

Alex Bowe, PhD

Senior Software Engineer and Algorithm Researcher 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](https://patents.google.com/patent/US11307590B2), 2022
- *Analysis of network effects of avoidance areas on routing*, co-inventor, [US10962380B2](https://patents.google.com/patent/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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](https://doi.org/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