



UNIVERSITY OF LEEDS

A Family of Spatial Interaction Modellers

Mark Birkin

Director, Leeds Institute for Data Analytics

LEEDS *Institute for
Data Analytics*

The Models...



UNIVERSITY OF LEEDS

A statistical theory of spatial distribution models

WILSON, A; (1967) A statistical theory of spatial distribution models. *Transportation Research* , 1 (3) pp. 253-269.

Full text not available from this repository.

Type: Article

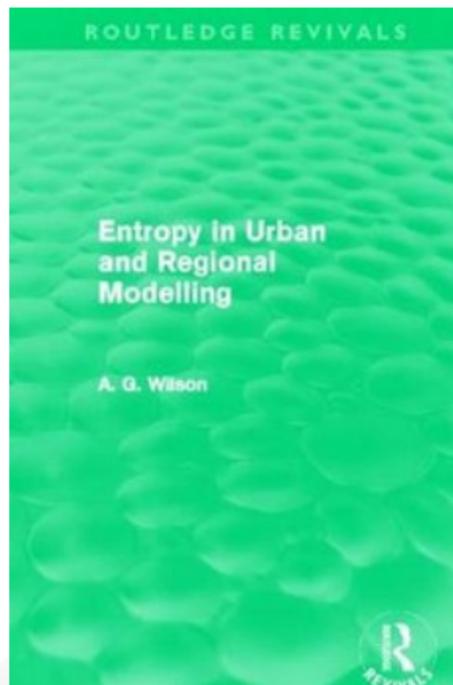
Title: A statistical theory of spatial distribution models

Additional information: Also reprinted in Quandt, RE The demand for travel - theory and measurement, Heath Lexington, Boston, 1970, pp 55-82, and reprinted in Angel, S and Hyman GM Urban Fields, Pion, London, 1976, pp 162- 178

UCL classification: [UCL > School of BEAMS](#)
[UCL > School of BEAMS > Faculty of the Built Environment](#)
[UCL > School of BEAMS > Faculty of the Built Environment > Centre for Advanced Spatial Analysis](#)

