

IM919-15 Data Infrastructures

24/25

Department

Centre for Interdisciplinary Methodologies

Level

Taught Postgraduate Level

Module leader

Nerea Calvillo Gonzalez

Credit value

15

Module duration

10 weeks

Assessment

100% coursework

Study location

University of Warwick main campus, Coventry

Description

Introductory description

- (1) To provide an overview of the theoretical and the practical debates surrounding the rapidly growing sub-field of Urban Science;
- (2) To develop appreciation for both the computer-based approach to data science and the social science contexts behind the real-world problems of cities.

[Module web page](#)

Module aims

- (1) To provide an overview of the theoretical and the practical debates surrounding the rapidly growing sub-field of Urban Science;
- (2) To develop appreciation for both the computer-based approach to data science and the social science contexts behind the real-world problems of cities.

Outline syllabus

This is an indicative module outline only to give an indication of the sort of topics that may be covered. Actual sessions held may differ.

Week 1 (3hr lecture): Introduction to Urban Science-Cities and their relationship with technology

and Smart cities?

How the three technological revolutions have restructured cities: industrial revolution, skyscrapers, proliferation of automobiles, and ubiquitous digital society.

Genealogy of smart cities. Top-down vs. Grass-Roots (Townsend 2013); Case studies from global cities: London, New York, Amsterdam, Rio De Janeiro, Barcelona; Experiments of Masdar City, UAE and Songdo, South Korea; Critical approaches to smart cities in geography, new media and art.

Week 2 (2hr lecture & 1hr seminar): Urban data ecosystems

Theory and Politics surrounding data; Policy-making urban data: land use and geographic data, Census & demographic data, traffic – mobility & flow data; Other types of urban data from social media and twitter to noise, urban lights and urban heat; Public and Open Data; Big Data of Cities.

Week 3 (2hr lecture & 1hr seminar): Data gathering, urban sensing

Theory, practices and examples of urban sensing; Why and how do we collect urban data?; From satellites to DIY devices; Institutional vs citizen science data.

Week 4 (2hr lecture & 1hr seminar): What is Data?

Using examples from the urban, examine the fundamental characteristics to build a critical and informed view of data; What are the hypotheses underlying and embedded within data?; Is there such a thing as “Raw Data”?; Observation errors – calibration, measurement, variation, sampling; Process errors – system effects, dynamic processes and dynamic states; Incomplete data and Metadata

Week 5 (2hr lecture & 1hr seminar): The Anatomy of Urban Visualisations

What is a visualisation composed of?; What is and isn't a visualisation?; Form and function - What do visualisations do and what are they used for; The encoding and decoding model of communication; Visualisations as data... Maps!

Week 6 Reading week

Week 7 (2hr lecture & 1hr seminar): Against the ubiquitous city

The material infrastructures of urban data; From sensors to datacenters; Digital infrastructures and their transformation of territory; Impact of digital infrastructures in urban design and urban imaginaries.

Week 8-10 (3hr workshop): Ethnography of data. Group work

Analysis, critical and alternative visions of an existing urban cartography whose data is available. Search, analyse and propose changes in the type of data, how it has been gathered, which other data it interacts, the material infrastructures that support the data, the agents involved, and the visualization.

Learning outcomes

By the end of the module, students should be able to:

- At the end of this module, students should be able to:• Demonstrate an understanding of how cities are shaped and transformed through technological developments;• Explain the basic propositions of smart cities, including their advantages, challenges and feasibility through examples;• Reflect on the implications of information and communication

technologies and big data for contemporary cities and smart cities; • Develop an appreciation of the methodological and epistemological challenges involved in conducting interdisciplinary research on cities using big and open data; • Demonstrate an understanding of the ways in which urban data is transforming traditional social research practices and processes; • Extend general and current knowledge in urban data to specific thematic context of urban challenges.

Indicative reading list

- Batty, M. ,2013. *The New Science of Cities*. MIT Press.
- Beecham, R. & Wood, J. ,2014. Exploring gendered cycling behaviours within a large-scale behavioural dataset. *Transportation Planning and Technology*, 37(1), pp. 83-97.
- Bettencourt, L. & West, G. ,2010. A unified theory of urban living. *Nature*, 467, 912-913.
- Bettencourt, L. et al. ,2007. Growth, innovation, scaling, and the pace of life in cities. *PNAS*. 104(17), 7301-7306.
- Campbell, T. ,2012. *Beyond Smart Cities: How Cities Network, Learn and Innovate*. Routledge.
- Crang, M. & Graham, S., 2007. SENTIENT CITIES Ambient intelligence and the politics of urban space. *Information, Communication & Society*, 10(6), pp.789–817
- Farías, Ignacio; Bender, Thomas ed., 2010. *Urban Assemblages*, London, New York: Routledge.
- Forman, R.T.T. ,2014. *Urban Ecology: Science of Cities*, Cambridge University Press.
- Fujita, M., Krugman, P. and Venables, A.J. (1999) *The Spatial Economy: Cities, Regions, and International Trade*. London: MIT Press.
- Gabrys, J., 2012. Sensing an Experimental Forest: Processing Environments and Distributing Relations. *Computational Culture*. Available at: <http://computationalculture.net/article/sensing-an-experimental-forest-processing-environments-and-distributing-relations> [Accessed May 31, 2013].
- Gabrys, J., 2007. Automatic Sensation: Environmental Sensors in the Digital City. *The senses and society*, 2(2), pp.189–200.
- Goldmith, S. and Crawford, S. ,2014. *The Responsive City: Engaging Communities Through Data-Smart Governance*, John Wiley.
- Graham, Stephen & Marvin, Simon, 2009. *Splintering Urbanism. Networked infrastructures, technological monilities and the urban condition*, London, New York: Routledge.
- Greene, R.P., and Pick, J.B. ,2006. *Exploring the Urban Community: A GIS Approach*. Pearson/Prentice Hall.
- Greenfield, A., 2013. *Against the Smart City. The City is Here for You to Use Do Projects.*,
- Halpern, O. et al., 2013. Test-Bed Urbanism. *Public Culture*, 25(2 70), pp.272–306.
- Harcourt, W, and Nelson, I. , 2015. *Practising Feminists Political Ecologies*, Zed Books.
- Kuznetsov, S. & Paulos, E., 2010. Participatory sensing in public spaces: activating urban surfaces with sensor probes. In *Proceedings of the 8th ACM Conference on Designing Interactive Systems*. DIS '10. New York, NY, USA: ACM, pp. 21–30.
- Latour, B. & Hermant, E., 1998. *Paris ville invisible*, Paris: Institut Sythélabo pour le progrès de la connaissance.
- Marres, N., 2011. The cost of public involvement Everyday devices of carbon accounting and the materialization of participation. *Economy and Society*, 40(4).

