

# ROSA LAVELLE-HILL, PHD

The Hector Institute of Education Sciences and Psychology, University of Tübingen

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## SUMMARY

- Interdisciplinary researcher with skills and experience in Data Science, Psychology, and Education Research.
- Worked in collaborative multi-disciplinary and international teams in various domains including applied data science, environmental psychology, health psychology, consumer psychology, education/learning analytics, and sustainable development.
- Specialised in building predictive models which are interpretable, user-centric, fair and ethical.
- Has a deep understanding of how to design and conduct social science research using big data and machine learning.

## EDUCATION

- PhD, Big Data Psychology, University of Nottingham (UoN), Dec 2020
- First Class Honours BSc (with international study) in Psychology, UoN, 2015; Lund University, Sweden (2013-2014)
- A levels in Biology, Psychology and Art (A,A,A) from Central Sussex College, Haywards Heath, 2011

## TECHNICAL SKILLS

- **Data Science:** Problem formulation, research design, model specification and selection, hypothesis testing, algorithm interpretability and explainability (variable importance, PDPs, ICE graphs, LIME, SHAP), rashomon set analysis, sentiment analysis, data management and cleaning, data storage and security, assessing generalisability and bias, responsible AI.
- **Machine Learning Methods:**  
*Unsupervised:* feature reduction techniques (Non-negative Matrix Factorisation (NMF), Principle Components Analysis (PCA), Factor Analysis), clustering (K-means, Gaussian Mixture Models, K-nearest neighbour), Natural Language Processing (NLP);  
*Supervised:* linear regression models, with regularisation (i.e. lasso, ridge, elastic net), decision trees, Bayesian Additive Regression Trees (BART), random forests, boosting, and some competency with neural networks.
- **Psychology:** Inferential statistics, Bayesian methods, personality and individual differences, psychometrics, experimental design, big data analytics
- **Programming Languages:** Python, R, SQL, Luigi pipeline, LaTeX
- **Software Skills:** QGIS, Docker and DockerHub, Git and GitHub, cloud computing platforms Azure and Amazon Web Services (AWS), Excel, Orange

## RESEARCH EXPERIENCE

### University of Tübingen

Research Associate (post-doctorate)

September 2021 to present

- Position at The Hector Research Institute of Education Sciences and Psychology researching how big data and machine learning can be leveraged to better understand educational attainment and individual differences in learning.

### The Alan Turing Institute

Research Associate (post-doctorate)

October 2019 to September 2021

- Using machine learning, artificial intelligence, and bayesian statistics to help prevent modern day slavery (MDS), human trafficking, and other exploitative crimes.
- Project 1: Using open source data, machine learning and contemporary variable importance analysis to detangle the national level predictors of MDS prevalence in data that is "small n, large p" in nature.
- Project 2: Working in partnership with UK law enforcement officers and NGOs to provide automated risk detection of sexual exploitation using online sex worker adverts, NLP, and machine learning models.
- Project 3: Leveraging digital phone records, mobile money data and satellite imagery to map vulnerability to exploitation in Tanzania.

### University of Nottingham

Researcher and Independent Consultant

Feb 2017 to September 2021

- Working on the design, implementation, and evaluation of decision support algorithms for marking student essays.
- Project 1: Investigating biases in academic grading, and trialling the introduction of algorithms to help reduce such biases, as well as alleviating cognitive load for academics.
- Project 2: Using questionnaire data alongside students' digital footprints to better understand the impact of COVID-19 on learning, and whether black and ethnic minority groups have been disproportionately affected.

### Imperial College London

Data Science for Social Good, Research Fellow

June 2019 to Sept 2019

- Part of a three-person data science team who designed and built a recommender system with the goal of improving employment outcomes in Portugal.
- This involved partnering with IEFP (the national Institute for Employment and Vocational Training in Portugal), harnessing their data to optimise and personalise their services - ultimately supporting people to find the right employment, quicker.
- Co-built an end-to-end Luigi pipeline for the decision support tool's integration into existing data systems.

