

# Yuyao Wang (she/her/hers) – Resume

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## Education

**Ph.D. in Statistics, Boston University — Boston, MA** Sep. 2021 – May 2026 (Expected)

Research Interests: Transfer Learning, Reinforcement Learning, Graph Mining, Spatio-Temporal Modeling, Robust ML

Advisors: Debarghya Mukherjee, Luis Carvalho

Awards: Ralph B. D'Agostino Endowed Fellowship (2025); Outstanding Teaching Fellow Award (2024)

**M.A. in Statistics, Columbia University — New York, NY** Sep. 2019 – May 2020

Honors: Dean's List ; Data Science Track

Selected Projects: Dog Classification • Recommendation System • Financial Sentiment •  
Airbnb Dashboard • Ad Optimization • Customer Segmentation • Mask Detection •

**B.S. in Mathematics (Hua Talent Program), Shandong University** Sep. 2015 – Jun. 2019

Honors: Summa Cum Laude; Outstanding Graduate & First-Class Scholarship (2019); Hua Loo-Keng Scholarship (2018)

## Publications

### Conference Papers

Yuyao Wang, Yu-Hung Cheng, Debarghya Mukherjee, Huimin Cheng. *Transfer Learning on Edge Connecting Probability Estimation Under Graphon Model*. *Conference on Neural Information Processing Systems (NeurIPS)*, 2025.

Zhihao Zhang, Long Zhao, Yuyao Wang, Xiangjun Dong. *Multi-Scale Based Cross-Modal Semantic Alignment Network for Radiology Report Generation*. *IEEE International Conference on Systems, Man, and Cybernetics (SMC)*, 2025.

### Journal Articles

Da Wang, Yuyao Wang, Yongkai Chen, Jun S. Liu, Huimin Cheng. *Network Perturbation Aggregation for Graphon Estimation*. *IEEE Transactions on Knowledge and Data Engineering (TKDE)*, 2025.

Aoyan Du, Guixin Zhao, Yuyao Wang, Aimei Dong, Xiangjun Dong. *Cross-Domain Hyperspectral Image Classification via Mamba-CNN and Knowledge Distillation*. *IEEE Transactions on Geoscience and Remote Sensing (TGRS)*, 2025.

## Manuscripts

Yuyao Wang, Nabarun Deb, Debarghya Mukherjee. *Smooth Contextual Bandits: Transfer Learning under Structural Smoothness Assumptions*. Manuscript in preparation, 2025.

Yuyao Wang, Debarghya Mukherjee. *Transfer Learning-Based Community Detection*. Manuscript in preparation, 2025.

Yuyao Wang, Nabarun Deb, Debarghya Mukherjee. *Phase Transition in Minimax Rates for Covariate Shifts on Approximate Manifolds*. Under review at *Journal of the American Statistical Association (JASA)*.

Yuyao Wang, Huimin Cheng, Luis Carvalho, Debarghya Mukherjee. *Network Functional Varying Coefficient Models with Transfer Learning*. Under review at *Annals of Applied Statistics (AOAS)*, 2025.

## Work Experience

**Data Scientist Intern, Plymouth Rock Insurance Boston, MA** May 2025 – Aug. 2025

**Project 1: Property-Level Loss Prediction** May 2025 – Jul. 2025

- Architected and deployed an end-to-end AWS SageMaker pipeline for property-level loss prediction, improving training and deployment efficiency by 45% and enabling reproducible model updates at scale.
- Increased Gini by +4.3 points and boosted high-premium segmentation accuracy using XGBoost Tweedie; reduced model complexity by 7% while maintaining interpretability for actuarial teams.
- Engineered 120+ imagery and metadata features with PySpark and SQL on millions of policies; collaborated with MLOps engineers to productionize models with robust monitoring and CI/CD integration.

**Project 2: LLM-Powered Image Risk Scoring** Jul 2025 – Aug. 2025

- Designed and implemented a novel pipeline that integrates Google Street View imagery with GPT-4o to automatically detect property risks (e.g., roof damage, structural cracks, vegetation hazards).
- Converted unstructured LLM outputs into structured JSON features and seamlessly integrated them into actuarial scoring models, bridging cutting-edge AI with traditional insurance risk assessment.

