

Urban Grammar

*Making it easy for Regional Scientists to consider (urban)
form & function*

SEA Lecture'22

Dani Arribas-Bel

@darribas

Martin Fleischmann

@martinfleis



**The
Alan Turing
Institute**



Geographic
Data Science
Lab

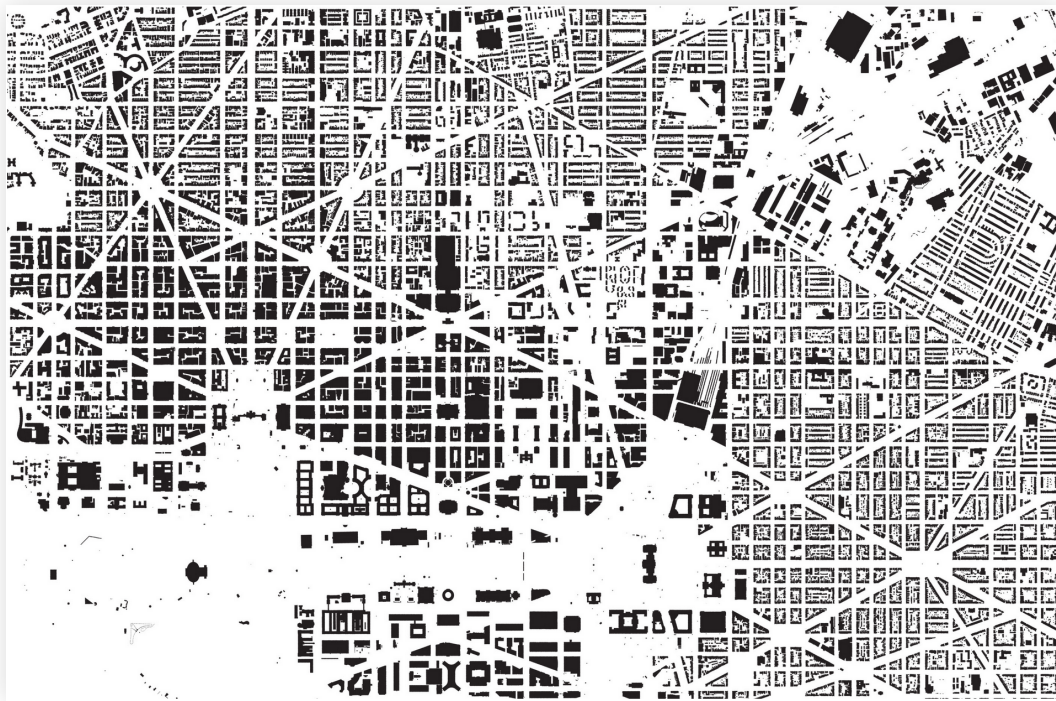


Today

- *Urban* Form & Function
- Urban Grammar
- A peek into the future

(Urban) Form & Function

How we arrange “stuff” in cities matters...



Source: *A map of every building in America* (New York Times)

Form & Function

Form

What does it look like?

“Physical structure and appearance of cities”

Function

What is it used for?

“Activities that take place within an environment”

Why Form & Function?

