

# Luke Thorburn

My primary research interest is in ensuring that the algorithms used to mediate our shared epistemic systems are aligned with human values, as well as figuring out the extent to which this is important. In particular, I seek to use methods from computational social choice and mechanism design. Other areas of interest include: opinion dynamics, information cascades, computational argumentation, deliberative democracy and improving institutional decision-making. My background is in probability and statistics.

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## Education

Oct 2021 – Present

### MPhil/PhD in Computer Science

King's College London

GROUP UKRI CDT in Safe & Trusted AI

TOPIC Bottom-Up Governance of Online Information Environments

SUPERVISORS Maria Polukarov, Carmine Ventre

Jul 2017 – Jul 2019

### Master of Science (with Distinction)

The University of Melbourne

SPECIALISATION Statistics & Stochastic Processes

MINOR Pure Mathematics

SUPERVISOR Kostya Borovkov

THESIS *On integral representations of fractional Brownian motion*

GRADE First Class Honours

Jan – Feb 2018

### AMSI Summer School

Australian Mathematical Sciences Institute

Completed two honours-level subjects.

Mar 2014 – Dec 2016

### Bachelor of Science

The University of Melbourne

MAJOR Mathematics & Statistics

SPECIALISATION Statistics & Stochastic Processes

GRADE First Class Honours

Feb 2014 – Dec 2016

### Diploma of Languages (Japanese)

The University of Melbourne

Feb 2012 – Nov 2013

### International Baccalaureate Diploma

St Leonard's College

GRADE 43/45 (equivalent to notional ATAR of 99.60)

## Teaching

Feb 2019 – Jun 2020

### The University of Melbourne

Mathematics & Statistics School Tutor

2019, 2020 Probability

2020 Linear Statistical Models

2020 Psychological Science: Theory & Practice (guest seminars)

Aug – Oct 2017 **Newman College**  
Academic Tutor  
2017 Linear Statistical Models

Jun 2014 – Nov 2019 **St Leonard's College**  
Student Study Assistant  
Academic tutoring and library support for students after school, on weekends and during school holidays.

Mar 2014 – Nov 2017 **Self-employed**  
Private Academic Tutor  
Mainly in Mathematics, Physics and Economics. Students ranged from high school to university postgraduate level. Over 300 hours of tutoring experience.

## *Employment*

Mar 2016 – Present **Resilient Youth Australia**  
Data Scientist  
Developing novel statistical methods, reporting infrastructure and interactive graphs (in d3.js) to enable stakeholders to extract value from a perennial survey measuring resilience and mental health in Australian school students.

Apr 2011 – Present **Future Problem Solving Program Australia**  
International Evaluator & Future Scene Writer  
Evaluating written competition booklets and writing Future Scenes at state, national & international levels.

Dec 2019 – Jan 2022 **Hunt Lab for Intelligence Research, University of Melbourne**  
Research Associate (Machine Learning & Statistics)  
Machine learning and other research as part of a group working to improve the quality of reasoning in intelligence organisations.

Jan – Jul 2021 **Population Interventions Unit, University of Melbourne**  
Data Visualisation  
Working with epidemiologist Tony Blakely to communicate modelling of SARS-CoV-2 outbreaks, vaccination, and the consequences of government lockdowns to the public via an interactive web tool.

Jun 2016 – Jul 2018 **CSIRO Manufacturing (Biomedical)**  
Research Assistant  
Used D3.js to visualise phase space in protein crystallisation. Originally 6-month appointment through the Undergraduate Research Opportunities Program (UROP), with several stints of follow-up work.

May – Jul 2017 **The University of Melbourne**  
Research Assistant  
Worked with A/Prof. Tony Wirth and Dr James Saunderson in the Department of Computing and Information Systems on algorithms for the finding of densest subgraphs.

Dec 2014 – Feb 2015 **Mercer**  
Stochastic Modelling  
Fixed-term Summer project, stochastically modelling mortalities for a new retirement income product.

## *Service*

- Jun 2022 – Present **Goodenough College**  
Treasurer, Members' Council
- Nov 2020 – Present **Buckley's Chance**  
Founding Editor  
Establishing an Australia-centric online publication for clear and accessible communication of quantitative topics in the public interest.
- Jun 2020 – Present **newDemocracy Foundation**  
Research & Computational Support
- Jan 2015 – May 2020 **Future Problem Solving Program Australia**  
Moderniser of Evaluator Resources  
Provided technical advice on the adoption/creation of an electronic evaluation platform. Previously, I rewrote the Evaluator Handbook.
- Dec 2015 – Dec 2017 **Australian Cancer and Health Sciences Competition Inc.**  
Director
- Jun – Oct 2014 **iGEM UniMelb**  
Videographer  
Produced three short videos to help explain and promote the work of the team from The University of Melbourne entering the International Genetically Engineered Machine competition.
- Feb – Oct 2012 **St Leonard's College**  
Peer Support Leader
- Feb – Nov 2011 **St Leonard's College**  
SCOPE Leader  
Mentored an overly reserved grade three student.

