# Ashitabh Misra

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## EDUCATION

**University of Illinois at Urbana-Champaign** *Urbana, IL*
*Candidate for PhD in Computer Science* *August 2021 – May 2026 (Expected)*
Advisor: Prof. Tarek Abdelzaher

**Indian Institute of Technology Bhilai** *Chhattisgarh, India*
*Bachelor of Technology in Computer Science and Engineering* *August 2016 – May 2020*
GPA: 9.2/10

## Publications

**Latency-Constrained Input-Aware Quantization of Time Series Inference Workflows at the Edge** *July 2024*
*Under Review at IEEE International Conference on Computer Communications (INFOCOM)*
**Ashitabh Misra**, Nurani Saoda, and Tarek Abdelzaher

**The Case for Micro Foundation Models to Support Robust Edge Intelligence** *July 2024*
*Sixth IEEE International Conference on Cognitive Machine Intelligence*
Tomoyoshi Kimura, **Ashitabh Misra**, Yizhuo Chen, Denizhan Kara, Jinyang Li, Tianshi Wang, Ruijie Wang, Joydeep Bhattacharyya, Jae Kim, Prashant Shenoy, Mani Srivastava, Maggie Wigness, Tarek Abdelzaher

**ViX: Analysis-driven Compiler for Efficient Low-Precision Variational Inference** *April 2023*
*Design, Automation, and Test in Europe Conference (DATE)*
**Ashitabh Misra**, Jacob Laurel, and Sasa Misailovic

**BullsEye: Scalable and Accurate Approximation Framework for Cache Miss Calculation** *August 2022*
*ACM Transactions on Architecture and Code Optimization (TACO)*
Nilesh Rajendra Shah, **Ashitabh Misra**, Antoine Miné, Rakesh Venkat, and Ramakrishna Upadrasta

**Network Based Framework to Compare Vaccination Strategies** *November 2021*
*Computational Data and Social Networks*
Rishi Ranjan Singh, Amit Kumar Dhar, Arzad Alam Kherani, Naveen Varghese Jacob, **Ashitabh Misra**, and Devansh Bajpai

## Research Experience

**Dept. of Computer Science, University of Illinois at Urbana-Champaign** *Urbana, IL*
*Research Assistant, Guide: Prof. Tarek Abdelzaher* *January 2022 - Present*
**Research focus**: Design algorithms for adaptive compression of neural networks and probabilistic programs

**Constrained Input-aware Compression of Neural Networks on the Edge**

- Design novel quantization techniques for neural network inference that adapt based on input variations and changing operational environments
- Implement end-to-end compilation pipelines to easily deploy complex dynamically quantized NNs on microcontroller-grade devices like Raspberry Pi Pico
- Current experiments show up to $4\times$ speed-up and up to $30\%$ additive increase in accuracy compared to existing state-of-the-art techniques on vehicular target detection benchmarks

**Quantized Variational Inference for Probabilistic Programs on the Edge**

- Designed novel static analysis techniques for probabilistic programs to perform Variational Inference (VI) using integer arithmetic with minimal overflows
- Implemented ViX, a probabilistic programming language that performs VI in integer arithmetic
- ViX achieves up to $15\times$ speed-up compared to its high precision counterpart on Arduino Due. ViX performs inference on $100\times$ more data than existing state-of-the-art accurately

## Work Experience

**Dept. of Computer Science, Indian Institute of Technology Hyderabad** *Hyderabad, India*
*Research Associate* *August 2019 - August 2021*

- Developed cache-optimized neural network compression algorithms, achieving $40\times$ compression for VGG-16 and AlexNet with competitive accuracy against existing state-of-the-art
- Designed cardinality estimation approximate algorithms for octagon abstract domain, that achieved $50\times$ speedup with $< 5\%$ accuracy loss relative to conventional techniques

**Egnyte** *Poznan, Poland*
*Machine Learning Intern* *May 2018 - July 2018*

- Initiated and deployed a hybrid probabilistic-ML event detection pipeline for smart data caching in Egnyte's macOS app
- The solution surpassed and replaced established solutions by capturing $12\times$ more target events

## Teaching Experience

**Dept. of Computer Science, University of Illinois at Urbana-Champaign** *Urbana, IL*
*Teaching Assistant, CS427: Software Engineering* *August 2021 - December 2021*

**Dept. of Computer Science, Indian Institute of Technology Bhilai** *Chhattisgarh, India*
*Teaching Assistant, CS200: Software Tools and Technology* *August 2019 - November 2019*

## Skills

**Languages**: C, C++, Python, Shell Scripting **OS:** Linux

**Frameworks**: PyTorch, Numpy, Pandas, Flask, Selenium(Web Scraping), Integer Set Library, Barvinok Library, Clang, LLVM

## Trading Projects

**Backtesting HFT market-making strategies** *Urbana, IL*
*Guide: Prof. David Lariviere* *August 2023 – December 2023*

- Lead a team of 4 to backtest high-frequency trading (HFT) market-making strategies, utilizing Level 2/Level 3 data for cash equities and cryptocurrencies
- Led end-to-end backtesting: configured Linux servers, sourced IEX data via Polygon API and crypto-exchanges, and implemented C++ strategies for algorithmic trading analysis.
- Backtested Ichimoku, Moving Average, and Volume-weighted moving average strategies over 1 month period producing net losses (Gitlab repo)

## Relevant Courses

**Compilers**: Compilers, Advanced Compilers, Machine Learning for Compilers

**Robotics**: Mobile Robotics for CS

**Approximate Computing**: Topics in Programming Languages: Approximate And Probabilistic Programming Systems

**Machine Learning**: Data Mining Principles, Machine Learning, Reinforcement Learning, Math for Machine Learning

**Cryptography**: Introduction to Cryptography, Blockchain Technology, and Lightweight Cryptography

**Trading**: Algorithmic Market Microstructure

## Achievements

**2020** **First Prize** in Health and Technology Category, Smart India Hackathon (SIH)

**2020** **Exemplary Alumni Award** Mahatma Hansraj Modern School, India

**2013** **Best Delegate** MUNOG (Model United Nations of Goldsberg, Germany) as Delegate of Afghanistan, UNESCO

**2013** **Youngest Recipient of the Wazir Balichand Trophy** Mayo College Ajmer for excellence in Chess, India