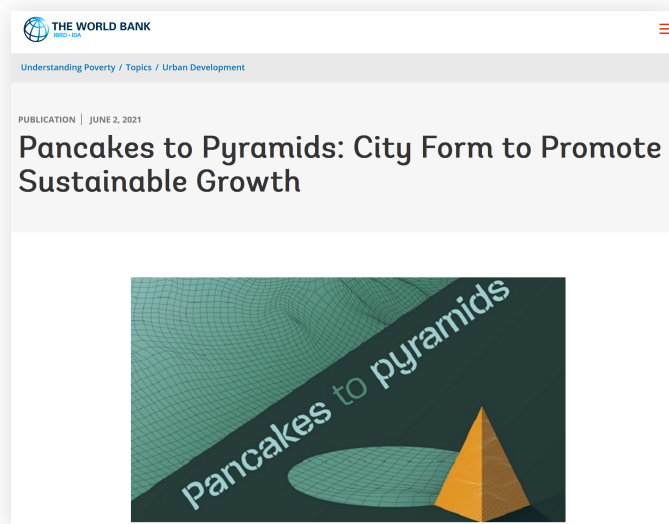
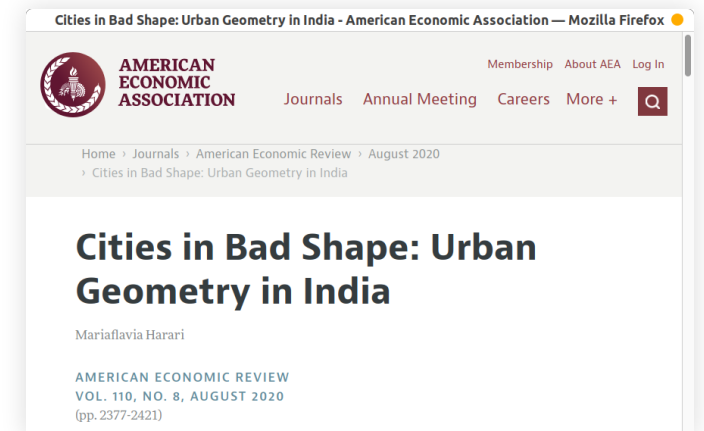
Encodes the past

- Geography
- History
- Technology
- ...

Frames the future

- Productivity
- Sustainability
- Quality of Life
- ...

F&F in Regional Science



F&F in Regional Science

Critical to understand:

- Agglomeration economies
- Amenities in cities
- Urban/rural
- ...

But often:

- Coarse
- Aggregate
- Ad-hoc
- ...

Detail matters...

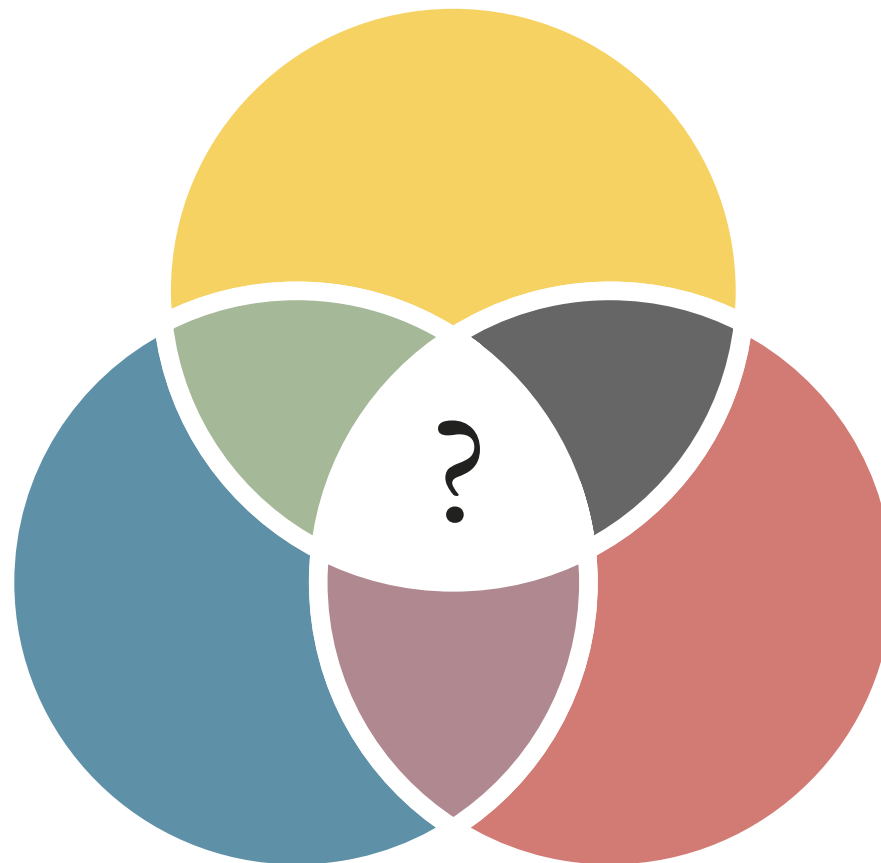


Source: *Six 15-minute walks capture the diversity, history of Houston neighborhoods* ([Urban Edge](#))