URI: <http://discovery.ucl.ac.uk/id/eprint/1301502>

Downloads since deposit



LID

A Family of Spatial Interaction Models, and Associated Developments

A G Wilson

First Published March 1, 1971 | Research Article

Download PDF

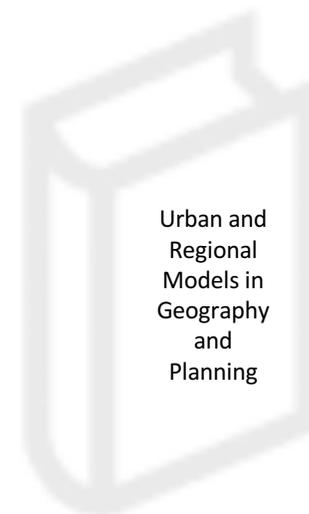
Article information



Please click here for full access options

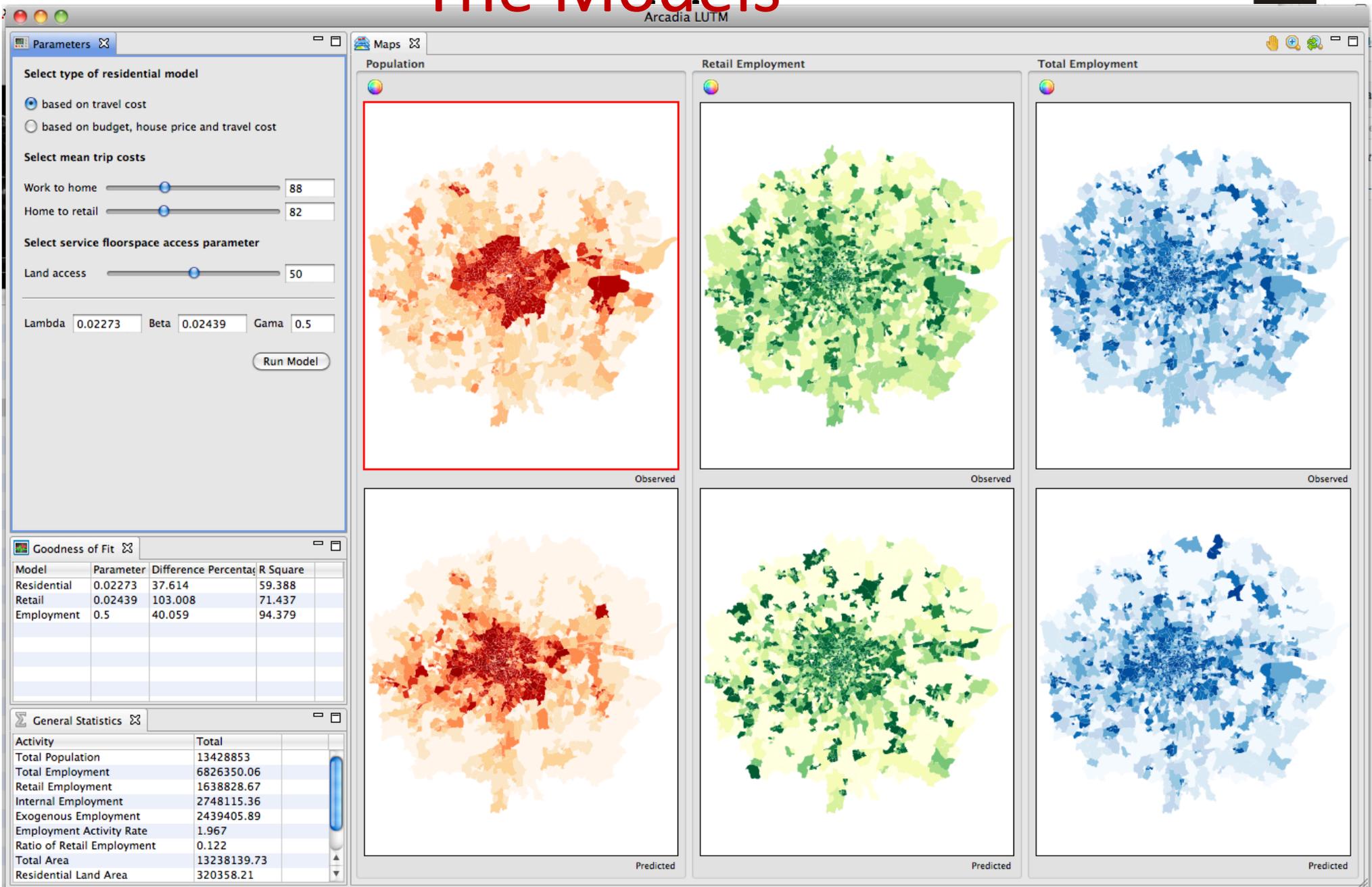
Abstract

This paper shows that the gravity model is not a single model but that there is a whole family of spatial interaction models. The properties of this family are outlined in some detail. Basic concepts of such models can be developed in a variety of ways, and these are illustrated. The paper then outlines a number of other theoretical developments, and is particularly concerned with the disaggregation of such models, with the incorporation of time variables, and with the relation of spatial interaction, to more general, models. Uses of spatial interaction models are outlined briefly and the final section of the paper draws a number of conclusions and presents a summary.



Urban and
Regional
Models in
Geography
and
Planning

The Models



The Modellers!!



