# Martin Fleischmann

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## **EDUCATION**

Ph.D. Architecture, University of Strathclyde, Glasgow, 2021
The Urban Atlas: Methodological Foundation of a Morphometric Taxonomy of Urban Form

MSc. Urban Design, University of Strathclyde, Glasgow, 2017

Measuring Urban Form: A Systematisation of Attributes for Quantitative Urban Morphology

BSc. Architecture and Urbanism, Czech Technical University, Prague, 2015

## **ACADEMIC APPOINTMENTS**

2024 – Charles University in Prague Research Associate, Department of Social Geography and Regional Development Urban and Regional Laboratory Research Team on Urban Structure

2023-24 The Alan Turing Institute
Postdoctoral Research Associate
Urban Analytics programme

2022-23 Charles University in Prague Postdoctoral Researcher, Department of Social Geography and Regional Development Urban and Regional Laboratory

2020-22 University of Liverpool

Research Associate, Department of Geography and Planning "Learning an urban grammar from satellite data through AI." Economic and Social Research Council & Alan Turing Institute

## HONORARY APPOINTMENTS

2022 – University of Liverpool Fellow, Department of Geography and Planning

# PROFESSIONAL APPOINTMENTS

2022–23 UrbanDataLab AG Head of Data and Analytics

## **PUBLICATIONS**

#### **Journal Articles**

- Fleischmann, M. and Arribas-Bel, D., 'Decoding (urban) form and function using spatially explicit deep learning' *Computers, Environment and Urban Systems* 112, 102147 doi:10.1016/j.compenvurbsys.2024.102147
- Fleischmann, M., and Vybornova, A., 'A shape-based heuristic for the detection of urban block artifacts in street networks' *Journal of Spatial Information Science* 28. doi:10.5311/JOSIS.2024.28.319
- Calafiore, A., Samardzhiev, K., Rowe, F., Fleischmann, M., and Arribas-Bel, D., 'Inequalities in experiencing urban functions. An exploration of human digital (geo-)footprints' *Environment and Planning B: Urban Analytics and City Science* 0 (0). doi:10.1177/23998083231208507
- Fleischmann, M. 'Clustergram: Visualization and diagnostics for cluster analysis'. *Journal of Open Source Software* 8 (89), 5240. doi:10.21105/joss.05240
- Wang, J., Fleischmann, M., Venerandi, A., Romice, O., Kuffer, M., and Porta, S. 'EO + Morphometrics: Understanding cities through urban morphology at large scale' *Landscape and Urban Planning*, 233. doi:10.1016/j.landurbplan.2023.104691
- Rowe, F., Calafiore, A., Arribas-Bel, D., Samardzhiev, K., and Fleischmann, M. 'Urban exodus? Understanding human mobility in Britain during the COVID-19 pandemic using Meta-Facebook data' *Population, Space and Place*, e2637. doi:10.1002/psp.2637
- Arribas-Bel, D. and Fleischmann, M. 'Spatial Signatures: Understanding (urban) spaces through form and function' *Habitat International*, 128, (102641). doi:10.1016/j.habitatint.2022.102641
- Fleischmann, M. and Arribas-Bel, D. 'Geographical characterisation of British urban form and function using the spatial signatures framework' *Scientific Data*, 9, (546). doi:10.1038/s41597-022-01640-8
- Venerandi, A., Feliciotti, A., Fleischmann, M., Kourtit, K., Porta, S. 'Urban form character and Airbnb in Amsterdam NL: A morphometric approach' Environment and Planning B: Urban Analytics and City Science 50 (2), 386-400. doi:10.1177/23998083221115196
- Samardzhiev, K., Fleischmann, M., Arribas-Bel, D., Calafiore, A., Rowe, F. 'Functional Signatures in Great Britain: A dataset.' *Data in Brief*, 108335, doi:10.1016/j.dib.2022.108335
- Singleton, A., Arribas-Bel, D., Murray, J., and Fleischmann, M. 'Estimating generalized measures of local neighbourhood context from multispectral satellite images using a convolutional neural network.' *Computers, Environment and Urban Systems*, 95, 101802. doi:10.1016/j.compenvurbsys.2022.101802
- Fleischmann, M., Feliciotti, A., Romice, O. and Porta, S. 'Methodological Foundation of a Numerical Taxonomy of Urban Form.' *Environment and Planning B: Urban Analytics and City Science* 49 (4), 1283-1299. doi:10.1177/23998083211059835
- Fleischmann, M., Feliciotti, A. and Kerr, W. 'Evolution of urban patterns: urban morphology as an open reproducible data science.' *Geographical Analysis* 54 (3). doi:10.1111/gean.12302
- Dal Cin, F., Fleischmann, M., Romice, O. and Costa, J.P. 'Climate Adaptation Plans in the Context of Coastal Settlements: The Case of Portugal.' *Sustainability* 12 (20). doi:10.3390/su12208559