- Mayer-Schonberger, V. and Cukier, K. ,2013. Big Data: A Revolution That Will Transform How We Live, Work and Think, John Murray.
- Meirelles, I. ,2014. Design for Information - An Introduction to the Histories, Theories, and Best Practices Behind Effective Information Visualizations. Rockport.
- Muller, N. Werner, P. & Kelcey, JG. ,2010. Urban Biodiversity and Design. Wiley Blackwell.
- Sheppard, M. ed ,2011. Sentient City. Ubiquitous Computing, Architecture and the Future of Urban Space., The MIT Press.
- Townsend, A.M. ,2013. Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia, W.W.Norton.
- Spade, Dean, 2008. Documenting Gender. Hastings Law Journal, 59(731).
- Weiser, Mark, 1991. The Computer for the 21st Century. Scientific American, 265(3).

Interdisciplinary

The module requires students to develop the following cognitive skills:

- Demonstrate an ability for critical analysis and evaluation of current research, reflecting on disciplinary roots of different models;
- Reflect on and contrast different disciplinary models;
- Apply concepts gained in one disciplinary area to that in another area;
- Demonstrate an ability to synthesise ideas from different disciplinary perspectives.

Subject specific skills

- Demonstrate an understanding of how cities are shaped and transformed through technological developments;
- Explain the basic propositions of smart cities, including their advantages, challenges and feasibility through examples;
- Reflect on the implications of ICTs and big data for contemporary cities and smart cities;
- Develop an appreciation of the methodological and epistemological challenges involved in conducting research on cities using big and open data;
- Evaluate and apply knowledge gained about urban science to address a specific aspect of cities.
- Demonstrate an ability for critical analysis and evaluation of current research, reflecting on disciplinary roots of different models;
- Reflect on and contrast different disciplinary models;
- Apply concepts gained in one disciplinary area to that in another area;
- Demonstrate an ability to synthesise ideas from different disciplinary perspectives.

Transferable skills

- Think critically, creatively and independently in relation to a topic provided each week;
- Demonstrate time-management skills;
- Demonstrate problem solving skills;
- Demonstrate independent learning skills;
- Participate in class discussions;

- Make productive links between theoretical ideas and practical phenomena;
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Study

Study time

Type	Required
Lectures	6 sessions of 2 hours (8%)
Seminars	3 sessions of 3 hours (6%)
Tutorials	6 sessions of 1 hour (4%)
Private study	123 hours (82%)
Total	150 hours

Private study description

Prescribed reading and self-directed study for formative and summative assessments.

Costs

No further costs have been identified for this module.

Assessment

You do not need to pass all assessment components to pass the module.

Assessment group A9

	Weighting	Study time
2500-word Group Report	40%	
1500-word Essay	60%	

Feedback on assessment

Class / seminar discussion
Verbal feedback provided in situ in class in response to class discussion.
Formative essay (a) Written feedback provided to each student online via Tabula;
(b) Aggregate/general verbal feedback provided in class.
Summative essay
Written feedback provided to each student online via Tabula.

Availability

Courses

This module is Optional for:

- Year 2 of TIMS-L990 Postgraduate Big Data and Digital Futures
- Year 1 of TCSA-G5PA Postgraduate Taught Data Analytics
- TIMA-L995 Postgraduate Taught Data Visualisation
 - Year 1 of L995 Data Visualisation
 - Year 2 of L995 Data Visualisation
- TIMA-L99A Postgraduate Taught Digital Media and Culture
 - Year 1 of L99A Digital Media and Culture
 - Year 2 of L99A Digital Media and Culture

This module is Core option list A for:

- Year 1 of TPSS-C803 Postgraduate Taught Behavioural and Data Science

This module is Core option list C for:

- Year 1 of TPSS-C803 Postgraduate Taught Behavioural and Data Science

This module is Option list A for:

- Year 1 of TIMS-L990 Postgraduate Big Data and Digital Futures