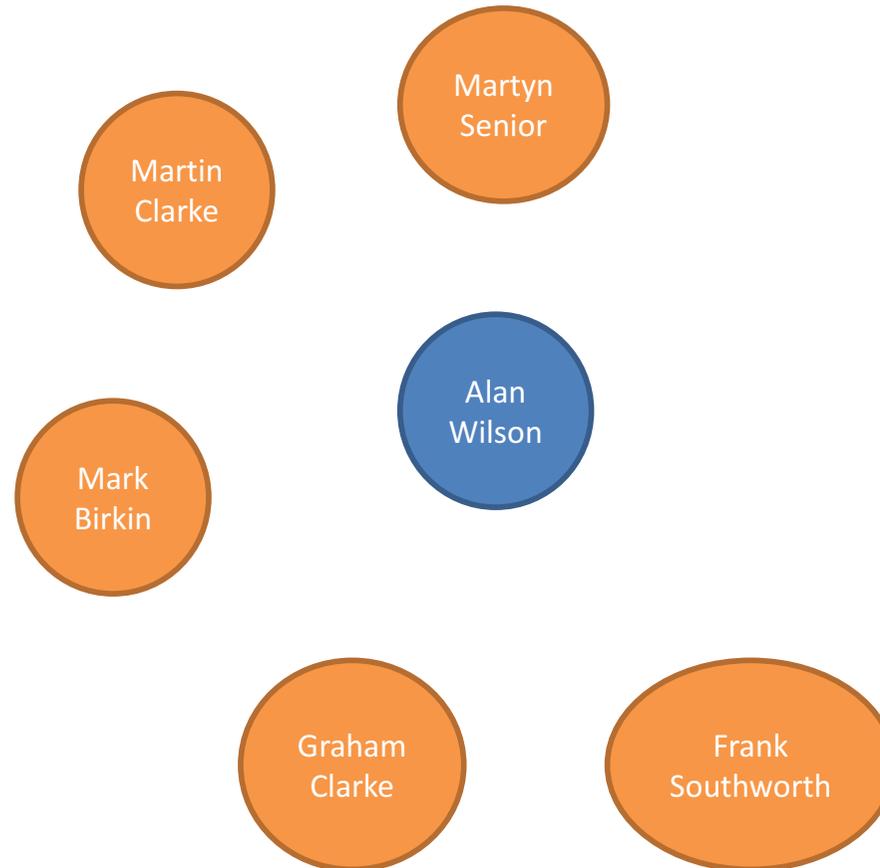
UNIVERSITY OF LEEDS



The Family...



