

Dr David Maybury
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July 8, 2026

To whom it may concern,

I am an applied mathematician and the Lead Data Scientist for the Digital Services Branch at Public Services and Procurement Canada (PSPC). Throughout my career, I have focused on transforming complex data into transparent, interpretable, and powerful decision insights for senior leadership.

My work sits squarely at the intersection of operational research and data science. In 2007, following a postdoctoral fellowship with the theoretical physics group at the University of Oxford, I transitioned into operational research as a senior scientist with Defence Research and Development Canada (DRDC). A decade later, I moved to PSPC to build and lead its data science initiative from the ground up. Today, I provide technical leadership for a multidisciplinary team, ensuring our statistical approaches, code quality, and final outputs are structurally sound and strictly actionable.

Driven by functionalism and first-principles reasoning, I cut through superficial assumptions to build robust machine learning/statistical models. My team and I deliver end-to-end solutions, from mathematical modelling to data visualization through custom web applications. For security reasons, we maintain our project code on our internal Git server.

My work consistently focuses on solving high-stakes, complex problems for the Government of Canada. A selection of my defining professional work includes:

- **Crisis Management & Queue Optimization:** During the government pay system failure, I designed the operational research approach to manage a boundlessly growing backlog of over 600,000 cases. By identifying an “aging effect” where manual effort increases as cases age, I built a method that used non-parametric survival analysis with hierarchical clustering to optimize the queue processing sequence. Through dynamic programming, with my team, we effectively eliminated induced workload from aging and maximized throughput. As part of an extension of that project, I built an AI system based on deep autoencoders for detecting pension contribution anomalies that the Phoenix pay system randomly inserted into the pension database. The autoencoders used machine learning in the code layer along with extreme value theory to enhance anomaly detection.
- **Combinatorial Optimization & Geospatial Analytics:** For the Government of Canada’s real estate divestment and employee restacking challenge, I directed the creation of an enterprise-wide combinatorial optimization engine. By modelling this challenge as variations of the Multiple Knapsack Problem, my solution maximized employee accommodation under strict constraints across the entire public service. Decision-makers explored portfolio solutions across Canadian metropolitan areas within our custom-made

geospatial web app, ultimately driving Cabinet-level divestment decisions and official public service restacking under new work mandates.

- **Quantitative Finance & Risk Modelling:** While supporting the Assistant Deputy Minister of Materiel at DND, I focused heavily on complex financial decision problems, applying measure-theoretic techniques grounded in modern mathematical finance. I implemented stochastic volatility models to publicly traded option data to monitor foreign exchange smile dynamics, built copula-based Value-at-Risk tools using GARCH-filtered return data, and modelled interest rate risk through fixed income engineering and credit derivative evaluation. I have deep understanding of financial engineering and financial economics, including the applications of Lèvy processes to derivative pricing, asset pricing through factor modelling, and real option theory.

My professional execution is anchored by my Ph.D. in theoretical physics and my ongoing commitment to research excellence, evidenced by winning the NATO Operations Research Paper of the Year (2016). I have published original research in Nuclear Physics B, Physical Review D, The Journal of High Energy Physics, and The Journal of Theoretical Biology.

At heart, I am a passionate applied mathematician with a deep interest in stochastic phenomena, dedicated to rigorous modelling.

Dr David Maybury

Enclosures: CV

David Maybury, PhD

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About me

At heart, I am a passionate applied mathematician with a deep interest in stochastic phenomena. I am always looking for opportunities to transform data into useful decision insights.

Areas of specialization

- Statistical learning/AI
- Operations research
- Financial engineering
- Hierarchical Modelling
- Stochastic processes
 - R and Python

Personal

Nationality: Canadian

SHORT RESUME

2018–present

Head Data Scientist

PUBLIC SERVICES AND PROCUREMENT CANADA · Artificial Intelligence and Machine Learning 📍



