResNet152) znd achieved **18% latency decrease without sacrificing the accuracy of the model**
- https://github.com/iphyer/FocousIngestOpt_FinalProject_CS744Fall2018
- **BBQ: Bounding Box Quality Checker,**: A web service built with Flask for checking the quality of object detection algorithm. https://github.com/iphyer/BBQ_Madhacks2018
- **Twitter Gender Classifier**: Collected Twitter user data(text and profile) from St Louis, MO to build a user gender classifier(Random Forest) based on Twitter messages. https://github.com/iphyer/cs760_TwitterDemographics
- **Driver-test-schedule-system**: Developed email reminder service for Driver-testers when there were personalized available space for their driving test in College Town of TAMU. https://github.com/iphyer/RoadTest-Scheduler

Skills

Programming: Python, Java, C **Software**: Linux, Git, Bash **Frameworks**: Keras, PyTorch, Pandas, Scikit-learn, OpenCV

Selected Publications

1. **Mingren Shen**, Guanzhao Li, Dongxia Wu, Yuhan Liu, Hima Bharathi Adusumilli, Jacob Greaves, Wei Hao, Nathaniel J. Krakauer, Leah Krudy, Jacob Perez, Varun Sreenivasan, Bryan Sanchez, Oigimer Torres, Wei Li, Kevin.G. Field, Dane Morgan. "Multi Defect Detection and Analysis of Electron Microscopy Images with Deep Learning." Computational Materials Science 199 (2021): 110576.
2. **Mingren Shen**, Guanzhao Li, Dongxia Wu, Yudai Yaguchi, Jack C. Haley, Kevin G. Field, and Dane Morgan. "A deep learning based automatic defect analysis framework for In-situ TEM ion irradiations." Computational Materials Science 197 (2021): 110560.
3. Kevin G. Field, Ryan Jacobs, **Mingren Shen**, Matthew Lynch, Priyam Patki, Christopher Field, and Dane Morgan. "Development and Deployment of Automated Machine Learning Detection in Electron Microcopy Experiments." Microscopy and Microanalysis 27, no. S1 (2021): 2136-2137.
4. Gurbani, Sidharth, Dane Morgan, Varun Jog, Leo Dreyfuss, **Mingren Shen**, Arighno Das, E. Jason Abel, and Meghan G. Lubner. "Evaluation of radiomics and machine learning in identification of aggressive tumor features in renal cell carcinoma (RCC)." Abdominal Radiology (2021): 1-11.
5. Lawrence, Nick, **Mingren Shen**, Ruiqi Yin, Cloris Feng, and Dane Morgan. "Exploring Generative Adversarial Networks for Image-to-Image Translation in STEM Simulation." arXiv preprint arXiv:2010.15315 (2020).
6. Xiaoyu Sun, Nathaniel J. Krakauer, Alexander Politowicz, WeiTing Chen, Qiying Li, Zuoyi Li, Xianjia Shao, Alfred Sunaryo, **Mingren Shen**, James Wang, Dane Morgan."Assessing Graphbased Deep Learning Models for Predicting Flash Point." Molecular Informatics (2020), 39 , 1900101.
7. Liu, Yilin, Gregory R. Kirk, Brendon M. Nacewicz, Martin A. Styner, **Mingren Shen**, Dong Nie, Nagesh Adluru, Benjamin Yeske, Peter A. Ferrazzano, and Andrew L. Alexander. "Harmonization and Targeted Feature Dropout for Generalized Segmentation: Application to Multi-site Traumatic Brain Injury Images." In Domain Adaptation and Representation Transfer and Medical Image Learning with Less Labels and Imperfect Data, pp. 81-89. Springer, Cham, 2019.
8. **Ming-Ren Shen**, Rui Liu, Ke Chen, and Mingcheng Yang. "Diffusive-Flux-Driven Microturbines by Fore-and-Aft Asymmetric Phoresis." Physical Review Applied 12, no. 3 (2019): 034051.
9. Luo, Guan-Zheng, Ziyang Hao, Liangzhi Luo, **Mingren Shen**, Daniela Sparvoli, Yuqing Zheng, Zijie Zhang et al. "N 6-methyldeoxyadenosine directs nucleosome positioning in Tetrahymena DNA." Genome biology 19, no. 1 (2018): 200.
10. **Ming-Ren Shen**, Fangfu Ye, Rui Liu, Ke Chen, Mingcheng Yang, and Marisol Ripoll. "Chemically driven fluid transport in long microchannels." The Journal of chemical physics 145, no. 12 (2016): 124119.