detailed

scalable

consistent



Urban Grammar

The Alan Turing Institute



☰ Menu

Home + Research + Research projects

Urban Grammar

Learning an urban grammar from satellite data through AI

Learn more ↓

Project status
Ongoing

Related
programmes

Urban analytics



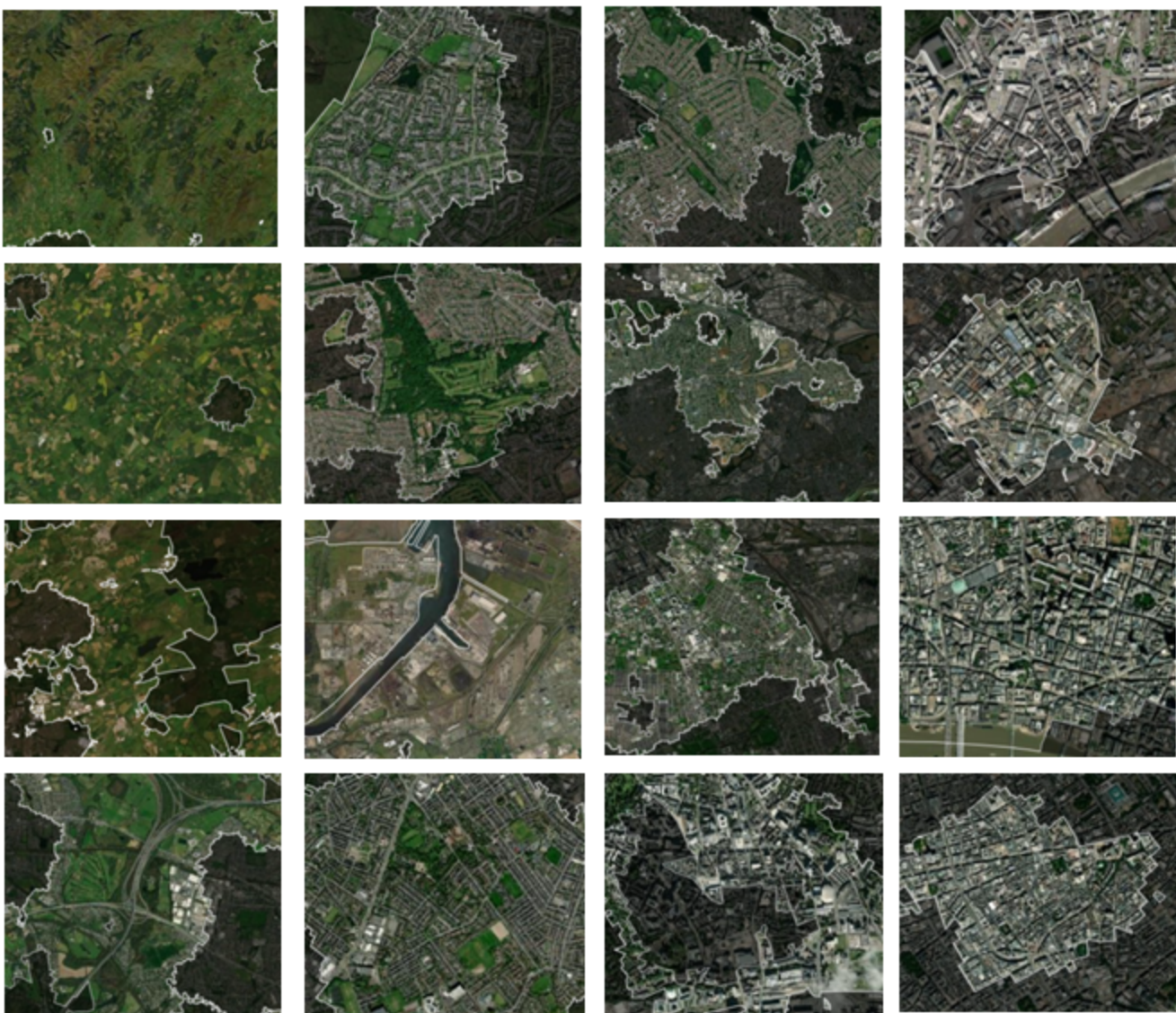
*Characterisations of space based on form and function
designed to understand urban environments*