- Lead a team of data scientists developing statistical models and library packages in R for decision making insight at Deputy/Assistant Deputy Minister level; mentor the team members, provide scientific leadership, and direct DevOps for production level applications.
- Spearhead major projects with the government of Canada's real estate portfolio rationalization initiative from the hybrid work policy: combinatorial optimization models (mix integer linear programming) for government real estate divestment recommendations; multivariate statistical models (conditional copulas) for building occupancy estimation from sensor data.
- Provide mathematical models of the Phoenix pay system queue, and the public service pension system: applications of survival analysis, time series modelling, support vector machines, autoencoders, multi-criteria decision analysis, queueing theory, dynamic programming, and inference with multilevel/hierarchical regression.
- Contribute to the federal government's efforts against COVID-19: original research in modelling propagation as a branching process, application of branching processes to workplace mitigation using cloud computing, original research with the Public Health Agency of Canada on the application of Bayesian hierarchical analysis of seroprevalence data, and on forecasting provincial ICU occupation using hidden Markov models and Skellam processes.
- Lead development of web-based data visualization platforms in Shiny for senior decision makers.
- Build data science solutions with external departments including Global Affairs Canada, Correctional Services Canada, and the Public Health Agency of Canada.

2008–2017

Senior Operational Research Scientist

DEFENCE RESEARCH AND DEVELOPMENT CANADA · Centre for Operational Research and Analysis 📍



- Led the international NATO task group on military economics with a focus on real option analysis applied to fleet replacement: treated fleet replacement as an American style option (contingent claim analysis).
- Applied machine learning techniques (tree based methods, hidden Markov models, and additive models) to naval operational data for improving schedules at the fleet maintenance facilities.
- Created geospatial stochastic filtering techniques for tracking ship movements in the Arctic from incomplete and noisy observations.
- Developed and implement foreign exchange risk models in R and MATLAB for defence procurement risk monitoring: stochastic volatility modelling, derivative pricing, model inference from traded assets, applications of stochastic calculus.
- Provided decision support and risk assessment directly to Assistant Deputy Minister/Flag officer level: inventory control, fleet performance, financial risk.

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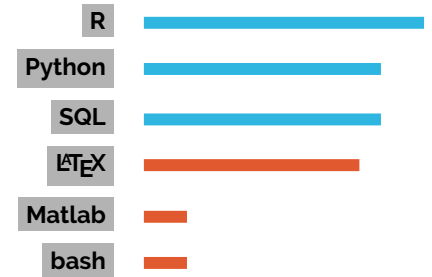
www.davidmaybury.ca

in david-w-maybury

DEGREES

- 2005 **Physics**
PHD · University of Alberta
Thesis: Electroweak physics beyond the standard model 
- 1999 **Applied Mathematics**
BSc · Western University 

PROGRAMMING



CURRICULUM

- 2008–2018 **Evening Lecturer**
CARLETON UNIVERSITY · Department of Physics 
Taught two astronomy courses every year: Introduction to the solar system; Introduction to stars, galaxies, and cosmology.
- 2005–2007 **Canada-United Kingdom Millennium Postdoctoral Fellow**
UNIVERSITY OF OXFORD · Rudolf Peierls Centre for Theoretical Physics 
Published original research on supersymmetric models, neutrino physics, extra dimensional physics, and early universe cosmology. Lecturer in early universe cosmology for the theoretical physics postgraduate program at Oxford.

AWARDS

- 2023 PSpC Real Property Services award.
- 2020 Nominated for the Government of Canada Public Service Award.
- 2016 NATO operational research paper of the year.
- 2010 DRDC operational research paper of the year.
- 2010 Best lecturer, Faculty of Science, Carleton University.
- 2005 NSERC postdoctoral fellowship award.
- 2005 Governor General's gold medal of academic excellence.

RECENT EXTERNAL PUBLICATIONS

- 2021 Valerie Hongoh, David Maybury, Jérôme Levesque, Aamir Fazil, Ainsley Otten, Patricia Turgeon, Lisa Waddell, and Nicholas H Ogden. **Evaluating transmission risk of covid-19 at gatherings.** CDR, 47:11, 2021.
- 2020 Jérôme Levesque, David W Maybury, and RHA David Shaw. **A model of covid-19 propagation based on a gamma subordinated negative binomial branching process.** Journal of Theoretical Biology, page 110536, 2020.
- 2020 Jérôme Levesque and David W Maybury. **A note on covid-19 seroprevalence studies: a meta-analysis using hierarchical modelling.** MedRxiv, 2020.

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