# ZIHAN ZHOU

PhD Applicant for Fall 2026

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## EDUCATION

**Boston University, Boston, Massachusetts** **Sep 2023 - May 2025**
*Master of Science in Computer Science*

**Hobart and William Smith Colleges, Geneva, New York** **Aug 2019 - May 2023**
*Bachelor of Science in Computer Science*

## RESEARCH EXPERIENCE

**Graduate Research Assistant - Computer Vision & Deep Learning** **Aug 2024 - Present**
*Boston University | Supervisor: Prof. Reza Rawassizadeh*

- Leading two major research initiatives in computer vision and machine learning optimization
- **Pose Estimation Pipeline:** Building end-to-end 'Camera to 3D Human Model' system for motion capture
- Explored high-fidelity models including Meta's Sapiens (308 keypoints) and DensePose
- Implemented pose matching algorithms using MediaPipe, Dynamic Time Warping, and k-NN
- Currently optimizing models through Knowledge Distillation and LoRA-C fine-tuning
- **GradES Project:** Developed gradient-based early stopping algorithm for transformers
- Achieved 1.57-7.22x training speedup with improved accuracy on language and multimodal tasks

**Graduate Research Assistant - Federated Learning** **Feb 2025 - Present**
*Boston University | Supervisor: Prof. Avi Mohan*

- Validated federated learning convergence theory through dual-track research methodology
- Conducted experiments using UltraFlwr framework integrating Flower and YOLOv8 for distributed object detection
- Discovered FedAvg achieves 12.3% better performance than FedSGD with 80% fewer rounds
- **Key Finding 1:** The "Theory-Practice Gap" is 1,000,000x - Theoretical max learning rate: ~3.4e-7 vs Experimental peak: ~0.34
- **Key Finding 2:** Validated inverse scaling law ($\eta \propto 1/E$) - 4x increase in E leads to 10x drop in stable learning rate
- **Key Finding 3:** Discovered U-curve of convergence with optimal learning rate multiplier region
- **Key Finding 4:** Proved Batch Normalization prevents gradient diversity explosion in heterogeneous settings

## PUBLICATIONS & PAPERS IN PROGRESS

### Published/Submitted:

- Wen, Q., Zeng, X., Zhou, Z., Liu, S., Hosseinzadeh, M., Su, N., Rawassizadeh, R. (2025). GradES: Significantly Faster Training in Transformers with Gradient-Based Early Stopping. Submitted to MLSys 2026. arXiv:2509.01842

### In Progress:

- Pose Estimation Pipeline: End-to-end Camera to 3D Human Model System (Target: CVPR 2026)
- Federated Learning: Validating McMahan's Convergence Theory - Quantifying the Theory-Practice Gap (Target: ICLR 2026)

## PROFESSIONAL EXPERIENCE

**Software Engineering Intern - GenAI** **Jun 2024 - Oct 2024**

*Bragr*

- Developed RAG planner utilizing recursive retrieval for model prompting and fine-tuning
- Architected data pipeline using Azure Cosmos DB, LangChain, and Azure Functions
- Implemented semantic chunking for enhanced embedding retrieval efficiency

**Large Language Processing Research Intern** **Jan 2023 - May 2023**

*Hobart and William Smith Colleges*

- Conducted NLP research using Word2Vec embeddings and PyTorch models
- Developed theoretical framework for semantic construction in language models

## SELECTED PROJECTS

**Pose Matching - Real-Time Fitness Analysis via Edge Computing** **Sep - Dec 2024**

- Developed edge computing application for real-time fitness pose matching with 60% accuracy
- Integrated OpenPose, MinHashing, and Dynamic Time Warping with sliding window analysis

**Resume Advisor - AI-Powered Career Matching Platform** **Sep - Dec 2024**

- Designed scalable platform using vector embeddings for job matching
- Implemented knowledge graph with chain-of-thought reasoning

**Full Stack E-commerce Platform** **Jan - May 2024**

- Built React frontend with Material-UI and Node.js/Express REST API backend
- Implemented state management and integrated with DummyJSON API

## TECHNICAL SKILLS

**Languages:** Python, Java, C/C++, JavaScript, HTML/CSS, SQL, CUDA, PHP

**ML/AI:** PyTorch, TensorFlow, Transformers, Computer Vision (OpenPose, MediaPipe), NLP, Federated Learning

**Frameworks:** React.js, Node.js, Express.js, Spring/SpringBoot, Django, LangChain

**Cloud & Tools:** Azure, AWS, GCP, Docker, Git, Linux, MongoDB, MySQL, PostgreSQL, Redis