Xiyang Wu

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Education

University of Maryland — College Park, MD
Ph.D. in Electrical and Computer Engineering — *Aug. 2021 – May. 2026 (Expected)*

Georgia Institute of Technology — Atlanta, GA
M.S. in Electrical and Computer Engineering — *Aug. 2019 – May. 2021*
Overall GPA: 4.00/4.00

Tianjin University — Tianjin, China
B.Eng. in Electrical Engineering (Honors Class) — *Sep. 2015 – Jul. 2019*
Overall GPA: 3.85/4.00 Major GPA: 3.96/4.00 Rank: 4/149

Research Experience

Kamaleswaran Lab, Emory University — Atlanta, GA
Research Assistant *Advisor: Rishikesan Kamaleswaran* — *Oct. 2020 – Jul. 2021*

- **Prediction Model for COVID-19 Diagnosis**
  - Analyzed and filtered clinical history, bio-medical measurements and physical features in raw datasets, imputed missing values via iterativeimputer, established 5 folder training and testing datasets for prediction
  - Implemented several machine learning models, including ElasticNet, Gaussian Naive Bayes Classifier, Logistic Regression and XGBoost to predict 30-day hospital admission for COVID-19 patients
  - Analyzed and visualized prediction results generated by each model, compared the prediction with actual 30-day admission records
  - Completed a second-author paper *BARK-COVID: An XGBoost Model to Predict Hospitalization at time of COVID-19 Diagnosis* submitted to PLOS ONE
- **Translation Model from PPG to ABP**
  - Investigated the frontier of heart rate analysis and generative model for time series translation, pre-processed Arterial Blood Pressure (ABP) and Photoplethysmography (PPG) signal in MIMIC-II waveform dataset
  - Implemented several benchmarks for the translation task, including TCN, LSTM and autoencoder, analyzed the mechanism for each benchmark and the temporal correlation within time series
  - Extracted indirect measurement for blood pressure from PPG signal, like Pulse Arrival Time (PAT) and Slope Transit Time (STT), investigated their co-relation with corresponding systolic and diastolic blood pressure extracted from ABP signal
  - Extracted Heart Rate Variability (HRV) analysis for synchronized heart rate signal ABP, PPG and ECG through PhysioNet Cardiovascular Signal Toolbox

Cognitive Optimization and Relational (CORE) Robotics Laboratory — Atlanta, GA
Research Assistant *Advisor: Matthew Gombolay* — *Jan. 2020 – Dec. 2020*

- **Learning Heterogeneous Multi-agent Cooperation for Joint Perception-Control Tasks**
  - Investigated the state-of-the-arInvt for multi-agent reinforcement learning, formulated the multi-agent joint perception-control task in FireCommander environment into a POMDP problem
  - Regulated the FireCommander environment for the multi-agent reinforcement learning, incorporated the agent and fire state update, reward computation module within the framework
  - Implemented several MARL algorithms IDQN, DIAL, CommNet, QMIX, COMA, etc. on the FireCommander environment to learn the coordination and cooperation in the heterogeneous agent team
  - Implemented the novel experience sharing method for the optimal coordination and cooperation on the FireCommander environment and compare its performance with benchmark algorithms
- **FireCommander: Multi-agent Wildfire Pruning System with Learning from Demonstration**
  - Investigated the state-of-art of reinforcement learning, learning from demonstration and multi-agent control, established the multi-agent kinematics and control model for wildfire pruning task
  - Designed the simulation environment for multi-agent firefighting tasks with PyGame based on actual wildfire pruning environment, fire propagation model, agent kinematics and control model
  - Established the user-interface with PyQt5 to incorporate the user input and scenario design with the simulation environment, designed the data storage protocol and animation reconstruction method

* Implemented the reward function based on relative importance for components in the environment, designed various scenarios to deal with real-world circumstances
* Summarized and presented the wildfire pruning environment in the paper *FireCommander: An Interactive, Probabilistic Multi-agent Environment for Joint Perception-Action Tasks*

Laboratory of Micronano Manufacturing Technology Tianjin, China

Research Assistant *Advisor: Xiaodong Zhang* *Sep. 2018 – Jul. 2019*

- **Online Scratch Inspection System with Photometric Stereo Method**
  * Surveyed frontiers of automatic inspection system for complex components, investigated various scratch detection methods, designed the online inspection system with the photometric stereo method
  * Coordinated images acquired in online inspection environment by spatial deviation compensation and contour template matching, extracted the inspection region from stitched images after coordination
  * Generated curvature images with photometric stereo method by presenting the surface contour in gray-scale, detected scratches on the component surface with image morphology method
  * Summarized and presented the investigation result in the undergraduate thesis and the paper *Online defects detection method for gearboxcover based on the four-source photometric stereo method*