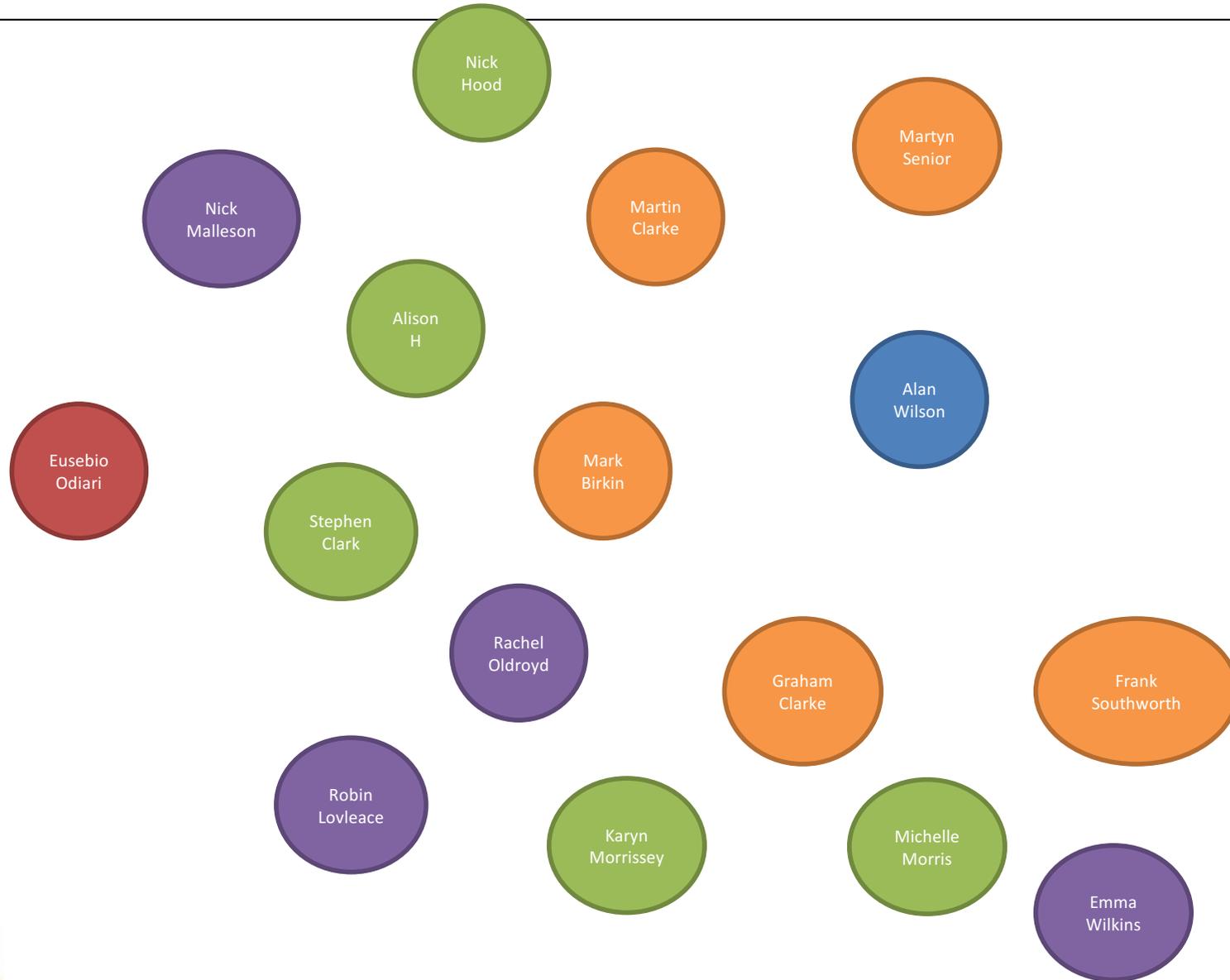
UNIVERSITY OF LEEDS



The Family...



