Wang Ma

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Summary

Ph.D. student specializing in **Uncertainty Quantification (UQ)** and **Bayesian Deep Learning**. Seeking a **Research Internship for 2026 Summer** to apply expertise in Bayesian Modeling to solve challenging real-world problems. Proven experience in developing novel algorithms from theory to implementation in vision and language tasks.

Education

Rensselaer Polytechnic Institute (RPI) — Aug 2024 – Present
Ph.D. in Computer & System Engineering (Advisor: Prof. Qiang Ji) — *Troy, NY*
Research Interests: Uncertainty Quantification, Bayesian Deep Learning, Knowledge-augmented AI

Southern University of Science and Technology (SUSTech) — Aug 2020 – July 2024
B.S. in Data Science and Big Data Technology (Advisor: Prof. Chao Wang) — *Shenzhen, China*

University of California, Irvine (UCI) — Mar 2023 – July 2023
Exchange Student (ASAP Program) — *Irvine, CA*

Publications & Manuscripts

1. **Black-Box Uncertainty Quantification for Large Language Models via Ensemble-of-Ensembles**
Wang Ma, Debarun Bhattacharjya, Junkyu Lee, Nhan Pham, Harsha Kokel, Qiang Ji.
Submitted to International Conference on Machine Learning (ICML), 2026.
(Preliminary version accepted to AAAI 2026 Workshop on Assessing and Improving Reliability of Foundation Models in the Real World)
2. **CURE: Counterfactual-guided Uncertainty Refinement to Break Uncertainty Entanglement**
Ali Najibi*, **Wang Ma***, Naiyu Yin, Qiang Ji. (*Equal Contribution)
Submitted to International Conference on Machine Learning (ICML), 2026.
3. **Towards Knowledge-augmented Bayesian Deep Learning For Computer Vision**
Wang Ma, Hanjing Wang, Yufei Zhang, Darsha Udayanga, Qiang Ji.
Submitted to IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2026.
4. **Causal Saliency Map For Post-hoc Model Explanation**
Hanjing Wang, **Wang Ma**, Naiyu Yin, Qiang Ji.
Submitted to IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2026.

Industrial Experience

IBM Research — **Yorktown Heights, NY**
Research Extern (Mentor: Dr. Debarun Bhattacharjya) — *May 2025 – Aug 2025*

- Developed a novel **perturbation-based framework** for UQ in **black-box LLMs**, enabling uncertainty decomposition without requiring access to model weights or intermediate results.
- Introduced an "ensemble-of-ensembles" method to disentangle **aleatoric and epistemic uncertainty**, using input perturbations as a proxy for parameter variability.
- **Outcome:** First-authored paper accepted to AAAI 2026 AIR-FM Workshop; Extented version was submitted to ICML 2026.

Academic Experience

Rensselaer Polytechnic Institute (RPI) — **Troy, NY**
Graduate Research Assistant (Advisor: Prof. Qiang Ji) — *Sept 2024 – Present*

- **Knowledge-Augmented Bayesian Deep Learning:** Proposed a two-stage framework that learns a **knowledge-induced prior** and an **adaptive knowledge likelihood**. Demonstrated superior accuracy, robustness, and **OOD detection** under domain shifts.
- **Causal Saliency Maps:** Led the implementation of core algorithms for a **Causal Markov Blanket (CMB)** detection method. Utilized label-wise mutual information to identify **causally relevant features**, effectively filtering out spurious correlations in vision models.
- **Semantic Uncertainty Disentanglement:** Developed a **contrastive learning framework** to disentangle semantic and nuisance uncertainties, achieving state-of-the-art performance on multiple benchmarks. (Technical Report)
- **Efficient Single-Model UQ:** Derived theoretical results from **NTK theory** to quantify regression uncertainty using only one auxiliary neural network. Implemented and advanced **credal interval-based methods** for practical uncertainty quantification. (Technical Report)

SUSTech — **Shenzhen, China**
Undergraduate Researcher (Advisor: Prof. Chao Wang) — *Mar 2024 – Aug 2024*

- **Hyperspectral Image Restoration:** Designed and implemented a self-supervised way using a novel combination of **Implicit Neural Representations (INR)** and **Diffusion Models**.
- **Unpaired Image Denoising:** Optimized a **VAE** from unpaired data, enhancing performance through Mutual Information maximization.

Technical Skills

- **Languages:** Python (PyTorch, NumPy, Pandas, Scikit-learn), Java, MATLAB, LaTeX
- **Developer Tools:** Git, Docker, Linux environment
- **Languages:** Mandarin Chinese (Native), English (Fluent), Japanese (Conversational)

Awards & Academic Engagement

- **SUSTech Excellent Undergraduate Graduation Project** (Thesis: End-to-end Unpaired Image Denoising) June 2024
- **Seminar Organizer:** AI Optimization & Theory (SUSTech); led sessions on Bayesian Optimization & Bayesian Deep Learning 2024
- Second Prize in Guangdong Province, Mathematical Contest in Modeling 2021
- **Scholarships:** SUSTech Excellent Student Scholarship (2021, 2022)