- Fleischmann, M., Romice, O. and Porta, S. 'Measuring urban form: overcoming terminological inconsistencies for a quantitative and comprehensive morphologic analysis of cities.' *Environment and Planning B: Urban Analytics and City Science* 48 (8), 2133-2150. doi:10.1177/2399808320910444
- Fleischmann, M., Feliciotti, A., Romice, O. and Porta, S. 'Morphological tessellation as a way of partitioning space: Improving consistency in urban morphology at the plot scale' *Computers, Environment and Urban Systems* 80, 101441. doi:10.1016/j.compenvurbsys.2019.101441
- Fleischmann, M. 'momepy: Urban Morphology Measuring Toolkit' *Journal of Open Source Software* 4 (43), 1807. doi:10.21105/joss.01807

## **Conference Papers**

- Fleischmann, M. and Arribas-Bel, D. 'Classifying urban form at national scale: the British morphosignatures', *Annual Conference Proceedings of the XXVIII International Seminar on Urban Form.* University of Strathclyde Publishing, Glasgow, pp. 895-905. ISBN 9781914241161. doi:10.17868/strath.00080527
- Wang, J., Fleischmann, M., Venerandi, A., Kuffer, M., Porta, S. 'Earth observation+ morphometrics: towards a systematic understanding of cities in challenging contexts', *Annual Conference Proceedings of the XXVIII International Seminar on Urban Form*. University of Strathclyde Publishing, Glasgow, pp. 363-370. ISBN 9781914241161. doi:10.17868/strath.00080467
- Fleischmann, M., Romice, O. and Porta, S. 'Applicability of morphological tessellation and its topological derivatives in the quantitative analysis of urban form' *Cities as Assemblages, Proceedings of XXVI International Seminar on Urban Form, volume 3.* Nicosia. doi:10.36158/978889295357413

#### **Commentaries**

Fleischmann, M. and Arribas-Bel, D. 'In praise of (spatial) bundles', *Environment and Planning B: Urban Analytics and City Science* 51 (1), 3-6 doi:10.1177/23998083231224151

# **Reports and Other publications**

- Feliciotti, A., Fleischmann, M., eds. 'ISUF Annual Conference Proceedings of the XXVII International Seminar on Urban Form:" Urban Form and the Sustainable and Prosperous City"'. University of Strathclyde Publishing, Glasgow, ISBN 9781914241161. doi:10.17868/80146
- Rowe, F., Arribas-Bel, D., Calafiore, A., MacDonald, J., Samardzhiev, K., Fleischmann, M., 'Mobility data in urban science. Workshop report'. The Alan Turing Institute. London, United Kingdom.
- Fleischmann, M. 'Policy Brief: Flexibilita prostorového uspořádání města' (Flexibility of the spatial configuration of the city) *Územně analytické podklady hl. m. Prahy*. Institute for Planning and Development, Prague, Czechia
- Darlington-Pollock, F., Arribas-Bel, D., Fleischman, M., Newsham, N., Rowe, F. 'Policy Brief: What do 'left behind' areas look like over time? Developing place-based typologies of left behind areas'. Local Trust, UK
- Places Platform, Smart Growth America, UDSU. 'Welcome to the Future of Grand Rapids: Assessing Place-Based Economic, Social Equity, and Public Health Performance'. Downtown Grand Rapids Inc., US

