XUDONG(NICK) ZHANG
PhD Candidate

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Research Interest

- Large-scale and High-performance Machine Learning, Deep Learning, NLP, Computer Vision.
- Object Tracking, Image Segmentation and Reconstruction.
- Modeling (ODE, PED, and Stochastics) and Simulation.

Education

Ph.D. | May 2021 (expected)| City University of New York, New York, USA.
Major: Computer Science (GPA: 3.91)

M. PHIL | 2014 | City University of New York, New York, USA.
Major: Mechatronics Engineering (Biosensor design and fabrication) (GPA: 3.74)

B. ENG | 2008 | Jilin University, Changchun, China.
Major: Mechatronics Engineering (GPA: 3.4)

Skills

- **Programming platforms**: Python, C++, MATLAB, Java.
- **Packages**: Scikit-learn, PyTorch, Pandas, NumPy, OpenCV, Matplotlib.
- **Machine/Deep Learning**: LightGBM, XGBoost, AdaBoost, Logistic Regression, Decision Trees, Random Forest, SVM (Support Vector Machines), Linear Regression, Clustering, Gaussian Mixture Models (GMM), Deep Learning (CNN, RNN).
- **High-performance and parallel packages**: OpenMPI, MPICH, Numba.
- **Operation System**: Linux (Ubuntu), Windows, Mac OS.

Academic Experience

09/2016 – Present, PhD Candidate, Dept. of Computer Science, City University Of New York, Ny, USA.

- Proposed a convolutional neural network (CNN)-based and one-stage ReID-based tracking model named HTracker to improve the tracking speed from **22 fps to 36.7 fps (state-of-the-art)** on public dataset MOT16, MOT17 challenges, which is **better than** the state-of-the-art trackers.
- Solved the missing data problems for **large-scale** datasets (20-year electronic health records of NYC) by using the maximum likelihood estimation. This imputation improved the disease prediction accuracy **from 0.8943 to 0.9621** on an SVM machine learning model.
- Analyzed, identified, and forecasted the crime victims and behaviors from National Crime Victimization dataset (NCVS-ITS 2012,2014,2016) by using the SVM model, the random forest classifier, and the pre-defined rules to improve the prediction accuracy **from 69.37% to 82.76%.**
- Segmented and reconstructed the fine chords with diameters **0.5mm-2mm** from 3D human heart images by using arithmetic topology, Discrete Morse theory, and an SVM classification model. Unlike the learning-based (CNN and GAN) model, the proposed model can provide precise segmentation results from **a small amount of image data without training**.
- Proposed a high-performance Gaussian Mixture clustering model (GMM) by using simultaneous perturbation stochastic approximation (SPSA) to improve the speedup factors, which is **6 times faster than** the traditional GMM model by using FDFA optimization.
- Propose a novel heuristic function for A* searching algorithm to identify the topological priors and the shortest topological cycles to lower the consumption of searching time and memory by **reducing the** number of expanded nodes by **5.8 times** in A* search.
- Propose a parallelized simulated annealing (SA) model for searching the global optima to improve the filtering efficiency by **102 times** for parallel particle filters on CUNY high-performance clusters (128 CPUs).

09/2011 – 12/2014, Research Assistant, Dept. of Mechanical Engineering, City University of New York, NY, USA.

- Developed **mathematical ODE/PDE models** to analyze the potential field distribution in impedance sensing and optimize the sensor design.
- Designed and fabricated **200 um** microfluidic chips and biosensors, including impedance, quartz crystal microbalance (QCM), and nitric oxide (NO) biosensors for cell activity analysis.
- Wrote **C++** code and Labview program for data acquisition from biosensors. Built experimental platform for cyclically stretching cells and signal acquisition, including software programing, printed circuit board (PCB) and circuit design for step motors.

09/2004 – 09/2008, Research Assistant, Jilin University, Changchun, China.

- Identified the critical features related to the electric spot welding (ESW) and used a backpropagation (BP) **neural network** to analyze and predict the quality of welding.

Work Experience

05/2018 – 08/2018, Data Scientist Intern, BMT Biosystems., Branford, CT, USA.

- Analyzed the data imputation of medical data by using maximum likelihood estimation. The imputed data improved the classification accuracy **by 32.31%**
- Extracted the critical features of medical data by applying the machine learning classifiers. The extracted features improved the (random forest) model stability and prediction accuracy **from 86.22% to 92.13%.**

05/2014 – 05/2016, Research Assistant, Nanofabrication Lab, City College of New York, NY USA.

- Built experimental platform for cyclically stretching cells and signal acquisition, including software programming, printed circuit board (PCB), and circuit design for step motors and data acquisition card.