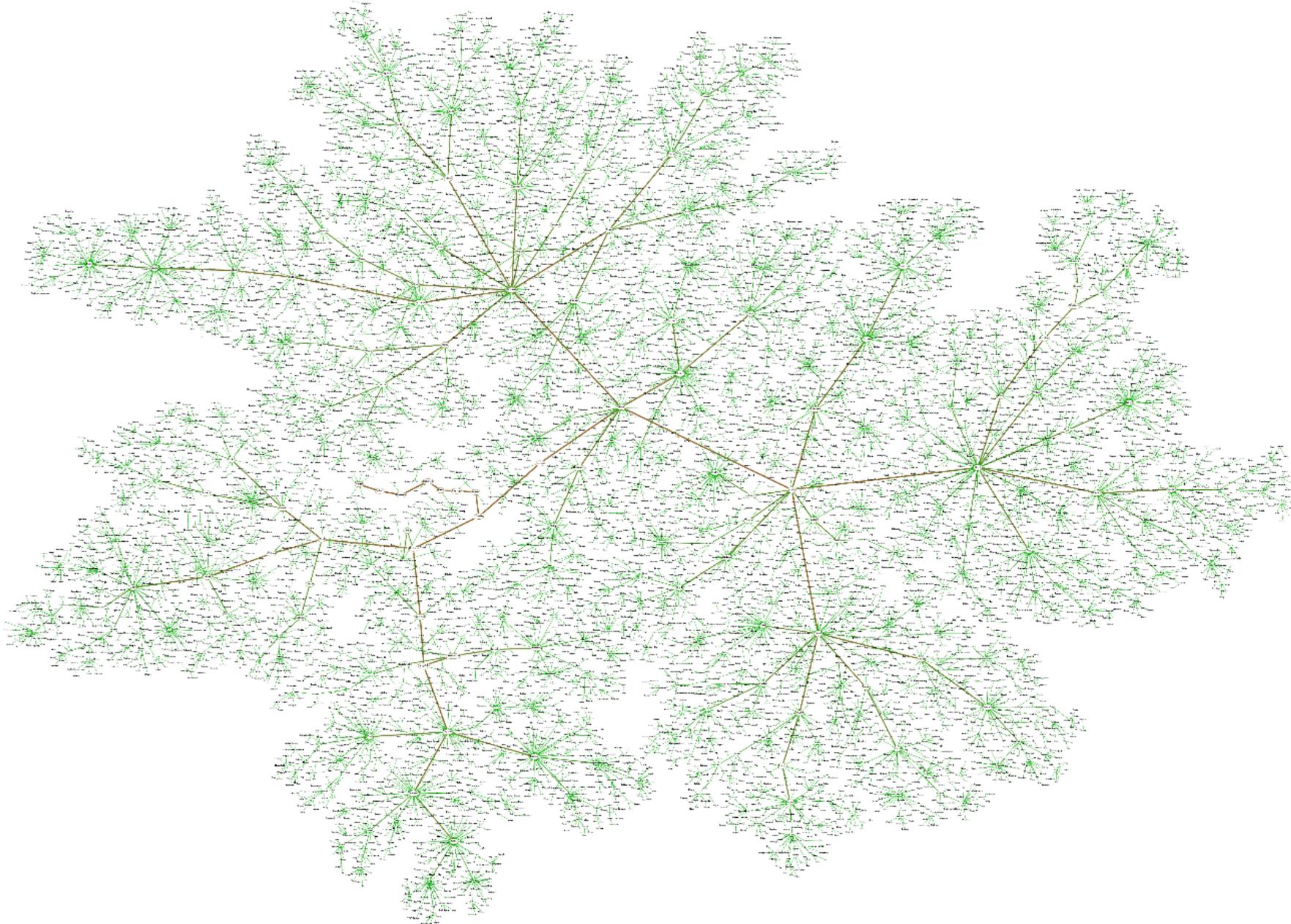
UNIVERSITY OF LEEDS



The Family...



UNIVERSITY OF LEEDS



Importance of the family...



UNIVERSITY OF LEEDS

- Research
- Training & Capacity-Building
- Impact
- Sustainability

Research – Modellers!!



UNIVERSITY OF LEEDS

- *Nick Malleson; Susan Grant-Muller; Frances Hodgson; Gillian Harrison* Quantifying Personal **Pollution Impacts** to Inform Transport Scheme Innovation through New Generation Mobility Data
- *Michelle Morris, Mark Birkin*
- What is the ESRC Strategic Network for Obesity?
- *Emma Wilkins; Mark Birkin; Claire Griffiths; Michelle Morris*
- Can big data solve a big problem: the **obesity data landscape**?
- *Emily Sheard; Nick Malleson; Mark Birkin*
- Exploring the Spatio-Temporal Distribution of **Car Key Burglary** in West Yorkshire: Routine Activity or Planned Behaviour?
- *Eusebio Odiari, Mark Birkin, Susan Grant-Muller and Nick Malleson*
- The use of big data **in spatial micro-simulation of railway passengers**
- *Tomas Crols; Nicolas Malleson*
- Quantifying the Ambient Population using Big Data and **Agent-Based Modelling**
- *Myles Gould; Nicholas Hood; Jocelyn Evans; Paul Norman*
- Introducing an **European comparative multilevel study of 'radical right'**
- support
- *Stephen Clark; Michelle Morris; Nik Lomax*
- Estimating the UKs referendum on EU
- *Frank Southworth*
- A Look at **Freight Demand Modeling** in the United States

