



# Rafael Cabral

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## Summary

As a statistics researcher, I specialize in applied and computational statistics. My research revolves around building more robust and computationally efficient modelling frameworks for spatial and temporal data. I have worked with Gaussian and non-Gaussian processes, model criticism and robustness, and approximate inference with MCMC, INLA, and variational inference. I also did internships in the industry in data science, deep neural networks, and image segmentation. My website is [rafaelcabral96.github.io](https://rafaelcabral96.github.io).

## Education

### Ph.D. in Statistics

KAUST

- Thesis entitled [Criticism and robustification of latent Gaussian models](#).
- Supervised by Profs. Håvard Rue and David Bolin

Saudi Arabia

2020 - 2023

### M.Sc. in Applied Mathematics

INSTITUTO SUPERIOR TÉCNICO - UNIVERSITY OF LISBON

- Thesis entitled [Space-time trends and dependence of wind extremes in north-western Germany](#).
- Top degree in Portugal: the lowest entry grade is 18.35/20.

Lisbon, Portugal

2017 - 2019

### B.Sc. in Engineering Physics

INSTITUTO SUPERIOR TÉCNICO - UNIVERSITY OF LISBON

- Top degree in Portugal: the lowest entry grade is 18.9/20.

Lisbon, Portugal

2014 - 2017

## Professional Experience

### Research Fellow

NUS YONG LOO LIN SCHOOL OF MEDICINE

- Research and consulting in (bio)statistics.

Singapore

2023

### Internship on Optimization

KAUST

- Implemented and improved a particle-swarm optimization algorithm.
- Application to non-convex function optimization and machine learning problems.
- Python (Numpy and Tensorflow).

Saudi Arabia

2019

### Data Science Internship

ODYSAI

- Startup developing a product that automatically extracts information from documents using machine learning.
- Data processing tasks using Python.
- Designed real-time analytics dashboards to understand user behavior and product performance.

Lisbon, Portugal

2018

### Deep Learning Internship

HOSPITAL DA LUZ LEARNING HEALTH

- Won the IST Enterprise Challenge competition on how AI can aid the medical industry.
- Applied deep learning algorithms to segment 3D medical images automatically.
- Convolutional neural networks in Python (Keras and Tensorflow).

Lisbon, Portugal

2018

### Data Science Spring Program

BNP PARIBAS

- Worked with Alteryx for data processing and Tableau for data visualization.

Lisbon, Portugal

2018

## Publications

### Robustness, model checking and latent Gaussian models

R. CABRAL, D. BOLIN, AND H. RUE, *arXiv* (PREPRINT)

- Paper: [arxiv.org/abs/2307.12365](https://arxiv.org/abs/2307.12365)

2023

### Fitting latent non-Gaussian models using variational Bayes and Laplace approximations

R. CABRAL, D. BOLIN, AND H. RUE, *Journal of the American Statistical Association* (UNDER REVISION)

- Paper: [arxiv.org/abs/2211.11050](https://arxiv.org/abs/2211.11050)
- R package: [github.com/rafaelcabral96/ngvb/](https://github.com/rafaelcabral96/ngvb/)

2022

## Controlling the flexibility of non-Gaussian processes through shrinkage priors

R. CABRAL, D. BOLIN, AND H. RUE, *Bayesian Analysis*

2022

- Paper: [doi.org/10.1214/22-BA1342](https://doi.org/10.1214/22-BA1342)
- Github: [github.com/stan-dev/connect22-space-time](https://github.com/stan-dev/connect22-space-time)

## Space-time trends and dependence of precipitation extremes in north-western Germany

R. CABRAL, A. FERREIRA, AND P. FRIEDERICHS, *Environmetrics*

2019

- Paper: [doi.org/10.1002/env.2605](https://doi.org/10.1002/env.2605)

## A price model with finitely many agents

A. ALHARBI, T. BARKARYAN, R. CABRAL, ET AL., *Bulletin of the Portuguese Mathematical Society*

2019

- Paper: [hdl.handle.net/10754/662310](https://hdl.handle.net/10754/662310)

## Leadership experience

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### Student Ambassador

Saudi Arabia

KAUST

2021-2023

- Represented the CEMSE division and aided in its recruitment efforts.
- Promoted the Statistics program abroad.

### Teaching assistant on the stochastic processes course

Saudi Arabia

KAUST

2020-2022

- Mandatory course in M.Sc./Ph.D. in Statistics and Electrical Engineering with 45 attending students.
- Designed course projects, weekly homeworks and graded exams and projects.
- Delivered weekly lectures where I solved the homework live and answered students' questions.

## Attended conferences and workshops

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### StanConnect 2022: Stan Through Space and Time

Online

- Speaker: Robust non-Gaussian models and how to fit them in Stan.
- [github.com/stan-dev/connect22-space-time](https://github.com/stan-dev/connect22-space-time)

2022

### Summer school: Statistics for Point Patterns in Space and Beyond

Aalborg, Denmark

AALBORG UNIVERSITY

2022

- Attended classes given by Professors Jesper Møller and Rasmus Waagepetersen.

### 2022 ISBA world meeting

Montreal, Canada

INTERNATIONAL SOCIETY FOR BAYESIAN ANALYSIS

2022

- Poster: Controlling the flexibility of non-Gaussian processes through shrinkage priors

## Awards

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2022	<b>Al-Kindi Statistics Research Student Award</b> , a research award for top Statistics Ph.D. students at KAUST	Saudi Arabia
2022	<b>McKinsey &amp; Company, Forward program</b>	Saudi Arabia
2022	<b>Dean's list award</b> , during Ph.D. at KAUST	Saudi Arabia
2020-2022	<b>Ph.D. progress rated as Outstanding (A+)</b> , by the KAUST evaluation committee	Saudi Arabia
2019	<b>Research fellowship grant</b> , for the development of research work in extreme value theory (FCT-BL299/2018)	Portugal
2019	<b>Diploma of academic merit</b> , for great performance in the M.Sc. in Applied Mathematics	Portugal
2017	<b>Diploma of academic merit</b> , for great performance in the B.Sc. in Engineering Physics	Portugal
2013	<b>Asteroid Discovery Award</b> , International Astronomical Search Collaboration. Confirmed asteroid by the Minor Planet Center of the University of Harvard with name 2013 EZ7	Portugal

## Referrals

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Håvard Rue  
Professor, Statistics  
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KAUST, Saudi Arabia

David Bolin  
Associate Professor, Statistics  
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KAUST, Saudi Arabia