## RESEARCH INTERNSHIPS

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- 2018 - Consumer Behaviour Research, Ipsos MORI, London
- 2015 - Psychology and Big Data, Horizon Digital Economy Research, UoN
- 2013 - Developmental Psychology Research, UoN

## TEACHING EXPERIENCE

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- 2022 - Designed and delivered a two day workshop and master's module (1ECT) "Introduction to Machine Learning in Psychology and Education Sciences" to the University of Tübingen, University of Stuttgart, and Humbolt University of Berlin.
- 2022 - Master's project supervisor - Machine Learning in Education
- Feb, 2021, 2020 and 2019 - Guest Lecturer on UoN Business Analytics master's
- Feb, 2020 - Lecture for London Interdisciplinary Doctoral Program's (LIDO) teaching week
- 2018-2019 - Technical teaching Assistant and seminar leader for the courses: Foundational Business Analytics, Computers in Business, and Machine Learning and Predictive Analytics for UoN Business Master's students
- 2018-2019 - Co-supervisor for UoN Master's projects
- 2018-2019 - Lecturer for two UG courses in Excel at UoN Business School
- 2015-2016 - Private tutor to UGs in Cognitive Psychology
- 2015-2016 - Demonstrator in labs, UoN Psychology UGs
- 2013-2015 - Online tutor for The Skills Network (UK)

## AWARDS AND FUNDING

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- 2019 - UoN Graduate School Travel Prize to present at ISSID (£1,200) (matched by Horizon CDT)
- 2018 - European Conference on Personality Scholarship for significant results in research and publication (€750)
- 2015 - Nottingham Advantage Award (French, Cultural Awareness, and Sports Leadership)

## CONFERENCE PRESENTATIONS (SELECTED)

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- 2020, virtual - Data for Policy 2020. *Machine Learning Methods for "Small-n, Large-p" Problems: Understanding the Complex Drivers of Modern-Day Slavery.*
- 2019, London - DSSG Data Fest. *Building a Recommender System to Improve Employment Outcomes in Portugal.*
- 2019, Florence - International Society for the Study of Individual Differences (ISSID) Conference. (Volume 157, ISSN 0191-8869. *Psychological and Demographic Predictors of Plastic Bag Consumption in Transaction Data.*)
- 2019, Hanoi - World Personality Conference. *Bags of money or bags of Impulsiveness? Psychological and Demographic Predictors of Plastic Bag Consumption in Big Data.*
- 2018, Zadar - European Personality Conference. *Using Machine Learning Techniques to Examine the Relationship between Money, Personality, and Well-being.*
- 2018, London - GovTechLab Knowledge Transfer Consortium. *Big Data for Social Good.*
- 2018, Cardiff - Guest Research talk. *Machine Learning, Psychology and Mass Datasets: Understanding Societal Issues.*

## PUBLICATIONS

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- Lavelle-Hill, R., Harvey, J., Smith, G., Mazumder, A., Ellis, M., Mwantimwa, K., Goulding, J. (2022). Using mobile money data and call detail records to explore the risks of urban migration in Tanzania. *EPJ Data Science*, 11(1), 1-23.
- Lavelle-Hill, R. Mazumder, A. (*In press*). AI for Detecting Sexual Exploitation Online in the UK: A Review of Indicators and Ethics.
- Lavelle-Hill, R., Mazumder, A., Smith, G., Landman, T., Goulding, J. (2021) Machine Learning Methods for "Wicked" Problems: Understanding the Complex Drivers of Modern-Day Slavery. *Nature Social Sciences and Humanities Communications*.
- Lavelle-Hill, R., Smith, G., Bibby, P., Clarke, D., Goulding, J. (2020). Psychological and Demographic Predictors of Plastic Bag Consumption in Transaction Data. *Journal of Environmental Psychology*
- Lavelle-Hill, R., Skatova, A., Goulding, J., Bibby, P., Clarke, D. (2020). Buying what people like you buy: Personality Homophily and Well-being in Consumer Behaviour. (*in press*)
- Lavelle-Hill, R. (2020). Big data psychology (Doctoral dissertation, University of Nottingham).
- Lavelle-Hill, R.; Coulson, N; Richter, T. (2019). Building a recommender system to improve employment outcomes in Portugal. *Data Science for Social Good (DSSG), DataFest 2019*.
- Tomas, C., Whitt, E., Lavelle-Hill, R.E., Severn, K. (2019). Modelling holistic marks with analytic rubrics. *In Frontiers in Education* (Vol. 4, p. 89). Frontiers.

## OTHER ACHIEVEMENTS AND RESPONSIBILITIES

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- 2022-present - Tübingen Postdoctoral Academy for Research on Education (PACE) member
- 2022-present - LEAD postdoc representative
- 2021-present - Mentor for Athena Women in Science Program
- 2021-present - LEAD Graduate School & Research Network member
- 2021-present - Organiser of the Big Data and Machine Learning Interest Group at the Hector Research Institute
- 2021-present - Organiser of Personality and Individual Differences Interest Group at the Hector Research Institute
- 2016-2019 - Campaign Ambassador, University of Nottingham
- 2017-2018 - Race Director and Event Organiser of Notts Triathlon to raise money for the Children's Brain Tumour Research Centre, with over 500 participants and over £4,000 secured in sponsorship.
- 2016-2017 - President, University of Nottingham Triathlon Club