

# 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

<b>Rensselaer Polytechnic Institute (RPI)</b> <i>Ph.D. in Computer &amp; System Engineering (Advisor: Prof. Qiang Ji)</i> Research Interests: Uncertainty Quantification, Bayesian Deep Learning, Knowledge-augmented AI	Aug 2024 – Present Troy, NY
<b>Southern University of Science and Technology (SUSTech)</b> <i>B.S. in Data Science and Big Data Technology (Advisor: Prof. Chao Wang)</i>	Aug 2020 – July 2024 Shenzhen, China
<b>University of California, Irvine (UCI)</b> <i>Exchange Student (ASAP Program)</i>	Mar 2023 – July 2023 Irvine, CA

## Publications & Manuscripts

1. **Towards Knowledge-augmented Bayesian Deep Learning For Computer Vision**  
Wang Ma, Hanjing Wang, Yufei Zhang, Darsha Udayanga, Qiang Ji.  
*Accepted to IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR), 2026.*
2. **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)
3. **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.*
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

<b>IBM Research</b> <i>Research Extern (Mentor: Dr. Debarun Bhattacharjya)</i>	Yorktown Heights, NY May 2025 – Aug 2025
• Developed a novel <b>perturbation-based framework</b> for UQ in <b>black-box LLMs</b> , enabling uncertainty decomposition without requiring access to model weights or intermediate results.	
• Introduced an “ensemble-of-ensembles” method to disentangle <b>aleatoric</b> and <b>epistemic uncertainty</b> , using input perturbations as a proxy for parameter variability.	
• <b>Outcome:</b> First-authored paper accepted to AAAI 2026 AIR-FM Workshop; Extended version was submitted to ICML 2026.	

## Academic Experience

<b>Rensselaer Polytechnic Institute (RPI)</b> <i>Graduate Research Assistant (Advisor: Prof. Qiang Ji)</i>	Troy, NY Sept 2024 – Present
• <b>Knowledge-Augmented Bayesian Deep Learning:</b> Proposed a two-stage framework that learns a <b>knowledge-induced prior</b> and an <b>adaptive knowledge likelihood</b> . Demonstrated superior accuracy, robustness, and <b>OOD detection</b> under domain shifts.	
• <b>Causal Saliency Maps:</b> Led the implementation of core algorithms for a <b>Causal Markov Blanket (CMB)</b> detection method. Utilized label-wise mutual information to identify <b>causally relevant features</b> , effectively filtering out spurious correlations in vision models.	
• <b>Semantic Uncertainty Disentanglement:</b> Developed a <b>contrastive learning framework</b> to disentangle semantic and nuisance uncertainties, achieving state-of-the-art performance on multiple benchmarks. ( <a href="#">Technical Report</a> )	
• <b>Efficient Single-Model UQ:</b> Derived theoretical results from <b>NTK theory</b> to quantify regression uncertainty using only one auxiliary neural network. Implemented and advanced <b>credal interval-based methods</b> for practical uncertainty quantification. ( <a href="#">Technical Report</a> )	

<b>SUSTech</b> <i>Undergraduate Researcher (Advisor: Prof. Chao Wang)</i>	Shenzhen, China Mar 2024 – Aug 2024
• <b>Hyperspectral Image Restoration:</b> Designed and implemented a self-supervised way using a novel combination of <b>Implicit Neural Representations (INR)</b> and <b>Diffusion Models</b> .	
• <b>Unpaired Image Denoising:</b> Optimized a <b>VAE</b> 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

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- **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)