Martin Clarke

- Numerical Experiments: exploring the properties of spatial interaction models using real and imaginary data
- *Mark Birkin*
- A family of spatial interaction modellers
- *Paul Williamson; Xin Gu; Karyn Morrissey; Ferran Espuny-Pujol*
- **Small-area estimation of comorbidity**: an indirect survey calibration approach
- *Emma Wilkins; Michelle Morris; Duncan Radley; Claire Griffiths*
- Geographic variation in the validity of two sources of secondary **food environment data**
- *Nik Lomax; Michelle Morris*
- Assessing **activity levels** of individuals in a large, self-selecting dataset
- *Rachel Oldroyd; Mark Birkin; Michelle Morris*
- The use of non-traditional data for monitoring **foodborne illness**: methodological recommendations and considerations
- *Robin Lovelace*
- Implementing **spatial interaction models**: from prototype to globally scalable tools

Training and Capacity Building



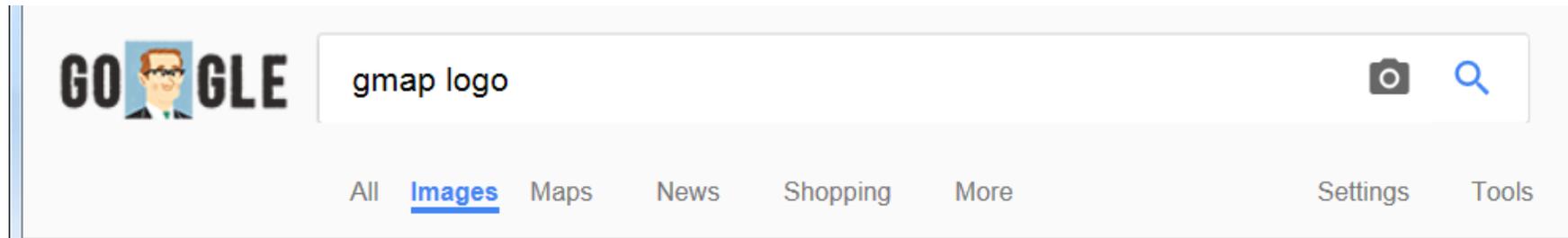
UNIVERSITY OF LEEDS

	Nick Addis
	Nawaf Alfadhli
	Nawaf Alatobi
	Rui Yu
	Eusebio Odiari
	Nabati Ray
	Emily Sheard
	Tom Waddington
	Rachel Oldroyd
	Emma Wilkins
Using community cohesion to link crime analysis	Usman Gulma
	Charlotte Sturley
Socio-inequalities in the provision of education in Beijing.	L. Xiang
Causal Inference Modelling and	Kellyn Arnold
Understanding bike mobility through Big Data	Yuanxuan Yang
Crime and Agent-based modelling	Verity Tether
Longitudinal Data	John Gadd
Retail consumer behaviour modelling	Matthew Butterfield
Predictive geodemographics	Jennie Gray
Predictive Data Analytics for Urban Dynamics	Annabel Whipp
Evaluation of consumer transactions as a source of dietary consumption in	Victoria Litherland
Examining judicial sentencing using court transcripts and natural language processing techniques	Annah Wooller
Incorporating e-commerce (home deliver and 'click and collect') in grocery sector retail location modelling.	Alan Urquhart
The social and geographical correlates of transport modal split: identifying choice and (potential for) change	Eugeni Vidal Tortosa
Agent-Based Modelling and Dynamic Data Assimilation for Modelling Urban Dynamics	Keiran Suckak
Bounts	Francesca Pontin