Projects

Convex Optimization Approach for Car-Like Robot Trajectory Planning *Apr. 2021 – Dec. 2021*

- Regulated robot trajectory planning as a convex optimization problem, established three diverse experimental scenarios, generated the baseline trajectories with RRT, PRM and FMT under these scenarios
- Implemented the trajectory shape optimization with Elastic Band Stretching and CVX Toolbox, implemented velocity optimization with MTSOS, estabilised the optimization solver with MATLAB, incorporated the trajectory optimization model with artificial potential field for further optimization
- Verified the algorithm performance under three scenarios, visualized and analyzed the optimized trajectories

AlphaZero Chess Player *Apr. 2020 – Dec. 2020*

- Regulated fully and partially observable chess playing task, implemented vanilla Monte-Carlo Search Tree (MCTS)
- Implemented AlphaZero by incorporating the neural network for state evaluation and decision making with the MCTS, implemented particle filter on the opponent's king tracking task to optimize the model
- Integrated the modules for different tasks into the feasible agent, established the training and testing framework, implemented the chess player agent on the partially observable chess playing environment

Fake News Detection *Jan. 2020 – Apr. 2020*

- Investigated multiple text classification methods on Kaggle Fake News dataset
- Pre-processed the dataset with Doc2Vec, designed the basic news classifier with unsupervised methods like K-Means and supervised methods like SVM
- Implemented deep learning based methods like Neural Network, CNN and LSTM on fake new detection, optimized classification model and visualized classification result
- Analyzed the experiment result, compared the classification accuracy for the traditional and deep learning methods

Content-Weighted Autoencoder for Image Compression *Aug. 2019 – Dec. 2019*

- Investigated the frontier of lossy image compression and super-resolution with deep learning methods
- Designed the content-weighted autoencoder and content-weighted importance map by introducing quantization layer that enhances the important features within the images by deeply compressing the background
- Compared the performance of the content-weighted autoencoder with benchmark methods, including the four-layer CNN and vanilla ResNet autoencoder

BuzzCup: Multi-agent Motion Simulator *Aug. 2019 – Dec. 2019*

- Designed the multi-agent control system with MPI for communication and interaction between agents that are controlled by independent threads
- Implemented the PID control to stabilize the agent's trajectory during its centripetal and rotation motion
- Visualized the multi-agent motion in the environment with OpenGL, presented the playground, intended sphere for surrounding and agents with their trajectory during simulation

Design and Simulation of a 5-DOF Hand-writing Robotic Arm *Sep. 2017 – Dec. 2017*

- Established the kinematic model for the manipulator with spatial transformation and D-H Representation
- Implemented trajectory planning for the hand-writing task in joint and Cartesian space, simulated the hand-writing task on the link model for the manipulator with MATLAB Robotic Toolbox
- Established the entity model for the manipulator, accomplished finite element analysis for the manipulator and obtained strain distribution during the whole task, managed dynamic analysis for the manipulator with ADAMS
- Designed the coordination protocol and interface between manipulator controller and laptop

Publication

Blake Anderson, **Xiyang Wu***, Theodore M Johnson II, Rebecca Steinberg, Amit Shah, James O'Keefe, Rishikesan Kamaleswaran, "BARK-COVID: An XGBoost Model to Predict Hospitalization at time of COVID-19 Diagnosis", *PLOS ONE*, *Manuscript Under Review*, 2021

Esmaeil Seraj, **Xiyang Wu***, Matthew Gombolay, "FireCommander: An Interactive, Probabilistic Multi-agent Environment for Joint Perception-Action Tasks", *arXiv:2011.00165*, 2020

Haoyue Liu, **Xiyang Wu***, Ning Yan, Zexiao Li, Xiaodong Zhang, "Online defects detection method for gearboxcover based on the four-source photometric stereo method", *IEEE Transaction on Instrument & Measurement*, *Manuscript Under Review*, 2020

Teaching Experience

Graduate Teaching Assistant University of Maryland

ENEE 322: Signal and System Theory *Fall 2021*

Technical Skills

Programming Languages: C/C++, JAVA, Python, PyTorch, LabVIEW, MATLAB, HALCON, ROS, GTSAM, OpenMP, MPI, OpenGL, Verilog HDL, MySQL, MCU Programming

Skills: LaTeX, AutoCAD, SOLIDWORKS, Android Studio, Multisim, Vivado, Qt, Altitum Designer, Zemax, ADAMS

Professional Certificate: Certified LabVIEW Associate Developer (CLAD)

Coursera Certificate: Reinforcement Learning Specialization, University of Alberta

Honor & Awards

- National Secondary Award in the 10th iCAN International Contest of Innovation, 2016
- Secondary Scholarship in Hexagon Innovation Laboratory in Tianjin University, 2016
- Samsung Scholarship, 2017
- Merit Student Award in Tianjin University, 2018