ELLIOTT VERCOE

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Location: Sydney, Australia

ABOUT ME

I am a software engineer / data engineer / data scientist with a master's in computer science and 5 years of professional software engineering experience. I was originally trained as a mechanical engineer, but soon became involved in a software engineering startup, and then moved to a computer science research group working at the intersection between academia and industry.

I am interested in data science and machine learning adjacent roles. I utilise my background in mathematics, machine learning and software engineering to provide a unique, full-stack perspective on both the theoretical underpinnings and practical application of data science solutions. I enjoy both doing the foundational research, and implementing my ideas in real systems.

WORK EXPERIENCE

CSIRO's Data61 - Information Security and Privacy Research Group **2020-2022**
Software Engineer

R4

- Lead development for R4; an application to assist data custodians with managing re-identification risk and to apply risk reduction methods to confidential datasets.
- Improved performance, reliability and mathematical correctness of the application, including building a testing framework to improve robustness and verify mathematical correctness.
- Created a streamlined build and deployment process integrating all services into Docker containers, allowing easy installation for multiple clients on varying system architectures.
- Supervisor and co-supervisor for 2 student internships.
- Technologies used: Scala (Play Framework) / Apache Spark / MongoDB / Docker / HTML / CSS / JavaScript / Git / Bitbucket

Differentially Private Generative Adversarial Networks (DP-GAN)

- Using Pytorch, applied a novel differential privacy injection method to a GAN, successfully trained the GAN on a range of datasets, and developed a range of utility metrics to assess the results.
- Co-authored a research paper [1]

Differentially Private One-step Top-k Selection Algorithms for the Real World

- Implemented a Python library to apply existing One-step Top-k Selection algorithms to generic datasets, with novel research improvements, and developed methodologies to assess the algorithm performance on a client's data.
- Co-authored a research paper [2]

Markov Model Privacy Risk Quantification API

- Took existing privacy quantification research and built an efficient, modular implementation with significant performance improvements over the existing work.
- Using Django / Celery, built an API to integrate the new code into a client's data pipeline.

PowerModelsPrivacyPreserving.jl

- With a multi-discipline team, developed a Julia package that applies differential privacy to Optimal Power Flow numerical optimizations.
- Co-authored a research paper [3]

Performance Based Group - BECODE **2018-2019**
Software Engineer

- Worked on the design and implementation of a new web application to assist engineers with applying fire safety standards to building design.
- Backend Django web development. Python / Django / PostgreSQL / Linux
- Agile project management. Jira /Git / Bitbucket
- Supervisor for a student internship.

Performance Based Group - PBC **2017-2018**
Fire Safety Design Engineer

- Writing fire engineering reports, liaising with clients to coordinate optimal fire safety solutions, and performing Computational Fluid Dynamics (CFD) fire modelling.

Engineering Commissioning Services **2016**
Undergraduate Mechanical Engineer

EDUCATION

Master of Information Technology **2018-2019**
University of New South Wales (UNSW)

- Specialising in Data Science and Artificial Intelligence
- Achieved a mark of 92 for my capstone research project:
  Bidirectional Classifying Generative Adversarial Networks (BiCGAN) [5]
- Graduated with Distinction; Overall WAM: 83

Bachelor of Mechanical Engineering **2013-2016**
University of New South Wales (UNSW)

- Achieved a mark of 87 for my undergraduate thesis: Low Energy Orbital Transfers
- Graduated with First Class Honours; Overall WAM: 84

OTHER ACTIVITIES

UNSW Outdoors Club Trip Leader **2016-Present**

- Teaching beginner and intermediate climbing, canyoning and hiking skills to participants, and leading and managing trips and events.

Remote Area First Aid Training **2021**

- Completed advanced first aid training to provide response in a remote or isolated location.

TECHNICAL SKILLS

Python - Data Science	Pandas / NumPy / Matplotlib / Pytorch / Scripting
Python - Django / Web Development	Backend developer on 4 Django projects utilising Test Driven Development best practices
Scala	Lead developer on a Scala / Spark project (R4)
Apache Spark	Implemented novel big data processing algorithms for privacy analysis
SQL / MongoDB	Experienced with traditional RDBMS and NoSQL
Docker / Docker-Compose	Designed a new Docker deployment strategy for R4
Linux	My daily driver is Ubuntu
HTML / CSS / JavaScript / jQuery	Experienced with front end development
AWS / Cloud	Comfortable with API Gateway / Lambda Familiar with DynamoDB / S3 / EC2
Julia	Implemented new research within a Julia based power systems framework
LaTeX	Written multiple papers and this resume

RESEARCH

[1] Time Series Synthesis Based on Differentially Private Generative Adversarial Networks 2022
Ming Ding, Elliott Vercoe, David Smith, Thierry Rakotoarivelo and Djazia Ladjal
Submitted for review

[2] Differentially Private One-step Top-k Selection Algorithms for the Real World 2022
Raghav Bhaskar, Elliott Vercoe, David Smith, Thierry Rakotoarivelo and Djazia Ladjal
Submitted for review

[3] Realistic Differentially-Private Transmission Power Flow Data Release 2021
David Smith, Frederik Geth, Elliott Vercoe, Andrew Feutrill, Ming Ding, Jonathan Chan, James Foster and Thierry Rakotoarivelo
https://arxiv.org/abs/2103.14036

[4] Multi-Resolution Differentially-Private Data: Model and Protocol 2020
Farhad Farokhi, Thierry Rakotoarivelo, Ming Ding, Paul Tyler, Elliott Vercoe
http://linked.data.gov.au/dataset/energy/81fc0731-4e69-4575-9311-4cb0fbdecf3b

5] BiDirectional Classifying Generative Adversarial Networks (BiCGAN) 2019
Elliott Vercoe and Alan Blair
https://elliottvercoe.dev/projects.html