ASIC Q. CHEN

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EDUCATION

University of Toronto *Master of Science in Computer Science: September 2022 - (estimated) January 2024*
Machine Learning Theory with Applications, Supervised by Prof. **Rahul Krishnan**
Main research interests: Generative modelling, density estimation, machine learning for causal inference, machine learning for mathematical finance
Will transfer internally to PhD program (estimated graduation: April 2027) GPA: 4.0 out of 4.0

University of Toronto *Bachelor of Science: September 2015 - April 2020*
Computer Science Specialist, Statistics Major, Mathematics Minor GPA: 3.93 out of 4.0

PUBLICATIONS

Chen, Asic Q., Ruian Shi, Xiang Gao, Ricardo Baptista, and Rahul G. Krishnan. "Structured Neural Networks for Density Estimation and Causal Inference." In *Neural Information Processing Systems*. 2023.

Abstract: Injecting structure into neural networks allows us to approximate functions with certain invariances. For instance, when learning probability density functions for generative models, it is particularly advantageous to encode conditional independence structure of observed variables. We propose the **Structured Neural Network (StrNN)**, which injects structure through weight masking. The masks are designed via a novel relationship we explore between neural network architectures and binary matrix factorization, to ensure that the desired conditional independencies are respected and predefined objectives are explicitly optimized. We devise and study practical algorithms for this otherwise NP-hard design problem. We demonstrate the utility of StrNN in three applications: (1) binary and Gaussian density estimation with StrNN, (2) real-valued density estimation with Structured Autoregressive Flows (StrAFs), autoregressive normalizing flows that leverage StrNN as a conditioner, and (3) interventional and counterfactual analysis with StrAFs. Our work opens up new avenues for data-efficient generative modeling and the use of normalizing flows for causal effect estimation. *Paper link*

SKILLS

Machine learning	PyTorch, PyTorch Lightning, Weights & Biases, Numpy, Pandas, Julia
Scientific Computing	Matlab, various numerical methods, optimization
Full-stack Development	Python, SQL & relational databases, Java, RESTful APIs, Angular, React
Systems Programming	C, Linux, general OS and architecture knowledge
Mathematics	Algebra, calculus, differential equations, real analysis
Statistics	Probability theory, time series analysis, stochastic processes
Finance & Investment	CFA Level 1 complete, Level 2 candidate
Languages	English (native or bilingual), Mandarin Chinese (native or bilingual)

EXPERIENCE

University of Toronto September 2022 - Present
Department of Computer Science *Teaching Assistant*

CSC311: Introduction to Machine Learning (Fall 2022, Winter 2023): Delivered tutorial lectures to 200+ students, hosted office hours, prepared midterm and assignment materials, and graded

TD Asset Management June 2020 - April 2022
Portfolio Research and Analytics Team *Quantitative Researcher*

To create quantitative solutions for fixed income pricing and trading: Built and backtested statistical and machine learning models for risk and alpha estimation - e.g.: projecting yield curves and determining optimal carry metrics - using various python statistical libraries; Maintained and improved a Gurobi mixed-integer programming-based portfolio optimizer; Integrated new data sources; Exposed interactive results through web applications in React and Django; Periodically gave presentations on new models and results to various technical and business stakeholders.

Royal Bank of Canada (RBC) May 2019 - August 2019, Toronto, ON
Amplify, Market Risk Team *Developer and Data Scientist Intern*

To improve the responsiveness of the market risk department: Conducted extensive user research on applying data science to market risk; Created patent-pending stress testing solution (**US Patent Application #20210049699**) using machine learning models in TensorFlow and D3.js for visualizations; Saved up to 2 months in stress scenario implementation and generated valuable insight. Pitched in front of Group Executive level judges; Among the 3 teams (out of 21) recognized at the Amplify Expo, awarded the Most Disruptive Solution and a 10K cash prize.

International Business Machines (IBM) May 2017 - August 2018, Markham, ON
Db2 Database Performance Analytics Team *Developer Intern*

To improve efficiency of existing performance testing infrastructure: Built a cognitive dashboard for various personas using Angular, Go (API), and IBM Db2 (database); Employed statistics and machine learning in Python to better analyze performance regressions and trends; Reduced false positives by around 11%.
As a Career & Development Lead: Represented IBM at recruitment events; Organized career and technical workshops.

Zeroth Responders (Start-Up) January 2018 - August 2018, Toronto, ON
University of Toronto Entrepreneurship Hatchery (Incubator) *Co-founder and Software Developer*

To create a crowd-sourcing solution to decrease response time for medical emergencies: Extended top prize-winning project from UofTHacks 2018 into a cross-platform application on AWS; People's Choice Award at the U of T Entrepreneurship Hatchery's incubator program; Pitched to various stakeholders such as the Toronto Police Service.

China Financial Futures Exchange (CFFEX) May 2016 - August 2016, Shanghai, China
Clearing and Settlement Technologies *Developer Intern*

To create next-gen software systems: Researched rules and procedures used by futures exchanges world-wide; Completed requirements analysis; Implemented parts of back-end logic using Oracle PL/SQL and Java.

AWARDS & INITIATIVES

DeepMind Fellowship, Computer Science Departmental Award	USD$15,000 in scholarship, 2022 - 23
Vector Scholarship in Artificial Intelligence	CAD$17,500 in scholarship, 2022 - 23
U of T Computer Science Student Union	Vice President, 2017 - 2019
University of Toronto Chancellor's Scholarships	2016, 2018
UofTHacks Hackathon	Top Prize, January 2018
IBM Center for Advanced Studies Conference (CASCON)	Workshop and demo host, 2018
University of Toronto President's Scholar of Excellence	CAD$13,000 in scholarship, 2015

SELECT COURSEWORK

STA2111 Probability Theory	Fall 2023	
STA2163 Online Learning & Sequential Decision Making	Fall 2023	
CSC2412: Algorithms for Private Data (Differential Privacy)	Winter 2023	A+
CSC2541: Topics in Machine Learning: Intro to Causality	Fall 2022	A+