## Technical Skills

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- **Programming & Database:** Python, R, SQL, MySQL, PostgreSQL, MongoDB, MATLAB, Git, Jupyter, VS Code.
- **ML Frameworks:** scikit-learn, TensorFlow, PyTorch, Keras, Hugging Face, Transformers, spaCy, NLTK, H2O.ai
- **Big Data & Cloud Platforms:** Apache Spark, Hadoop, AWS (S3, EC2, SageMaker), Microsoft Azure, Kubernetes
- **Data Science Tools:** Tableau, Power BI, Excel (PivotTables, VLOOKUP), Google Data Studio.

## Research Experience

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### Transfer Learning for Contextual Multi-armed Bandits

- Developed a smooth contextual bandit framework that leverages structural smoothness assumptions to transfer knowledge from offline source environments, establishing improved theoretical regret bounds.
- Designed algorithms and validated them through simulations and real-data experiments, demonstrating significant gains in sample efficiency and robustness compared to baseline bandit methods.

### Network Functional Varying Coefficient Model with Transfer Learning

- Developed a network-based functional varying-coefficient model that captures spatio-temporal traffic dynamics by allowing edge-level coefficients to vary smoothly across both the road network and time.
- Designed an adaptive transfer learning scheme that aligns structurally related source and target cities via graph-similarity measures, enabling knowledge transfer and improving predictive performance.

### Transfer Learning-Based Community Detection

- Proposed a transfer learning framework for community detection based on matrix tri-factorization, modeling source-to-target perturbations in block structures and enabling knowledge transfer under distributional shifts.
- Designed alternating algorithms that jointly update community memberships and inter-community interaction matrices, incorporating covariate-assisted SBMs with spectral smoothing to improve edge probability estimation.

### Phase Transition in Minimax Rates for Covariate Shifts on Approximate Manifolds

- Derived sharp minimax lower and upper bounds for nonparametric regression under covariate shift, establishing phase transitions in rates when target functions are supported on low-dimensional manifolds.
- Proposed an adaptive local polynomial estimator with exponential concentration guarantees, achieving rate-optimal performance without prior smoothness knowledge and validated through extensive simulations.

### Transfer Learning on Edge Probability Estimation under Graphon Model

- Proposed *GTRANS*, the first transfer learning framework for graphon estimation without node correspondences, integrating neighborhood smoothing with Gromov–Wasserstein optimal transport for structural alignment.
- Developed an adaptive module to guard against negative transfer; Provided theoretical guarantees on the stability of the estimated matrix and demonstrated SOTA improvements on downstream tasks (link prediction, graph classification).

### Cross-Domain Hyperspectral Image Classification via Mamba-CNN and Knowledge Distillation

- Designed a dual alignment strategy combining soft-label distillation with GraphSAGE-based optimal transport, aligning feature distributions across domains while preserving inter-class structure and reducing domain shift.
- Conducted extensive experiments on three cross-domain hyperspectral image benchmarks, achieving SOTA overall accuracy and Kappa scores, consistently surpassing domain adaptation and domain generalization baselines.

### Network Perturbation Aggregation for Graphon Estimation

- Proposed *Net-Paging*, a bagging-inspired framework for network analysis that generates pseudo-replicates through edge-level perturbations with bias correction, preserving the underlying graphon structure with provable guarantees.
- Provided theoretical analysis on variance reduction and consistency of the aggregated estimator, and empirically demonstrated improved stability and accuracy in link prediction, and graph classification across benchmark datasets.

### Multi-scale Cross-modal Semantic Alignment Network for Radiology Report Generation

- Proposed a multi-scale cross-modal network that integrates CNNs for local feature extraction with Transformer encoders for global context, enhanced by a semantic alignment module; introduced a contrastive loss for fine-grained alignment.
- Conducted extensive experiments on IU-Xray and MIMIC-CXR, achieving SOTA BLEU, METEOR, and ROUGE metrics; ablation studies confirmed the contribution of multi-scale fusion, sparse attention.

## Academic Services

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- Reviewer: *NeurIPS 2025*, *CIKM 2025*.
- Teaching Fellow, Boston University: MA 575 (Linear Models), MA 582 (Mathematical Statistics), MA 415 (Data Science in R), MA 214 (Applied Statistics), MA 213 (Statistics and Probability), MA 113 (Elementary Statistics).
- Mentor: Undergraduate and Master's students on applied data science and statistics projects.