Alex Bowe, PhD

Algorithm Researcher and Senior Software Engineer specializing in Compression, Information Retrieval, and AI Planning
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WORK EXPERIENCE

Senior Software Engineer, Route Planning, AI | Cruise, San Francisco, CA **Dec 2018 – Oct 2023**

- Owner of internal Python library abstracting on-car router, empowering 100s of staff in automated analysis; designed API, managed releases, and achieved 94% test coverage, supported via extensive docs, tutorials, and office hours
- Co-architected and implemented modular fleet-wide intelligence sharing system, enabling real-time responses to city-wide events, reducing remote operator calls by 4.6% and vehicle recovery incidents by 19.6%
- Spearheaded cross-functional task force of 6 to resolve a complex fire-up issue in less than 24 hours, saving the company millions and securing 90-day GTM targets. Authored playbook to prevent recurrence
- Revamped router architecture using the builder pattern, supporting high frequency lazy updates and cached subcomponents, simplifying usage, improving speed, reducing bugs, and removing 1000s of lines of code
- Partnered with Data Science team to establish automated training and delivery of weekly traffic model, improving ETA accuracy by 16.5%
- Initiated cross-functional effort to implement route-aware pullover suggestion system, yielding 17% improvement to both ETA and customer wait times
- Mentored and paired with 12 engineers and interns on research projects, leading one intern to receive a patent

Software Engineer, Route Planning, AI | Cruise, San Francisco, CA **Mar 2017 – Nov 2018**

- One of the first 100 engineers; instrumental in engineering fine-tuned route planning controls, such as avoidance and attraction areas, reducing takeovers and directly contributing to receiving over $2.25B during early investor demos
- Partnered with all engineering team leads to define key routing metrics and built tools for daily prediction and monitoring of real-world performance to guide company-wide development
- Accelerated development feedback cycle by collaborating with the simulation team to fully integrate, control, and visualize the router within simulations
- Engineered global pullover interval index, reducing vehicle recovery incidents caused by being stuck while searching for free space, and facilitating future safety and comfort criteria expansion

Algorithms Research Consultant **Oct 2013 – Aug 2015**

- Increased genetic database capacity by 150% using succinct indexes, reporting directly to CTO of One Codex
- Improved quantum DNA sequencer recall by 7% using k-means, reporting directly to CTO of Quantum Biosystems

PATENTS

- *Real time AV fleet parking availability*, co-inventor, pending, 2023
- *System-level optimization and mode suggestion platform for transportation trips*, primary inventor, pending, 2023
- *Systems and methods for overlap-aware ranking of navigation avoidance areas for autonomous vehicles*, primary inventor, US11307590B2, 2022
- *Analysis of network effects of avoidance areas on routing*, co-inventor, US10962380B2, 2021

PUBLICATIONS

** indicates primary authorship*

- M. Muggli*, A. Bowe*, N. Noyes, P. Morley, K. Belk, R. Raymond, T. Gagie, S. Puglisi, C. Boucher, *Succinct colored de Bruijn graphs*, Bioinformatics, 10.1093/bioinformatics/btx067, 2017
- C. Boucher, A. Bowe, T. Gagie, G. Manzini, J. Sirén*, *Relative select*, String Processing and Information Retrieval: 22nd International Symposium, 10.1007/978-3-319-23826-5_15, 2015
- C. Boucher, A. Bowe*, T. Gagie, S. Puglisi*, K. Sadakane, *Variable-order de Bruijn graphs*, Data Compression Conference, 10.1109/DCC.2015.70, 2015
- A. Bowe*, T. Onodera, K. Sadakane*, T. Shibuya, *Succinct de Bruijn graphs*, International Workshop on Algorithms in Bioinformatics, 10.1007/978-3-642-33122-0_18, 2012

EDUCATION

PhD in CS (Bioinformatics) | National Institute of Informatics, Tokyo, JP | GPA 4.0 **Mar 2020**

- Co-invented compressed suffix array-based DNA graph, reducing memory requirements by 93%, enabling complex analysis on commodity hardware at home or in the field (utilized in COVID-19 vaccine - source: 10.3390/v15051065)
- Co-invented variable-order DNA graph, supporting context window adjustment on-the-fly at marginal cost to performance. Later research built off of this to improve DNA sequencing accuracy to near-optimal levels
- Co-invented compressed colored DNA graph, enabling large scale population genomics such as rapid detection of all Antimicrobial Resistance Genes in food supply chains, preventing epidemics
- Designed and implemented algorithm in CUDA to compute parallel functions over succinct trees (2 bits per vertex)

MS in CS (Information Retrieval) | RMIT, Melbourne, AU | GPA 4.0, Summa cum laude, Dean's list **Oct 2010**
BS in CS (Computational Mathematics) | RMIT, Melbourne, AU | GPA 4.0, Summa cum laude, Dean's list **Oct 2009**

PROJECTS

Tech Lead, Smoothbrain.ai | github.com/smoothbrain-ai

- Led team of 3 to develop an Anki plugin that fetches user highlights from Readwise.io, then uses the ChatGPT API to rank usefulness and generates spaced-repetition flashcards, helping users to streamline their learning

Tech Lead, Distributed Keyphrase Ranker | github.com/alexbowe/keyphrase

- Researched and implemented a distributed keyphrase extractor and document ranker
- Utilized NLTK for POS tagging, Context Free Grammars for chunking, TF-IDF for ranking, and Hadoop to scale

Tech Lead, Cosmo DNA Assembler | github.com/cosmo-team

- Led team of 3 to develop cutting edge low-memory DNA assembler, used in several Bioinformatics labs worldwide
- Improved construction speed from days to hours using parallel asynchronous multi-disk external sort

AWARDS

Knuth Reward Check **Mar 2013**

- Received 0x$1 for correcting a combinatorial math error in Donald Knuth's *The Art of Computer Programming Vol. 4A*

SKILLS

Core Competencies: Information Retrieval, Compression, High Performance Computing, Natural Language Processing, Self-Driving Cars, Robotics, Route Planning, Bioinformatics
Programming Languages: Python, C++, CUDA, Java, Erlang
Technologies: Numpy, SciPy, Pandas, NLTK, Boost, Thrust, gRPC, Robot Operating System