## RESEARCH SOFTWARE DEVELOPMENT

- 2023 geodatasets: spatial data examples. (author and maintainer)
- 2022 Xvec: vector data cubes for Xarray. (author and maintainer)
- 2021– xyzservices: source of XYZ tiles providers. (author and maintainer)
- 2020 clustergram: visualization and diagnostics for cluster analysis (author and maintainer)
- 2020 PySAL: Python Spatial Analysis Library (core developer)
- GeoPandas: an open source project to make working with geospatial data in python easier (core developer)
- 2018 momepy: Urban Morphology Measuring Toolkit (author and maintainer)

## **EDITORIAL APPOINTMENTS**

2021– Journal of Open Source Software Associate Editor

## **HONORS AND AWARDS**

- 2024 Dean's Award for Early Career Researcher *Faculty of Science, Charles University*
- 2023 Michael Breheny Prize Environment and Planning B: Urban Analytics and City Science

## RESEARCH INCOME

# Awards

- 2024 European Space Agency 'EuroFab: European Urban Fabric Classification Using Artificial Intelligence', €250,000
- 2023 Primus Research Programme, Charles University 'Influence of Socioeconomic and Cultural Factors on Urban Structure in Central Europe', €325,000
- NumFOCUS 'Create a more consistent geometry API through the feature parity between low-level (Shapely) and high-level (GeoPandas) packages', \$8,000
- 2020 NumFOCUS 'Improvement and modernization of GeoPandas documentation', \$5,000
- 2018 University of Strathclyde 'John Anderson Research Award', £60,000

## **INVITED TALKS AND KEYNOTES**

#### **Keynote speeches**

'From a building to a region: Scalable morphology with urban morphometrics' International Seminar on Urban Morpho-Science. Nanjing, China. Oct 26

'The emergent structure of cities' 4th UrbanMetaMapping conference 'City Transition'. Saarbrücken, Germany. Sep 12.

#### **Seminars**

- 'Open by Default' Oak Ridge National Laboratory, Oak Ridge. USA. Online. June 7.
- 'Open by Default' University of California,m Santa Barbara. USA. Online. June 2.
- 'The emergent structure of urban form and function' Space Syntax Lab Seminars, UCL, London. Online. May 18.
- 'Urban morphology drawn and seen' NEtwoRks, Data, and Society. IT University of Copenhagen. Denmark. Online. Apr 26.
- 'Capturing the structure of cities with data science.' Spatial Data Science Conference 2021.
  Online. Oct 26.
- 'Spatial Signatures: Dynamic classification of the built environment.' Spatial Analytics and Data seminar series by University of Newcastle and University of Bristol. Online. Mar 30.
- 'Reading cities as numbers. Where data science meets urbanism.' Academy of Urbanism (Scotland). Online. Dec 3.

## **TEACHING**

- 2024 Spatial Data Science in Python (online) Charles University
- 2023– Spatial Data Science for Social Geography *Charles University*

#### **CONFERENCE ACTIVITY**

#### **Conferences Organized**

- 'Spatial Data Science across Languages' Prague, CZ. Sep 18 Sep 19.
- 'XXVIII International Seminar on Urban Form' Urban Form and the Sustainable Prosperous City. Glasgow (virtually), UK. Jun 29 Jul 3.

## **Conference Papers Presented**

Presenting author *italicized* if other than first author.

