

KEY SKILLS

- Machine Learning, Data Analysis, Statistical Modeling, Optimization, Programming, Video Object Tracking

TECHNICAL SKILLS

- **Programming languages:** Python, MATLAB, R, SQL, Java, C, C++
- **Packages/tools:** NumPy, Pandas, Scikit-learn, Matplotlib, Jupiter Notebook

EDUCATION

PhD, Computer Engineering (GPA: 4.0/4.0) **Virginia Tech (Arlington, VA, USA)** **Aug. 2013 – May 2021**

- **Research areas:** Bioinformatics, Bio-image analysis, Object (cell) tracking
- **Honor:** Prasad Scholarship 2019, recognizing academically excellent graduate student in the ECE department

B.S., Automation (GPA: 85.4/100.0) **Tsinghua University (Beijing, China)** **Aug. 2008 – Jul. 2012**

- **Undergraduate thesis:** A real-time traffic sign detection and recognition system for autonomous vehicles

WORK EXPERIENCE

Research Associate **Virginia Tech** **Jul. 2021 – Present**

- Developed a novel algorithm for temporal consistency based refinement of detected signals with errors
- Conducted theoretical analysis and application to object (cell) tracking from real-world videos

SELECTED RELEVANT COURSES

- **Machine Learning and statistics:** Data Analytics, Advanced Machine Learning, Fundamental Pattern Recognition, Applied Stochastic Processes, Stochastic Signals and Systems, Managerial Statistics
- **Optimization:** Operations Research, Advanced Optimization Techniques
- **Image analysis:** Digital Image Processing
- **Programming:** Computer Languages and Programming, Theory of Algorithms, Data Structure

TECHNICAL EXPERIENCE (RESEARCH AND PROJECTS)

Systematic Detection Refinement for Crowded Object Tracking Using Temporal Consistency

- Proposed a novel **model of spatiotemporal relationships** among single-frame detections of crowded objects
- Conducted **systematic inference** of potential errors in single-frame detection candidates using the model
- Successfully relaxed the intuitive formulation (generally **unsolvable NP-hard** discrete optimization problem) into an equivalent but efficiently solvable problem (**strongly polynomial** network flow problem on graph)
- Language: MATLAB, C

Migrating Cell Identification and Tracking from Videos of Crowded Live Cell Cluster

- Developed **solutions to unusual difficulties** in tracking with weaker-than-the-typical information for both spatial detection and temporal linking
- Designed an **iterative** tracking algorithm to **enhance spatial detection through temporal links and vice versa**
- Dropped #cells per detection from 3.82 to 1.04 by **iteratively imposing temporal consistency** of detections
- Proposed a method for **multi-motion-model linking**, introducing motion labels into min-cost-flow linking
- Correctly identified migrating cells by their tracked trace pattern with precision 89.41% and recall 84.93%
- Language: MATLAB

Real-time Traffic Sign Recognition

- Developed an algorithm pipeline for **real-time traffic sign recognition**, which was later integrated into a system **equipped on an experimental autonomous vehicle** tested successfully on highway for >100 km

- Tested various features and classifiers, getting a pipeline with **HOG + Hue** features, **LDA dimensionality reduction**, **SVM classifier** for foreground/background and **k-means + VQ** for subclasses
- Created a dataset with >10k images, utilizing **data augmentation** techniques
- **Accelerated the program** by transforming MATLAB codes into **highly optimized C codes**, decreasing the runtime from 5 min to 0.15 sec, making the real time application possible
- Language: MATLAB, C

FASP: Regional Spiking Signal Detection from Microscopic Videos with Low Signal-to-Noise Ratio

- Proposed an **Expectation-Maximization style algorithm** to solve the intertwined inference of temporal signals and their associated pixel labels, being **the first to handle spatial propagation** of spiking signals
- Realized **noise control** by introducing **probabilistic transforms** and order statistic corrected **hypothesis testing** into segmentation, achieving especial advantage under low SNR
- **Significantly raised performance** compared with the cutting-edge (when SNR=5db: signal curve fidelity 0.917 vs 0.874; area accuracy 81.9% vs 62.3%)
- Developed a **software** using Java, providing **GUI** and extra functions facilitating manual control
- Language: R, Java

Predicting Loss of Ambulation from Clinical Data of DMD Patients

- Set up an analysis pipeline for **predicting the time of event** (loss of ambulation) from **right-censored** longitudinal clinical data, achieving MAE of 0.885 year in the typical age range (5, 20)
- Evaluated and compared **various regression models** including ordinary least squares, ridge regression, lasso regression and Cox survival analysis
- **Discovered critical predictor** that was different from traditional understanding of the problem
- Language: Python (Pandas, Scikit-learn and Matplotlib)

Texture-absent Cell Segmentation and Parametric Minimum s-t Cut Solver

- Designed a propose-then-select algorithm for **crowded live cell segmentation**, targeting at challenges in images where severely weak textures and incomplete edges are present
- Modeled the generating of segment proposals as **a series of length-penalized minimum s-t cut problems**
- Developed **an efficient algorithm** to find the **full solution sequence** for the length-penalized min s-t cut series, decreasing time complexity from $O(L|V|^2|E|)$ (generally purposed method) to $O(L|V||E|)$
- Language: MATLAB

RELEVANT PUBLICATIONS (* EQUAL CONTRIBUTION)

(<https://scholar.google.com/citations?user=NiR1HrEAAAAJ&hl=en&oi=ao>)

- **Wang, Yinxue**, et al. "Automated functional analysis of astrocytes from chronic time-lapse calcium imaging data." *Frontiers in neuroinformatics* 11 (2017): 48.
- *Mizuno, Grace O., ***Yinxue Wang**, et al. "Aberrant calcium signaling in astrocytes inhibits neuronal excitability in a human Down syndrome stem cell model." *Cell reports* 24.2 (2018): 355-365.
- **Wang, Yinxue**, et al. "Detection and tracking of migrating oligodendrocyte progenitor cells from in vivo fluorescence time-lapse imaging data." *2018 IEEE 15th International Symposium on Biomedical Imaging (ISBI)*
- **Wang, Yinxue**, et al. "FASP: A machine learning approach to functional astrocyte phenotyping from time-lapse calcium imaging data." *2016 IEEE 13th International Symposium on Biomedical Imaging (ISBI)*.
- **Wang, Yinxue**, et al. "Predicting age at loss of ambulation in Duchenne muscular dystrophy with deep phenotypic measures." *2014 IEEE Global Conference on Signal and Information Processing (GlobalSIP)*.