https://andrewnc.github.io **Andrew Carr** andrewcarr06@gmail.com

Education

M.S. Computer Science; 4.0 2020
Brigham Young University *Provo, UT*

B.S. Applied and Computational Mathematics; 3.81 2018
Brigham Young University *Provo, UT*

Relevant Experience

Google Brain - Research Intern May - Oct 2020

- Contributed key mathematical and algorithmic insights into a new self-supervised pretraining method that leverages recent advances in differentiable sorting for representation learning
- Defined new state of the art performance for audio and vision based tasks
- Streamlined and standardized several scattered experiments across notebooks and code bases. This drastically increased team productivity and we were able to launch multiple large scale experiments daily
- Designed and developed two novel metrics to measure experimental success now used by the team to communicate our findings
- Orchestrated foundational experiments across thousands of GPUs and decreased data loading time from 5 minutes to 300ms
- Explored mathematical relationship between entanglement and optimal transport distance, presented work to team
- Explored the literature and successfully reproduced results from the field which increased our ability to iterate and improve upon existing research
- Work under review at ICLR and in progress for ICML

Lyft, Level 5, Autonomous Vehicles - Prediction Intern June - Aug 2019

- Developed A/B testing platform in high performant C++ to compare prediction models locally and in the cloud greatly increasing my team's development velocity
- Identified predictive features and developed real-time feature extraction system for use in machine learning pipeline
- Explored statistical and neural models for dynamical vehicle motion prediction leading to a 22.5% performance improvement
- Lead 3 engineers in exploratory 20% project for semantic code search
- Presented research to members of my team, explaining relevant topics and mathematics to apply to our technology stack

Qualtrics - NLP Intern May - Aug 2018

- Achieved ∼96% accuracy with a .005% false positive rate, matching state of the art on phishing detection by researching and implementing system using sophisticated NLP feature engineering and machine learning
- Increased speed of system 3x resulting in a 63% reduction in hardware costs while handling 3 million daily requests by engineering asynchronous API using parallel processing and high performance computing techniques
- Identified, explored, and implemented state of the art emerging topic tracking system which allowed my team to reach their stretch goals for the quarter and led to a **patent**
- Built question similarity tool using sentence embeddings after collecting and curating a dataset of ∼130,000 questions. Improved f1 score from .3 to ∼.7 built using both structured and unstructured datasets
- The final estimated impact of my internship is $300k - 500k in yearly savings

Amazon Alexa Prize: Team Eve - Machine Learning Researcher Jan - Apr 2018

- Member of team Eve for the Alexa prize challenge. One of eight teams selected out of hundreds to research and build a social chatbot system to hold arbitrary conversation for 20 minutes on any topic
- Designed and built an offensive speech filtering system using probabilistic methods, which performed ∼3% better than current industry standards
- Researched and designed a complex sentiment analysis tool that classified sentences as having complex sentiment used for noteworthy knowledge retrieval

Perception, Control, and Cognition Lab - Deep Learning Researcher Dec 2016 - Present

- Lead multiple projects from inception to completion while mentoring students with a variety of skill levels which resulted in a number of novel contributions and publications
- Developed a system to improve MRI quality using a denoising auto encoder
- Designed deep architecture to improve hearing aid quality resulting in signal to noise ratio increase of 197%

BYU Math Department - Competitive Coding Instructor Aug 2017 - Present

- Designed a course targeted to teach applied math students about technical problem solving while also teaching interview strategy, and various programming languages
- Resulted in 12 out of our 14 teams placed in the top 20 of the annual university coding competition
- Received a course rating of 4.8/5.0 which is 0.5 points higher than the department average

Private Capital Group - Software Engineer, Intern May - Oct 2016

- Developed web solutions to significantly increase back-office employee effectiveness by creating automated systems that resulted in yearly savings of over $200,000
- Collected, cleaned, and analyzed internal and external data which was built into reporting dashboards that tracked key business insights and allowed partners to make informed decisions
- Decreased product downtime by 47% by implemented full testing suite and fixing critical bugs