## *Awards & Honours*

- 2021 **Rae and Edith Bennett Travelling Scholarship**  
The University of Melbourne
- 2019 **Mathematics and Statistics School Scholarship**  
The University of Melbourne
- 2018 **Maurice H. Belz Scholarship**  
The University of Melbourne
- 2016 **Undergraduate Research Opportunities Program (UROP) Scholar**  
Biomedical Research Victoria  
**Leaders in Communities Award (LiCA)**  
The University of Melbourne
- 2015 **Keith Frampton Roll of Honour (Member)**  
Future Problem Solving Program Australia  
**Highest Mark, Weather & Climate Systems**  
The University of Melbourne
- 2014 **Second Place, Introductory Microeconomics Film Competition**  
The University of Melbourne

- 2013 **Year 12 IB Dux**  
St Leonard's College  
Full College, Music and House Colours  
St Leonard's College  
Old Collegian's Award for Positive Involvement  
St Leonard's College
- 2012 **Monash Prize for Excellence & Year 11 IB Dux**  
St Leonard's College  
E. Paul Torrance Youth Award  
Future Problem Solving Program Australia

## ***Grants & Funding***

- Oct 2021 – Sep 2025 **Computational Social Choice and Machine Learning for Ethical Decision Making**  
Centre for Doctoral Training in Safe & Trusted AI  
SPONSOR UKRI Engineering & Physical Sciences Research Council  
VALUE ≈ £43,180 / year
- Jun – Dec 2021 **Transfer Learning for Argument Operations**  
Artificial Intelligence for Decision Making Initiative (Phase 2)  
SPONSOR Office of National Intelligence, Commonwealth of Australia  
VALUE \$50,000
- Aug – Nov 2020 **Augmenting Corpus Analysis through Argument Mining and Networked Notes**  
Artificial Intelligence for Decision Making Initiative (Phase 1)  
SPONSOR Office of National Intelligence, Commonwealth of Australia  
VALUE \$20,000

## ***Publications***

### Academic Papers

#### **Optimizing Language Models for Argumentative Reasoning**

L Thorburn and A Kruger

*1st International Workshop on Argumentation & Machine Learning (ArgML), 2022.*

#### **Using argument mapping to improve clarity and rigour in written intelligence products**

A Kruger, L Thorburn and T van Gelder

*Intelligence and National Security 37(2), 2022.*

#### **Towards Argument Embeddings**

L Thorburn

*OHAAI 2(1), 2021.*

#### **Tools to Ease the Choice and Design of Protein Crystallisation Experiments**

N Rosa, M Ristic, L Thorburn, GJ Abrahams, B Marshall, CJ Watkins, A Kruger, A Khassapov and J Newman

*Crystals 10(2), 2020.*

## Technical Reports

### **What the Observatory cannot do**

L Thorburn

*Submission to the Prefiguration Working Group for the International Observatory on Information and Democracy, 2022.*

### **The Impact of Evidence on Decision Making**

A Kruger, T van Gelder and L Thorburn

*Centre of Excellence for Biosecurity Risk Analysis, 2021.*

### **Analytic Rigour in Intelligence**

A Barnett, T Primoratz, R de Rozario, M Saletta, L Thorburn and T van Gelder (alphabetical)

*Hunt Lab for Intelligence Research, 2021.*

### **Enhancing human analysis of large corpora via argument mining and backlinks—a prototype**

L Thorburn

*Hunt Lab for Intelligence Research, 2021.*

## General Press

### **A Menu of Recommender Transparency Options**

P Bengani, J Stray, and L Thorburn

*Tech Policy Press, 2022.*

### **How to Measure the Effects of Recommenders**

L Thorburn, J Stray, and P Bengani

*Understanding Recommenders, Center for Human-Compatible AI, 2022.*

### **What Will “Amplification” Mean in Court?**

L Thorburn, J Stray, and P Bengani

*Tech Policy Press, 2022.*

### **What's Right and What's Wrong with Optimizing for Engagement**

P Bengani, J Stray, and L Thorburn

*Understanding Recommenders, Center for Human-Compatible AI, 2022.*

### **The Nature of Preferences in Recommender Systems**

L Thorburn, J Stray, and P Bengani

*Understanding Recommenders, Center for Human-Compatible AI, 2022.*

### **How Platform Recommenders Work**

L Thorburn, P Bengani and J Stray

*Understanding Recommenders, Center for Human-Compatible AI, 2022.*

### **Charting our way back to normal**

T Blakely, T Wilson, L Thorburn and N Grills

*Pursuit, 2021.*

## **Talks**

### **Algorithmic Risks to Collective Decision-Making**

Mar 2022 Goodenough-Oxford Joint Colloquium on AI and Regulation

### **Metaphors for Public Discourse**

Feb 2022 Newspeak House

### **Argument Processing**

Dec 2021 Sensemaking Systems Symposium, UTS

Sep 2021 Laboratory for Analytic Sciences, NCSU

## *Symposia*

### **Reviewer**

ACM Conference on Economics and Computation (**EC**)  
2022 Online

### **Participant**

Oxford-Goodenough Joint Colloquium on AI and Regulation  
Jesus College, University of Oxford and Goodenough College  
2022 Venice, Italy

Summer Institute on Topics in the History of Economics  
Center for the History of Political Economy, Duke University  
2017 Raleigh, US

### **Attendee**

The Race to Regulate AI: Global Comparative Perspectives  
Bonavero Institute of Human Rights, University of Oxford  
2022 Oxford, UK

International Conference on Algorithmic Decision Theory (**ADT**)  
2021 Online

Conference for Truth and Trust Online (**TTO**)  
2021 Online

International Conference on Computational Models of Argument (**COMMA**)  
2020 Online

Effective Altruism Global (**EAG**)  
2019 London, UK

INFORMS Applied Probability Society Conference (**INFORMS-APS**)  
2019 Brisbane, Australia

Conference on Neural Information Processing Systems (**NeurIPS**)  
2016 Barcelona, Spain

## *Memberships*

Apr 2022 – Present Trust & Safety Professional Association  
Jan 2022 – Present Institute of Mathematics and its Applications  
Nov 2021 – Present Information Professionals Association  
Oct 2021 – Present Newspeak House  
Jan 2018 – Present Statistical Society of Australia  
Jan 2018 – Present Australian Mathematical Society