

# ROSA LAVELLE-HILL, PHD

The Hector Research Institute of Education Sciences and Psychology (HIB), 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 (HIB) 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 (3 months)
- 2015 - Psychology and Big Data, Horizon Digital Economy Research, UoN (3 months)
- 2013 - Developmental Psychology Research, UoN (3 months)

## TEACHING EXPERIENCE

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- Oct 2022-Feb 2023. Big Data Analytics (3ECTs, **lecturer, master's course**, HIB)
- Feb 2022-June 2022. Machine learning in Education (**master's diss supervisor**, HIB)
- Feb 2022-March 2022. Introduction to Machine Learning in Psychology (1ECT (intensive), **lecturer, master's course**, HIB)
- Mar 2022. Introduction to Machine Learning in Psychology and Education Sciences (**external workshop** at FDZ-akademien)
- Feb 2021, March 2020, and March 2019. Personality Psychology and Big Data Analytics (**guest lecturer, master's course**, UoN)
- Feb 2020. Big Data Psychology (London Interdisciplinary Doctoral Program's (LIDO), **guest lecturer, PhD candidates**)
- Feb 2019-June 2019. Studying body-dysmorphia through data (**master's diss supervisor**, UoN)
- Oct 2018-Jan 2019. Computers in Business (**seminar leader, bachelors**, UoN)
- Oct 2018-Dec 2018. Data at Scale, Machine Learning and Predictive Analytics (**tutorial assistant, master's course**, UoN)
- Oct 2018-Dec 2018. Foundational Business Analytics (**tutorial assistant, master's course**, UoN)
- Aug 2015-Oct 2016. Psychology labs (**teaching assistant, bachelors**, UoN)
- Sep 2015-June 2016. Cognitive Psychology (**private tutor, bachelors**, UoN)
- May 2013-Oct 2015. Online tutor for The Skills Network (vocational)

## PUBLICATIONS

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- **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.**, Skatova, A., Goulding, J., Bibby, P., Clarke, D. (*in press*). Buying what people like you buy: Personality Homophily and Well-being in Consumer Behaviour.
- **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., 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*, 8(1), 1-11.
- **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*, 72, 101473.
- **Lavelle-Hill, R.** (2020). *Big data psychology* (Doctoral dissertation, University of Nottingham).
- 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 Media SA.
- **Lavelle-Hill, R.**; Coulson, N; Richter, T. (2019). Building a recommender system to improve employment outcomes in Portugal. *poster at Data Science for Social Good (DSSG), DataFest 2019.*

## 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.*

## 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)

## OTHER ACHIEVEMENTS AND RESPONSIBILITIES

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- 2022-present - Research Affiliate at University California Irvine (UCI)
- 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