BYU Math Department - PDE Research Assistant Sept 2015 - Apr 2016

- Discovered proper boundary condition equations to more accurately model pressure waves using numerical methods, resulting in a method of approximation that was 3x faster than previous methods

Carnegie Mellon University - IT Lab Research Fellow June - Aug 2015

- Performed secondary research on police effectiveness in the presence of body cameras. We found a 70% decrease in violence on both sides when using body cameras
- Analyzed data from user studies and developed a custom web game to help local refugees learn English

Full-Stack Web Developer - BYU Studies Jan 2014 - Mar 2015

- Led a web team of 3 in maintaining a VB/ASP.NET website with thousands of unique visitors, increasing traffic and profitability by over 38%
- Managed large SQL databases while analyzing customer information to improve overall business increasing customer retention by 11%

Publications and Patents

Carr, A., Berthet, Q., Blondel, M., Teboul, O., Zeghidour., N (2020). Shuffle to Learn: Self-supervised Learning from Permutations Via Differentiable Ranking. Under Review at ICLR 2021

Carr, A. N. (2020). Geometric Extensions of Neural Processes

Carr, A., Nielson, J., & Wingate, D. (2019). Wasserstein Neural Processes. OTML Workshop NeurIPS arXiv:1910.00668.

Carr, A., & Wingate, D. (2019). Graph Neural Processes: Towards Bayesian Graph Neural Networks. arXiv preprint arXiv:1902.10042.

Text Analytic Notifications (2019) US 20055.538

Fulda, N., Etchart, T., Myers, W., Ricks, D., Brown, Z., Szendre, J., ... Carr, A., & Wingate, D. (2018). Byu-eve: Mixed initiative dialog via structured knowledge graph traversal and conversational scaffolding. Proceedings of the 2018 Amazon Alexa Prize.

Talks and Awards

Workshop Poster NeurIPS 2019: Presentation of our work on Wasserstein Neural Processes

1^{st} **place Student Research Conference 2019**: Presentation of our work on Graph Neural Processes to peers and professors

President's Leadership Council Presentation: Selected by faculty and staff to represent my college's 4,000+ students by presenting my research to BYU's $1 million+ donors and top administration

Judge and Presenter 2019, 2020: Mentored hackathon participants, presented technology relevant to multiple projects, served on the judging panel at the Global Legal Hackathon

No Code Presentation 2019: Presented novel visual coding platform to group of students at the Global Legal Hackathon

Burton Scholarship 2017 - 2018: Full tuition academic merit scholarship

Excellence in Mathematics 2016: Nominated by research advisor for research contributions

Other Experience

TA Control theory: Developed curriculum for optimal control, built small self driving car platform for student projects

TA Graduate Deep Learning: Developed labs, held help sessions, and taught lectures on advanced deep learning concepts

Applied Math Curriculum Development: Developed and wrote labs for students to practice mathematical and algorithmic skills, wrote **solutions manual** to applied math textbook on optimization and algorithms

2^{nd} **place BYU ACM Hackathon 2019**: Built a computer vision pong game that is controlled with hand detection

2^{nd} **place BI Wolff Hackathon 2018**: Built prescriptive ML solution to predict individual risk of becoming homeless

1^{st} **place BYU ACM Hackathon 2017**: Created Auto Dino program to perfectly play the chrome dino no wifi game

1^{st} **place BYU ACM Hackathon 2016**: Created *Mathify* app using polynomial interpolation to display text as math

1^{st} **place BYU ACM Summer Coding Competition 2018, 2019**

Top 5 BYU ACM Fall Coding Competition 2017

2^{nd} **place Global Legal Hackathon Utah**: Made a chrome extension using NLP to summarize terms and conditions which I grew to 2000 active users and sold

Python 3.8 Open Source: Fix small doc bug in cpython pull #11683

pyprobml Open Source: A primary contributor for Machine Learning a Probabilistic Perspective v2 Python code with Dr Kevin Murphy

Data Science Blog: 300+ monthly readers. Data science problems solved with esoteric programming languages

Ranked 8th in world: Tetris in spring of 2011