Blair **Drummond**

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DevOps Engineer
& Ex Math Student
= Kubernetes + Data Science

My academic background is in ergodic theory & random graphs, but I started out in cognitive science, linguistics, & computer science. I like learning about how mistakes get made (Kahneman, Taleb, Don Norman), why reasonable people disagree, and how problems get identified and placed in a framework. I am a long-time unix and programming enthusiast, and my combination of skills has turned me into a DevOps and Kubernetes developer, interested in operationalizing systems and creating smooth interfaces/APIs between data science & development teams and the product life-cycle they feed work into.

Education

M.Sc. in Mathematics *University of Ottawa, 2017-2019*
Thesis on the Benjamini-Schramm limits of Rauzy graphs of low-complexity words. Supervised by Dr. Vadim Kaimanovich. *Successfully defended August 7, 2019. Slides available here; thesis available here.*

Honours B.Sc. in Mathematics *University of Ottawa, 2013-2017*
Honours project on ergodic theory and fractal geometry, studying dynamics of the "zoom" transformation to study the Minkowski and Hausdorff dimension of a fractal. Before switching into mathematics I also studied computer science and linguistics ($\approx$ 2 years). Graduated magna cum laude.

Jobs & Projects

DevOps & Data Engineer & Outreach *Statistics Canada, 2019-Present*
Built fast and scalable satellite imaging pipelines within the Data Science Division; took a pipeline that used to run for hours on a dozen large cloud computers, and implemented a lightning-fast feather-weight Pachyderm implementation with orders of magnitude of savings.

In subsequent work with the platform team, worked on kubernetes controllers, CI/CD systems, security systems such as Istio and Gatekeeper, helm chart development/packaging, and container development, to enable, secure, and operationalize our data science platform. Also worked directly with the application teams to deploy their projects on the platform, assisting my own division and others.

I also represented the platform in presentations at conferences and in meetings with external departments, showcasing and explaining the work to CIOs across the government of Canada and with project teams as well.

R Programmer and Consultant *University of Ottawa, 2017-2019*
Authored an R library for analysis of single ion-channel experiments for the daCosta lab. I am the principal author of a published paper on the library. The package is available on CRAN under the name `scbursts`.

Member of Mathematics Reading Group *University of Ottawa, 2016-2019*
Participated in and contributed to a mathematics reading group of four members. We studied algebraic geometry, category theory, probability & dynamical systems, and complex analysis. We also took on an original research problem from a professor and we solved it. That was published on March 12, 2020 in Springer.

Developer (Automation) *Sonus Networks, Summer 2015*
Developed automation tools for testing the deployment of operating system upgrades and rollbacks to servers over a network, working in linux environment with python. Worked extensively on parallel processing of tasks.

NLP Research Assistant *University of Ottawa, Fall 2014*
Did natural language processing work in python with NLTK, extracting statistics from a corpus of poems as a computational linguistics project. Presented a research poster on my work.

Technical Skills

Cloud Native / Kubernetes

- Security & Policy: Open Policy Agent+Rego, Gatekeeper, Istio Authorization Policies, secure container image development and automated scanning. (Todo: want to learn more about new container runtimes and container security)
- Monitoring: Some experience with Kiali, Prometheus exporters & Grafana, Elastic Search basics. Interested in fluentd, eBPF, and load modelling.
- CI/CD: Experience with ArgoCD, Github Actions, Gitlab CI, and a little Tekton.
- Deployment & Packaging: a little experience with terraform, work with Helm and ArgoCD as well as plain-ol' kubernetes yaml. (Todo: I will write an operator some day)
- Data Science: Kubeflow, Pachyderm, Argo Workflows, Seldon.
- Fun: I have my own raspberry-pi based Kubernetes cluster https://happylittlecloud.ca (on `k3s`). I write my own applications; code on gitlab.
- *Interests*: Want to get better at observability and reliability, and storage architecture on cloud.

Algorithms

- I got ≈100% in my *Data Structures and Algorithms* course and I later became a teaching assistant while in undergrad.
- Interested in high-performance computing and general-purpose GPU programming (one day!).
- Studied distributed optimization algorithms such as ant-colony optimization, as well as ML algorithms such as random forests, support vector machines, naïve Bayes, neural networks (autoencoders, recurrent NNs), manifold learning, topological data analysis.

General Computing

- 10+ years of experience as a linux user, with 5+ years programming on a range of distributions across personal computers, servers, and the cloud. Have acted as unofficial sysadmin in many places. Happiest on the command-line.
- Screen-scraping, web-crawling, API design, NLP, and automation in python.
- Wrote fast pipelines in bash, R, and python for satellite imaging. Made orders of magnitude impact on speed, CPU and memory profile. Have also written fast Julia code for Covid-19 modelling work with the Public Health Agency of Canada, in collaboration with a data science colleague.
- Ran a python+linux workshop for a machine learning group at the University of Ottawa.
- Professional experience in R and C++ designing intuitive tools for scientists.

(previously) Analysis & probability

- Expertise in ergodic theory of discrete dynamical systems, random graphs, and symbolic dynamics.
- Experience with time-series, Markov chains, graph theory, de Bruijn graphs and Rauzy graphs, abstract dynamical systems.
- Advanced knowledge of functional analysis & measure theory, probability theory, and commutative algebra.
- In my fourth year I took a PhD level reading course (for graduate credit) on Markov processes and gave a talk on hidden Markov models.
- Wrote a small graph-theory / mathematical programming program in Haskell. Rauzy graphs.
- *Note: My interests turned from pure research to the intersection of technological and business problems. Not sure when I became boring.*

Works & Publications

- My Kubernetes Cluster — happylittlecloud.ca
- My Personal Website — blair.happylittlecloud.ca
- My Master's thesis — https://ruor.uottawa.ca/handle/10393/39594
- Gitlab profile — gitlab.com/blairdrummond/
- Github profile — github.com/blairdrummond/
- The R library that I wrote — CRAN.R-project.org/package=scbursts
- Research poster for my old NLP project — ruor.uottawa.ca/handle/10393/32644

[1] Joey Beauvais-Feisthauer, Richard Blute, Ian Dewan, Blair Drummond, and Pierre-Alain Jacqmin. Finiteness spaces, étale groupoids and their convolution algebras. *Semigroup Forum*, 2020.

[2] Blair Drummond. Limits of Rauzy graphs of low-complexity words. Master's thesis, Université d'Ottawa/University of Ottawa, 2019.

[3] Blair R. Drummond, Christian J.G. Tessier, Mathieu F. Dextraze, and Corrie J.B. daCosta. scbursts: An R package for analysis and sorting of single-channel bursts. *SoftwareX*, 10:100285, 2019.

`Transcripts attached.`