Danny James **Williams**

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Statement

I am currently a final year PhD student, studying computational statistics and data science on the COMPASS CDT. I am enthusiastic about using my statistical knowledge to enhance artificial intelligence in domains such as the climate and health sciences, where I can be of most value. My research interests also include NLP, computer vision and deep learning.

Education

COMPASS CDT
University of Bristol
Began September 2019

MMath Mathematics
University of Exeter
Graduated with a first in 2019

Study

Undergraduate
- Generalised Linear Models
- Spatial Statistics
- Time Series Analysis
- Statistical Inference
- Numerical Optimisation
- Machine Learning
- Extreme Value Theory
- Mathematical Proofs
- Analysis

Postgraduate
- Statistical Methods
- Statistical Computing
- Convex Optimisation
- Statistical Proofs
- Deep Learning
- Bayesian Modelling
- Monte Carlo Methods
- Machine Learning

Teaching

- Probability/Statistics Tutor 2019-2022
- Bristol Teaching Award nomination

Research

Truncated Kernelised Stein Discrepancies
Daniel Williams, Song Liu | ICML 2023

Developed a data-driven solution to truncated probability density estimation via solving a constrained optimisation problem and minimising a modified kernelised Stein discrepancy. I showed theoretical guarantees for this estimator and performed numerical experiments showing improvements over state-of-the-art methods.
Skills: Python • Asymptotic Theory • machine learning • constrained optimisation

Score Matching for Truncated Density Estimation on a Manifold
Daniel Williams, Song Liu | TAG in ML, ICML Workshop

I extended the theoretical approach of truncated score matching to the manifold case using an application of Stokes' theorem to rederive the objective function. I constructed alternative weighting functions for a generic spherical boundary and demonstrated strong numerical performance.
Skills: Density Estimation • Statistics Theory • Differential Geometry • R • Packaging R Code

Estimating Density Models with Truncation Boundaries using Score Matching
Song Liu, Takafumi Kanamori, Daniel Williams | JMLR

Developed an estimator of truncated probability densities where the computation of the normalizing constant is infeasible using score matching. Our estimator involved a weighting function derived from heuristics and analytical results, with demonstrable numerical advantages across a series of benchmark experiments and applications.
Skills: Density Estimation • Statistics Theory • Proofs • MATLAB • Experimental Process

Downscaling Extremes of Precipitation
University of Exeter | Masters Project (2019)

Modelled the relationship between extremes of rainfall and their spatial properties for both gridded model output and point-level observations using extreme value theory. By downscaling, I predicted rainfall extremes at a high resolution via a spatial generalised additive model (GAM).
Skills: GAMs • Extreme Value Theory • Writing • Presenting • R • Packaging R Code

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Achievements

Online Courses

- Machine Learning with Tensorflow on Google Cloud Platform
- Build a Deep Learning Based Image Classifier with R
- Neural Networks and Deep Learning
- Academic Literacy

Awards

- The Exeter (Employability) Award
- Level 1 Tennis Coach

Skills

Programming

Python • R • C++ • Rcpp • MATLAB • SQL

Professional

Report Writing • Group Project Work • Presenting • Teaching • Critical Thinking • Time Management

Focus Labs

- Energy Forecasting Demand Hackathon with EDF Energy
- Anomaly Detection for Pipe Leaks with Wessex Water
- Consultancy with Spin Up Science
- Car Insurance Claim Prediction with LV

Personal

Weightlifting is one of my biggest passions outside of work.

I'm environmentally concious and strive to live as sustainably as I can.

Classical music and movie soundtracks are my favourite type of music, but in a stark contrast, my second favourite genre is rap and hip-hop.

Supplementary Projects

Water Pipe Leakage Detection

Worked with Wessex Water and within my PhD cohort to identify potential leaks in water pipes. The final method involved unsupervised learning of time series clusters, fitting a seasonal additive model to output residuals, and then implementing a changepoint detection algorithm on these residuals.

Natural Language Analysis

Independently analysed the sentiment and syntax of the lyrics of famous artist Kanye West using Google's Natural Language API. I created interactive visualisations of the results for an online blog post on my personal website, and for an open-source repository on Github.

Gaussian Process Classification

Part of a group project during my PhD, involved learning, detailing and exploring the process of classification using Gaussian processes with an MCMC sampler. Implemented a pseudo-marginal likelihood approach, with intelligent subset selection for large datasets and a Laplace approximation for the posterior of the latent variables. All code was written into an Rcpp package.

Chicago Crime Classification

Classified whether an arrest would be made for a particular crime, using a public crime dataset for Chicago. Implemented a logistic regression approach with iteratively re-weighted least squares from scratch, whilst taking advantage of the sparsity of the model matrix to improve efficiency.

Employment

Customer Service Assistant | Libraries Unlimited (2018 - 2019)

- Social Media Management
- IT Systems
- Customer Facing Role
- Warehouse Work

Delivery Rider | Deliveroo (2017 - 2018)

- Personal Schedule
- Physical Fitness
- Strict Deadline
- Time Keeping

Customer Consultant | Dixons Carphone (2016 - 2017)

- Sales Role
- Constant Communication
- Working to Targets
- Simplifying Complex Technology

Customer Assistant | Tesco (2014 - 2015)

- Long Working Hours
- Worked Under Management
- Interpersonal Skills
- High Pressure Environment

References

Available upon request.