Business Impact: GMAP Limited

UNIVERSITY OF LEEDS



Google Maps



Business Impact: GMAP Limited



UNIVERSITY OF LEEDS

Stuart Hayes

Head of Data

+44 (0) 7-----



2 Wellington Place
Leeds
LS1 4AP



MORRISONS



Andy Bell

Director Global Data Product Management at
Pitney Bowes Software

Leeds, United Kingdom | Marketing and Advertising

Current Pitney Bowes Software

Previous GlaxoSmithKline, Callcredit Marketing Solutions,
Bell Hanson

Education University of Leicester

500+
connections



Sainsbury's



LIDA

Government Impact

UNIVERSITY OF LEEDS



Sir Alan Wilson

Sir Alan Wilson FBA FAcSS FRS is CEO of The Alan Turing Institute and Professor of Urban and Regional Systems in the Centre for Advanced Spatial Analysis at University College London. He is Chair of the Home Office Science Advisory Council.

He is a Cambridge Mathematics graduate and began his research career in elementary particle physics at the Rutherford Laboratory. He turned to the social sciences, working on cities, with posts in Oxford and London before becoming Professor of Urban and Regional Geography in Leeds in 1970. He was a member of Oxford City Council from 1964-1967. In the late 1980s, he was the co-founder of GMAP Ltd, a University spin-out company. He was Vice-Chancellor of the University of Leeds from 1991 to 2004 when he became Director-General for Higher Education in the then DfES. After a brief spell in Cambridge, he joined UCL in 2007. From 2007-2013 he was Chair of the Arts and Humanities Research Council; and from 2013-2015, he was Chair of the Lead Expert Group for the Government Office for Science Foresight Project on The Future of Cities. He is a Member of Academia Europaea, an FBA, an FAcSS and an FRS. He was knighted in 2001. In August 2017, he received an honorary degree from the School of Advanced Study, University of London in recognition of his outstanding contributions to higher education.

His research field covers many aspects of mathematical modelling of cities and the use of these models in planning. These techniques are now in common use internationally – including the use of the concept of entropy in building spatial interaction models – summarised in *Entropy in urban and regional modelling* (re-issued in 2011 by Routledge). These models have been widely used in areas such as transport planning, demography and economic modelling. His recent research is on the applications of dynamical systems theory in relation to modelling the evolution of urban structure in both historical and contemporary settings. This led to the laying of the foundations of a comprehensive theory of urban dynamics described in *Complex spatial systems* (2000). He has published over 200 papers and his recent books include *The science of cities and regions* (2012), his five volume *Urban modelling* (2012, edited), *Explorations in urban and regional dynamics* (2015, with Joel Dearden), *Global dynamics* (2016, edited) and *Geo-mathematical modelling* (2016, edited). He has a particular interest in interdisciplinarity and published *Knowledge power* in 2010; he writes the *quaestio* blog (www.quaestio.blogweb.casa.ucl.ac.uk).



