Xiangyu Zeng

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RESEARCH INTERESTS

Vision-Language-Action Models for Robot Manipulation · Imitation Learning and Diffusion Policy · Transformer-based Policy Learning · Trajectory Prediction and Motion Planning · Deep Learning for Autonomous Systems

EDUCATION

University of Illinois Urbana Champaign 09/2025-Present

- MEng in Mechanical Engineering, concentration in Control & Robotics

Wuhan University of Technology 09/2021-06/2025

- Bachelor of Engineering in Intelligent Manufacturing Engineering GPA: 4.071/5.0

HONORS & AWARDS

- First Prize of Yanchang Petroleum Scholarship (Top 0.5%), Wuhan University of Technology, 2023
- University-level First Class Scholarship (Top 3%), Wuhan University of Technology, 2022-2024
- Outstanding Student Class Leader, Wuhan University of Technology, 2023
- Independent Innovation Research Fund (Undergraduate Program), Wuhan University of Technology, 2022

PUBLICATIONS

[1] Yiying Wei*, **Xiangyu Zeng***(co-first author), Xirui Chen. HTSA-LSTM: Leveraging Driving Habits for Enhanced Long-Term Urban Traffic Trajectory Prediction. Accepted by *Applied Sciences*.

[2] Xu F, Zong W, Zeng X, et al. Construct a health indicator for bearing based on unsupervised SDAE with Euclidean distance[J]. *Journal of Vibration and Control*, 2025: 10775463251342614

[3] **Xiangyu Zeng**, Fan Xu. Construction of Bearing Degradation Health Indicators Based on Unsupervised Augmented Noise Reduction Deep Belief Network. Submitted to *Quality and Reliability Engineering International*. Under Review.

[4] **Xiangyu Zeng**, Zhou Hang, Lei Wang. Research on Batch Scheduling of Unrelated Parallel Machines with Flexible Job Sequences for the Standard Gas Manufacturing Sector. Submitted to *Computers & Industrial Engineering*. Under Review.

RESEARCH EXPERIENCES

Research on Enhanced Long-Term Urban Traffic Trajectory Prediction Model (HTSA-LSTM)

Supervised by Dr. Yiying Wei from Wuhan University of Technology 06/2024-06/2025

- Designed HTSA-LSTM network integrating dual spatiotemporal attention mechanism with driving style analysis for autonomous vehicle trajectory prediction
- Developed a novel driving style analysis module using SICC-SC to extract driving primitives and cluster trajectory patterns without predefined labels
- Implemented spatiotemporal attention mechanisms to capture dynamic dependencies across time and space
- Evaluated on the NGSIM dataset with significant improvements over benchmark models: 20.72%

reduction in RMSE and 24.98% reduction in NLL for 5-second predictions

- Carried out real-world validations on two types of roads in Wuhan, achieving: R^2¿0.979 for 5-second highway predictions and R^2¿0.927 for 3-second urban road predictions

Construction of Bearing Degradation Health Indicators Based on Unsupervised Augmented Noise Reduction Deep Belief Network 11/2022-03/2024

Team Leader, Wuhan University of Technology Independent Innovation Research Fund Undergraduate Program, Supervised by Prof. Fan Xu from Wuhan University of Technology

- Gathered and preprocessed the bearing data provided by the University of Cincinnati lab
- Constructed an SGDBN model using Python, which is processed with Savitzky-Golay filters between each RBM layer of the DBN and after the output layer, to process the data generated during bearing operation and reduce noise, thus accurately predicting bearing life
- Examined and selected the optimal filter parameters, learning rate, and neural network structure in turn through multiple sets of experiments
- Assessed the performance of the SGDBN model on the test set using the Mon smoothing metrics, finding that the Mon value obtained reaches 7-10 times that obtained by traditional RMS and K-Mediods, and 3-5 times that obtained by SOM and DBN, proving it extracts health indicators with the highest smoothing and noise reduction performance
- Demonstrated the excellent performance of this model in constructing bearing degradation curves and determining the health status of bearings for fault diagnosis

Non-Standard Gas Filling Plant Scheduling Problem Based on Imperialist Competitive Algorithm

Supervised by Prof. Lei Wang from Wuhan University of Technology 11/2022-04/2024

- Developed a Federated Imperialist Competitive Algorithm (FICA) using MATLAB to address the scheduling challenges in a non-standard gas filling plant, overcoming the local optima issues of traditional ICA through federated partitioning and local optimization
- Constructed a mathematical model to minimize makespan and resource consumption, considering the complexity of flexible filling, batch processing, and heterogeneous equipment
- Introduced a dual-layer optimization strategy for both intra- and inter-batch scheduling, significantly enhancing search efficiency and solution quality
- Demonstrated that FICA improves scheduling performance, reducing processing time by approximately 15% and machining losses by 20% compared to traditional ICA, and both by over 30% compared to the genetic algorithm

TECHNICAL SKILLS

Programming Languages: Python, MATLAB

ML/DL Frameworks: PyTorch

Robotics Platforms: Kinova Gen3, UR5

Simulation & Tools: ROS/ROS2, Gazebo, Isaac Sim/Isaac Gym

Methods: Imitation Learning, Diffusion Policy, Transformer-based Policy Learning