09/2017 – 05/2020, Adjunct Lecturer, Computer Science Dept. Queens College, NY USA.

- Taught C++, Java, Computer Networks, and Algorithmic Problem Solving.

Honors & Awards

- **Best Paper Award**, Symposium on Theory of Modeling and Simulation 2018, Baltimore, Maryland, USA.
- Graduate Center 5-year fellowship, City University of New York, NY, USA.
- Doctoral Student Research Grant, City University of New York, NY, USA.

Publications

1. <u>Xudong Zhang</u>, Jiehao Xiao, Yifei Gong, Ning Yu, Wei Zhang, Sunghoon Jang, and Feng Gu. "Handling the missing data problem in electronic health records for cancer prediction. In Proceedings of the Modeling and Simulation in Medicine (MSM 2020).
2. Hu, Xiaochen, <u>Xudong Zhang</u>, and Nicholas P. Lovrich. " Forecasting identity theft victims: Analyzing characteristics and preventive actions through machine learning approaches." Victims & Offenders (2020): 1-30.
3. Hu, Xiaochen, <u>Xudong Zhang</u>, and Nicholas Lovrich. "Public perceptions of police behavior during traffic stops: logistic regression and machine learning approaches compared." Journal of Computational Social Science (2020): 1-26.
4. <u>Xudong Zhang</u>, Pengxiang Wu, Changhe Yuan, Yusu Wang, Dimitris Metaxas, and Chao Chen. "Heuristic search for homology localization problem and its application in cardiac trabeculae reconstruction." International Joint Conferences on Artificial Intelligence (IJCAI 2019). (Oral Presentation, Acceptance Rate 17.9%)
5. <u>Xudong Zhang</u>, and Feng Gu. "Adaptive particle sampling and resampling in parallel/distributed particle filters." In Proceedings of the High-Performance Computing 2019.
6. <u>Xudong Zhang</u>, Jiehao Xiao, and Feng Gu. "Applying a support vector machine to electronic health records for cancer classification." In Proceedings of the Modeling and Simulation in Medicine (MSM 2019).
7. <u>Xudong Zhang</u>, Mohamed, A., Nguyen, L, and Gu, F. Performance analysis of parallel/distributed particle filters, Theory of Modeling and Simulation' 18 (TMS 2018) (Best Paper Award, Oral Presentation, acceptance rate 2.5%).
8. <u>Xudong Zhang</u> and Jang Sang "The application of electric cell-substrate impedance sensing (ECIS) biosensors" International Journal of Biosensors & Bioelectronics, 4(6):260–261, vol. 4. 6–2018.

9. <u>Xudong Zhang</u>, Lixin Huang, Evan Ferguson-Hull, Feng Gu. Adaptive particle routing in parallel/distributed particle filters. High Performance Computing Symposium (HPC 2017).
10. <u>Xudong Zhang</u>, Fang Li, Kun-Lin Lee and Ioana Voiculescu. "Lab-on-chip stretchable impedance spectroscopy device for mammalian cells studies." 19th International Conference on Solid-State Sensors (TRANSDUCERS 2017).
11. <u>Xudong Zhang</u>, Fang Li, Ioana Voiculescu, Stretchable impedance spectroscopy sensor for mammalian cell impedance measurements. Proceedings of the ASME 2014 International Mechanical Engineering Congress & Exposition.
12. <u>Xudong Zhang</u>, Liang Zhao, Wei Zhong, and Feng Gu. "Performance Analysis of Resampling Algorithms of Parallel/Distributed Particle Filters." IEEE Access (2020). (Impact factor: 3.745)
13. <u>Xudong Zhang</u>, Liang Zhao, Wei Zhong, and Feng Gu. A generic hybrid resampling algorithm in parallel/distributed particle filters and corresponding convergence analysis. Journal of Parallel and Distributed Computing (2020). Minor Revision. (Impact factor: 2.296)
14. <u>Xudong Zhang</u>, William Wang, Fang Li, Ioana Voiculescu. Stretchable impedance sensor for mammalian cell proliferation measurements. Lab on a Chip (2017). Jun 13;17(12):2054-2066. (Impact factor:6.914)
15. <u>Xudong Zhang</u>, Anis Nurashikin Nordin, William Wang, Fang Li, Sunghoon Jang, Ioana Voiculescu. The influence of the electrode dimension on the detection sensitivity of electric cell–substrate impedance sensing (ECIS) and its mathematical modeling. Sensors and Actuators B 247, pp.780-790. (Impact factor: 7.1)
16. <u>Xudong Zhang</u>, Wen Jing, Xu Guocheng. Qualitative estimation of resistance spot welding for stainless steel based on backpropagation neural network, China Welding. Vol.18, No.3, September, 2009, Pages 32–35.