Academic Impact

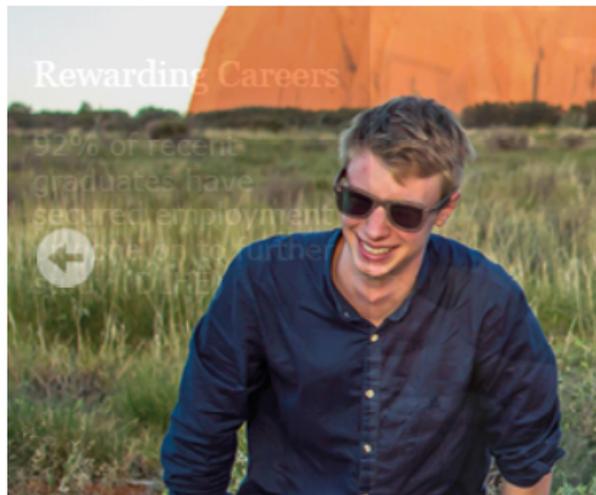
Faculty of Environment

UNIVERSITY OF LEEDS

School of Earth and Environment

HOME | ADMISSIONS & STUDY | RESEARCH | BUSINESS & CONSULTANCY | PEOPLE | INTRANET

You are here: Earth and Environment > Home



News

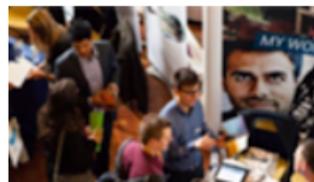
Research News



Excellent student satisfaction results for the Faculty of



Magical creatures help conservation



STEM Careers Fair 2017



Undergraduate ▶
Masters (PG) ▶
Research Degrees ▶

Search site

Go

About ▶

Annual Newsletter 2016 ▶

Student Experience ▶

Careers/Employability ▶

Contact us/Visit us ▶

Outreach ▶

Alumni ▶

Jobs ▶



Sustainability



UNIVERSITY OF LEEDS

The
Alan Turing
Institute

Sign in



[Home](#)

[News](#)

[Publications](#)

[Research](#)

[Events](#)

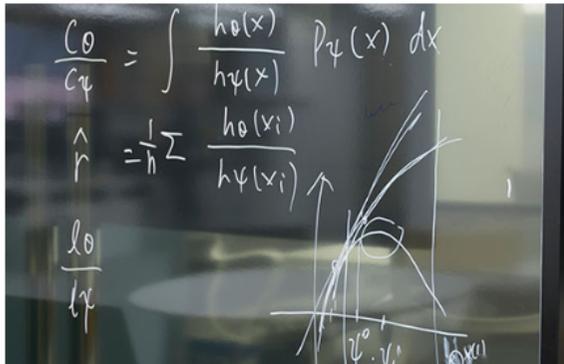
[People](#)

[Partners](#)

[Opportunities](#)

[About us](#)

[Contact](#)



[What's on](#)



[Turing YouTube Channel](#)



[Career Opportunities](#)



The Alan Turing Institute is the national institute for data science, headquartered at the British Library.

Five founding universities – Cambridge, Edinburgh, Oxford, UCL and Warwick – and the UK Engineering and Physical Sciences Research Council created The Alan Turing Institute in 2015.

Our mission

Our mission is to make great leaps in data science research in order to change the world for the better.

Research excellence is the foundation of the Institute: the sharpest minds from the data science community investigating the hardest questions. We work with integrity and dedication.

Latest News

What is the future of data in public life?

From Brexit and Trump, to elections and fake news, the...

[Read more](#)

Sustainability



UNIVERSITY OF LEEDS

The screenshot shows the website for the Leeds Institute for Data Analytics. At the top, there is a navigation bar with the University of Leeds logo and name, and a search icon. Below this is a secondary navigation bar with links for HOME, ABOUT, LATEST, DATA, RESEARCH, PARTNERSHIPS, and STUDY & TRAINING. The main content area features a large banner with a dark background on the left containing the text: "Dr Nick Malleson awarded ERC Grant" and "Congratulations to Dr Nick Malleson who has been awarded a €1.4 million ECR grant to further his research in using big data to react to civil emergencies." Below this text is a "MORE" link with a right-pointing arrow. To the right of the text is a large image showing a 3D city model with glowing data points and connections, and a portrait of Dr Nick Malleson. Below the main banner is a horizontal menu with four items: "DR NICK MALLESON AWARDED ERC GRANT" (highlighted in orange), "UNDERSTANDING POLITICAL SENTIMENT", "RETHINKING HEART ATTACK TREATMENT", and "UNLOCKING CYCLING POTENTIAL". At the bottom of the page is the logo for "LEEDS Institute for Data Analytics".

Conclusion



“We kept a field going that was embryonic...”

“on the basis of about two ideas!”

Conclusion



UNIVERSITY OF LEEDS

- Don't say: "Kept an embryonic field going with two ideas"
- Do say: "Gave birth to a **family of (spatial interaction modellers)** who have collectively shaped **research** in spatial analysis with real world **impact**, building **skills and capability** for a **sustainable** long-term future!"