- Araldi, A., Fleischmann, M. and Fusco, G. 'Urban Visibility Analysis: Integrating Street-level Protocols into the momepy Python Library' XXXI International Seminar on Urban Form: Future horizons for urban form. Sao Paulo. Sep 16–20.
- Fleischmann, M. 'GeoPandas 1.0 and beyond' EuroPython 2024, Prague, CZ, Jul 8–14.
- Fleischmann, M. and Van den Bossche, J. 'GeoPandas 1.0 and beyond' GeoPython 2024, Basel, CH, May 27–29.
- Arribas-Bel, D. and Fleischmann, M. 'Learning from Deep Learning: Lessons from using computer vision to identify (urban) form and function in open data satellite imagery.' AAG Annual Meeting. Denver, US Mar 23 26.

- Fleischmann, M. 'Vector data cubes as a bridge between raster and vector worlds.' GeoPython. Basel. Mar 6–8.
- Fleischmann, M. 'Learning from the "cool kids": how academic research can benefit from becoming more like open-source.' GeoPython. Basel. Jun 20–22.
- Fleischmann, M. and Arribas-Bel, D. 'Detecting urban typology from multispectral satellite imagery using neural networks.' ISUF Italy 2022, Bolgona/Virtual, IT. Jun 8 10.
- Fleischmann, M. and Arribas-Bel, D. 'Using deep learning to identify (urban) form and function in satellite imagery the case of Great Britain.' GISRUK 2022, Liverpool UK. Apr 6 8
- Fleischmann, M. and Arribas-Bel, D. 'Classifying urban form at a national scale: The case of Great Britain' XXVIII International Seminar on Urban Form: Urban Form and the Sustainable Prosperous City. Glasgow/Virtual. Jun 29 Jul 3.
- Venerandi, A., *Feliciotti, A.*, Fleischmann, M., Kourtit, K., Romice, O., Nijkamp, P., Porta, S. and Fusco, G. 'Urban form and Airbnb: a study of their spatial relation in Amsterdam (NL)' XXVIII International Seminar on Urban Form: Urban Form and the Sustainable Prosperous City. Glasgow/Virtual. Jun 29 Jul 3.
- Porta, S., *Venerandi, A.*, Feliciotti, A., Fleischmann, M. and Romice, O. 'A Numerical Taxonomy of Urban Form in London: an Urban Morphometric Approach' XXVIII International Seminar on Urban Form: Urban Form and the Sustainable Prosperous City. Glasgow/Virtual. Jun 29 Jul 3.
- Wang, J., Fleischmann, M., Venerandi, A., Kuffer, M. and Porta, S. 'Earth Observation + Morphometrics: towards a systematic understanding of cities in challenging contexts' XXVIII International Seminar on Urban Form: Urban Form and the Sustainable Prosperous City. Glasgow/Virtual. Jun 29 Jul 3.
- Fleischmann, M. 'On the morphological composition of cities and how to measure it.' GeoPython. Virtual. Sep 21–22.
- Fleischmann, M., Romice, O. and Porta, S. 'The Urban Atlas: Towards a Morphometric Taxonomy of Urban Form' XXVII International Seminar on Urban Form: Cities in the 21st Century. Salt Lake City/Virtual. Sep 1–4.
- Hořák, D., Fleischmann, M., Romice, O. and Porta, S. 'Just like a bird. A community ecology perspective on urban form evolution' XXVII International Seminar on Urban Form: Cities in the 21st Century. Salt Lake City/Virtual. Sep 1–4.
- Feliciotti, A., Fleischmann, M., Romice, O., Kerr, W. and Porta, S. 'Morphological Resilience Evaluation (MoRE): a new assessment framework for multi-level assessment of urban form resilience' XXVII International Seminar on Urban Form: Cities in the 21st Century. Salt Lake City/Virtual. Sep 1–4.
- Dal Cin, F., Fleischmann, M., Romice, O. and Costa, J.P. 'DECODING SEASHORE STREETS: urban morphometrics as a tool for adaptation measures' XXVII International Seminar on Urban Form: Cities in the 21st Century. Salt Lake City/Virtual. Sep 1–4.
- Fleischmann, M., Dal Cin, F., Romice, O. and Barreiros Proença, S. 'Understanding seashore streets: urban morphometrics as a tool for climate-induced risk assessment' ISUF Italy International Conference: Urban Substrata and City Regeneration. Rome Feb 19–22.
- Feliciotti, A., Fleischmann, M., Romice, O., and Porta, S. 'Morphological Resilience: from a

