HONG ZHAN (IVY)

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RESEARCH INTERESTS

Applied AI for Engineering and Industrial Systems; investigating model robustness and uncertainty quantification in mission-critical applications (e.g., predictive maintenance, quality inspection). Focus areas include Transformer architectures, Causal Inference, and Active Learning.

EDUCATION

The University of York (Russell Group University) York, UK

MSc in Social Media and Management (Merit) Sep 2023 - Feb 2024

Dissertation:Algorithmic Exposure and Cross-Context Reposting Behavior on Social Media — A Data-Driven Study of What Users Choose to Amplify (using computational content and engagement analysis).

Relevant Modules: Research Design (Quantitative Focus); Innovation & Technology Management.

Wuchang University of Technology Wuhan, China

BEng in Computer Science & Technology (First Class Honours) Sep 2017 - Jun 2021

GPA: 90 / 100

Thesis: Evaluating the Stability of Feature Selection Algorithms under Data Distribution Shift in IoT Systems.

RESEARCH EXPERIENCE

Temporal Fusion Transformer for Predictive Maintenance | Academic Research 2024

- Developed a Transformer-based framework to model cross-sensor dependencies and long-range degradation patterns in turbofan engines, addressing limitations of traditional recurrent architectures.
- Implemented a Temporal Fusion Transformer in PyTorch using the NASA C-MAPSS dataset; engineered spectral and correlation features for robust multi-sensor fusion.
- Achieved ≈20% RMSE reduction versus LSTM/GRU baselines; conducted SHAP interpretation to identify critical failure precursors and presented findings at a departmental seminar.

Causal Analysis of Oversampling Strategies under Distribution Shift | Applied Research 2024

- Investigated causal effects of oversampling techniques (SMOTE, ADASYN) on model robustness under covariate shift across multiple public tabular datasets.
- Designed a Propensity Score Matching protocol to isolate oversampling effects from confounders, benchmarking against cost-sensitive learning methods.
- Quantified a 10–15% out-of-distribution accuracy drop; documented methodology and findings in an internal technical report presented at the ML Reading Group, University of York.

Bayesian Active Learning for Efficient Visual Inspection | Independent Research 2024

- Explored epistemic uncertainty from Bayesian deep networks to minimize labeling costs in industrial defect inspection, implementing Monte Carlo Dropout with BALD-based querying.
- Built and trained a convolutional architecture on the MVTec AD dataset, prioritizing informative samples to optimize annotation efficiency.
- Achieved 95% classification accuracy with 40% fewer labeled samples versus random sampling; released a fully reproducible GitHub repository with interactive visualization dashboard.

TECHNICAL & RESEARCH SKILLS

Programming & Frameworks: Python (PyTorch, TensorFlow, Scikit-learn, NumPy, Pandas), MATLAB, SQL, Bash/Linux.

ML & Research Expertise: Transformer architectures, Bayesian deep learning, Active Learning, Causal Inference, SHAP interpretability, time-series forecasting.

Tools & Deployment: Git/GitHub, Docker, AWS/Azure, LaTeX, Jupyter, Edge AI deployment.

HONORS & AWARDS

First-Class Academic Scholarship, Wuchang University of Technology (2019 - 2020).

Additional Activities: Mentored peers in algorithms and PyTorch debugging; led internal study groups on causal inference and active learning.