MOHIT RAJPAL

mohitr@comp.nus.edu.sg

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

openreview.net/profile?id= Mohit_Rajpal1

mohit-rajpal.github.io

WORK EXPERIENCE

Postdoctoral Researcher   Mar. 2025 – May 2025
Singapore-ETH Centre & ETH Zurich Scalable Parallel Computing Lab   Hybrid. Singapore, SG
- Project led joint lab venture in AI for healthcare
- Architected multi-modal foundation model for automated X-Ray/CT/musculoskeletal analysis
- Drafted musculoskeletal foundation model SwissAI proposal for 3M in funding

Research Assistant, Server Admin   Nov. 2022 – Mar. 2024
National University of Singapore   Singapore, SG
- Directed design, procurement, and operation of 2–4M compute infrastructure supporting multi-team research operations

Research Intern, Research Contractor   Mar. 2017 – Jul. 2018
Microsoft Research   Redmond, WA, USA
- Led integration of software testing architecture into SaaS offering (Microsoft Security Risk Detection)
- Developed a neural network software testing architecture improving software testing speeds by $2\times$ - $3\times$

Software Engineer   Jun. 2013 – Aug. 2014
PDT Partners LLC   New York City, NY, USA
- Engineered high-throughput, low-latency trading infrastructure connecting directly to global equity markets

Software Engineer   Jul. 2011 – May 2013
Microsoft Corporation, Windows Division   Redmond, WA, USA
- Developed a highly scalable, distributed, fault-tolerant, multi-threaded file hashing utility
- Maintained support for 32-bit compatibility layer for 64-bit Windows (WoW64)
- Performed end-to-end validation of Windows 8 device and driver telemetry prior to release of Windows 8

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

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

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, uses a neurosymbolic approach combining symbolic graph pruning and compression with a cascaded graph neural network (GNN) to compute optimal traffic allocation with millisecond latency. 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. 2024

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 models (e.g., a reinforcement learning policy) addressing challenges posed by sparse reward. We propose a high-dimensional policy using probabilistic graphical models for cooperative multi-agent decision making. This high-dimensional policy model is optimized using Dependency structure search Bayesian optimization, an approach that scales to hundreds of dimensions with provable performance guarantees. Validation demonstrates the effectiveness of the proposed approach in various benchmark environments.

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 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 neural networks for fast nonlinear decoding. To constrain the problem space and impart inductive bias, a convolutional neural network is combined with a linear decoder. This approach outperforms linear decoding approaches and pure convolutional neural networ based approaches.

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 Neural Machine Translation 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
NUS

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 $150,000$.

Course Assistant Fellowship
Fall 2016
Columbia University

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 $32,000$.

Course Assistantship
Fall 2015
Columbia University

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

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), Fourier Analysis (Audit)
Programming languages, libraries, and frameworks: Python, C, C++; Tensorflow, Pytorch; Kernel programming