Mohit Rajpal

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https://scholar.google.com.sg/citations?user=qUvSFVkAAAAJ
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Work Experience

Postdoctoral Researcher Mar. 2025 – May 2025
Singapore-ETH Centre & ETH Zurich Scalable Parallel Computing Lab Singapore, SG

- Architected foundation model for healthcare
- Drafted foundation model SwissAI proposal for CHF 3,000,000 in funding

Research Contractor Jul. 2017 – Jul. 2019
Microsoft Research Redmond, WA, USA

- Research, validation, and integration work on greybox fuzzing architecture
- Work during this period led to a technical preprint and US Patent

Research Intern Mar. 2017 – Jun. 2017
Microsoft Research Redmond, WA, USA

- Developed a novel neural network augmented fuzzing architecture to discover software vulnerabilities

Systems and Applications Developer Jun. 2013 – Aug. 2014
PDT Partners LLC New York City, NY, USA

- Implemented communication software to place orders with stock exchanges

Software Development Engineer Jul. 2011 – May 2013
Microsoft Corporation, Windows Division Redmond, WA, USA

- Developed automatic web indexers using an asynchronous, multithreaded workflow
- Developed a highly scalable, distributed, fault-tolerant, multi-threaded file hashing utility

Education

Doctor of Philosophy | ***Thesis: Scaling up decision-making under uncertainty*** Aug. 2018 – Oct. 2024
National University of Singapore Singapore, SG
Supervisor: A/P Bryan Kian Hsiang Low

Master of Science | ***Major: Computer Science, Track: Machine Learning*** Sep. 2015 – Dec. 2016
Columbia University New York City, NY, USA

Bachelor of Science | ***Major: Computer Science*** Aug. 2008 – May 2011
University of Illinois at Urbana-Champaign Urbana-Champaign, IL, USA

Publications and preprints

Citations: 240

SaTE: Low-latency traffic engineering for satellite networks Sep. 2025
Hao Wu, Yizhan Han, **Mohit Rajpal**, Qizhen Zhang, Jingxian Wang
To appear in Sigcomm 2025

This paper presents a novel traffic engineering (TE) solution for large-scale Low-Earth-Orbit (LEO) satellite constellations. Unlike traditional TE systems designed for static wide-area networks (WANs), this approach addresses the rapidly changing topology of satellite networks, ensuring ultra-low-latency traffic allocation. The proposed framework, named SaTE, leverages a cascaded graph neural network (GNN) to compute optimal traffic allocation with millisecond latency, accelerated by GPU parallelization. Evaluation on Starlink's 4236 satellites shows a 23.5% improvement in satisfied demand, achieving a 2738x speedup with an average runtime of 17ms compared to commercial solvers.

Dependency structure search Bayesian optimization for decision making models Oct. 2023

Mohit Rajpal, Lac Gia Tran, Yehong Zhang, Bryan Kian Hsiang Low

Transactions on Machine Learning Research

This paper introduces an approach to optimize decision making systems addressing challenges posed by sparse reward. A compact higher-order model is used for cooperative multi-agent decision making. This high-dimensional model is optimized using Hessian-aware Bayesian optimization. Validation demonstrates the effectiveness of the proposed approach in various benchmarks.

Pruning during training by network efficacy modeling Mar. 2023

Mohit Rajpal, Yehong Zhang, Bryan Kian Hsiang Low

Springer Machine Learning Journal

This paper introduces a novel method for early pruning of deep neural network (DNN) neurons during training to reduce computational costs while preserving model performance. The approach models the future efficacy of DNN elements in a Bayesian manner, using efficacy data collected during training to identify and prune neurons during training. Empirical evaluations demonstrate that the proposed Bayesian early pruning improves the computational efficiency of DNN training while maintaining better model performance compared to other tested pruning approaches.

Neural networks for efficient Bayesian decoding of natural images from retinal neurons Dec. 2017

N. Parthasarathy, E. Batty, W. Falcon, T. Rutten, **Mohit Rajpal**, E.J. Chichilnisky, Liam Paninski

Neural Information Processing Systems (NeurIPS)

This paper introduces a novel Bayesian method for decoding natural images from retinal ganglion cell (RGC) spiking activity, utilizing artificial neural networks for fast nonlinear decoding. The decoder, trained on natural images and simulated neural responses, outperforms linear decoding and provides insights for optimizing retinal prosthesis technologies. This work suggests that the retina may offer a more accurate representation of the visual scene than previously thought.

Not all bytes are equal: Neural byte sieve for fuzzing Nov. 2017

Mohit Rajpal, William Blum, Rishabh Singh

arXiv Preprint

This paper introduces a new approach to enhancing fuzzing, a dynamic program analysis technique for identifying software vulnerabilities. In this work deep learning architectures are trained on fuzzing data to learn valuable locations to fuzz in input files. By integrating these models into the a greybox fuzzer, significant improvements are demonstrated in terms of code coverage, unique code paths, and crash discovery across diverse input format (e.g., ELF and XML).

HONORS AND AWARDS

President's Graduate Fellowship Fall 2018

The President's Graduate Fellowship (PGF) is awarded to a small number of NUS Computer Science PhD students. The PGF provides tuition waiver, and a stipend in return for research and teaching responsibilities. The stipend is valued at approximately $\$150,000$. NUS

Course Assistant Fellowship Fall 2016

The Course Assistant (CA) Fellowship provides for a tuition waiver, and a stipend for select high performing CAs in return for teaching responsibilities. The CA fellowship is valued at approximately $\$32,000$. Columbia University

Course Assistantship Fall 2015

The Course Assistantship provides a stipend in return for teaching responsibilities. The assistantship is valued at approximately $\$11,000$. Columbia University

COURSEWORK AND TECHNICAL SKILLS

Undergraduate computer science: Algorithms, Artificial intelligence, Numerical methods, Operating systems design, Parallel computing, Programming languages & compilers, Theory of computation
Undergraduate mathematics: Basic discrete mathematics, Foundations of mathematics, Intro to combinatorics, Linear programming, Multivariable calculus, Probability theory, Real analysis
Graduate computer science: Advanced algorithms, Introduction to computational complexity, Introduction to databases, Introduction to cryptography, Machine learning, Uncertainty modeling in AI
Graduate mathematics: Differentiable Manifolds, Probability Theory (audit)
Programming languages, libraries, and frameworks: Python, C, C++; Tensorflow, Pytorch; Kernel programming