- theory of resilient urban forms to the tools for its implementation' 12th CITTA International Conference on Planning Research: Spatial Planning for Change. Porto. Sep 19–20.
- Fleischmann, M., Romice, O. and Porta, S. 'Applicability of morphological tessellation and its topological derivatives in the quantitative analysis of urban form' XXVI International Seminar on Urban Form: Cities as Assemblages. Nicosia. Jul 2–6.
- Fleischmann, M., Hořák, D., Porta, S. et al. 'Ecological and evolutionary perspectives in urban morphology' Ecology and Evolution of Urban Areas, CEE Symposium. London. Jun 13.

#### Other conference activities

- Fleischmann, M. 'A brief introduction to Spatial Data Science' 4th UrbanMetaMapping conference 'City Transition'. Saarbrücken. Sep 12.
- Fleischmann, M. and Van den Bossche, J. 'Getting the most out of GeoPandas 1.0' GeoPython 2024, Basel, CH, May 27 29.
- Fleischmann, M. and Van den Bossche, J. 'Writing efficient code for GeoPandas and Shapely in 2023' GeoPython 2023, Basel, CH, Mar 6 8.
- Fleischmann, M. and Gaboardi, J. 'Understanding the structure of cities through the lens of data' Spatial Data Science Symposium 2022, Virtual, Sep 22 23.
- Fleischmann, M. and Van den Bossche, J. 'Scaling up vector analysis with Dask-GeoPandas' GeoPython 2022, Basel, CH, Jun 20 22.
- Nieves, J., Fleischmann, M. and Calafiore, A. 'Dasymetric population modelling in R and Python workshop' GISRUK 2022, Liverpool UK. Apr 6 8.
- Fleischmann, M. and Arribas-Bel, D. 'Spatial Signatures in Great Britain lightning talk'
  Towards urban analytics 2.0, Alan Turing Institute (Urban Analytics) event, Leeds UK. Nov
  30 Dec 1.

#### **SERVICE**

#### **Academic Journal Peer Review**

Cartography and Geographic Information Science

Environment and Planning B: Urban Analytics and City Science

Geographical Analysis

Habitat International

Journal of Geographical Systems

Journal of Open Research Software

Journal of Open Source Software

Journal of Statistical Software

Moravian Geographical Reports

Nature Communications

Nature Machine Intelligence

Plos ONE

Scientific Reports Transactions in GIS Urban Morphology

## **Academic Press Peer Review**

CRC Press

## **Other Peer Review**

Austrian Academy of Sciences
Czech Technical University
pyOpenSci
ZHAW Zurich University of Applied Sciences

#### Other

Lecturer, OpenGeoHub Summer School Siegburg
Introduction to GeoPandas and its Python ecosystem

Mentor, Google Summer of Code.
PySAL - Street network simplification projects
Greg Maya, Gabriel Agostini

Mentor, Google Summer of Code.
Geopandas - Dask bridge to scale geospatial analysis
Thomas Statham (University of Bristol)

2019, 2022 External reviewer, FA CTU Doctoral workshop

# **CONSULTING**

4ct platform, Czechia
 UrbanDataLab AG, Switzerland
 All-Party Parliamentary Group for 'left behind' neighbourhoods, UK
 Institute for Planning and Development, Prague, Czechia
 Places Platform, US

## **MEMBERSHIPS**

2021– Royal Geographical Society (Fellow)
 2019– International Seminar on Urban Form (Member)
 2018– Academy of Urbanism (Young Urbanist)

Updated March 2025