*Characterisations of space based on form and function
designed to understand urban environments*

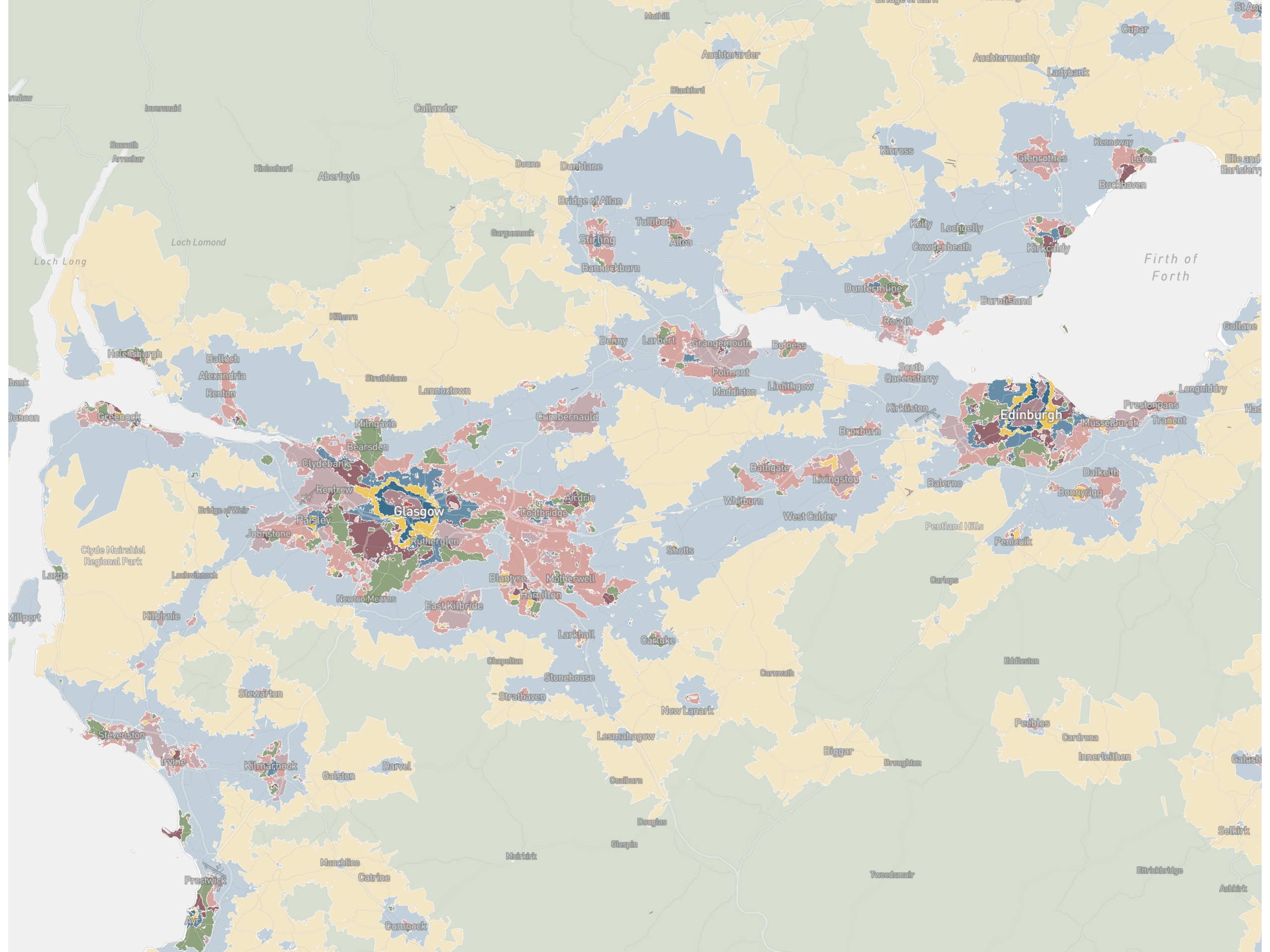
*Characterisations of space based on form and function
designed to understand urban environments*

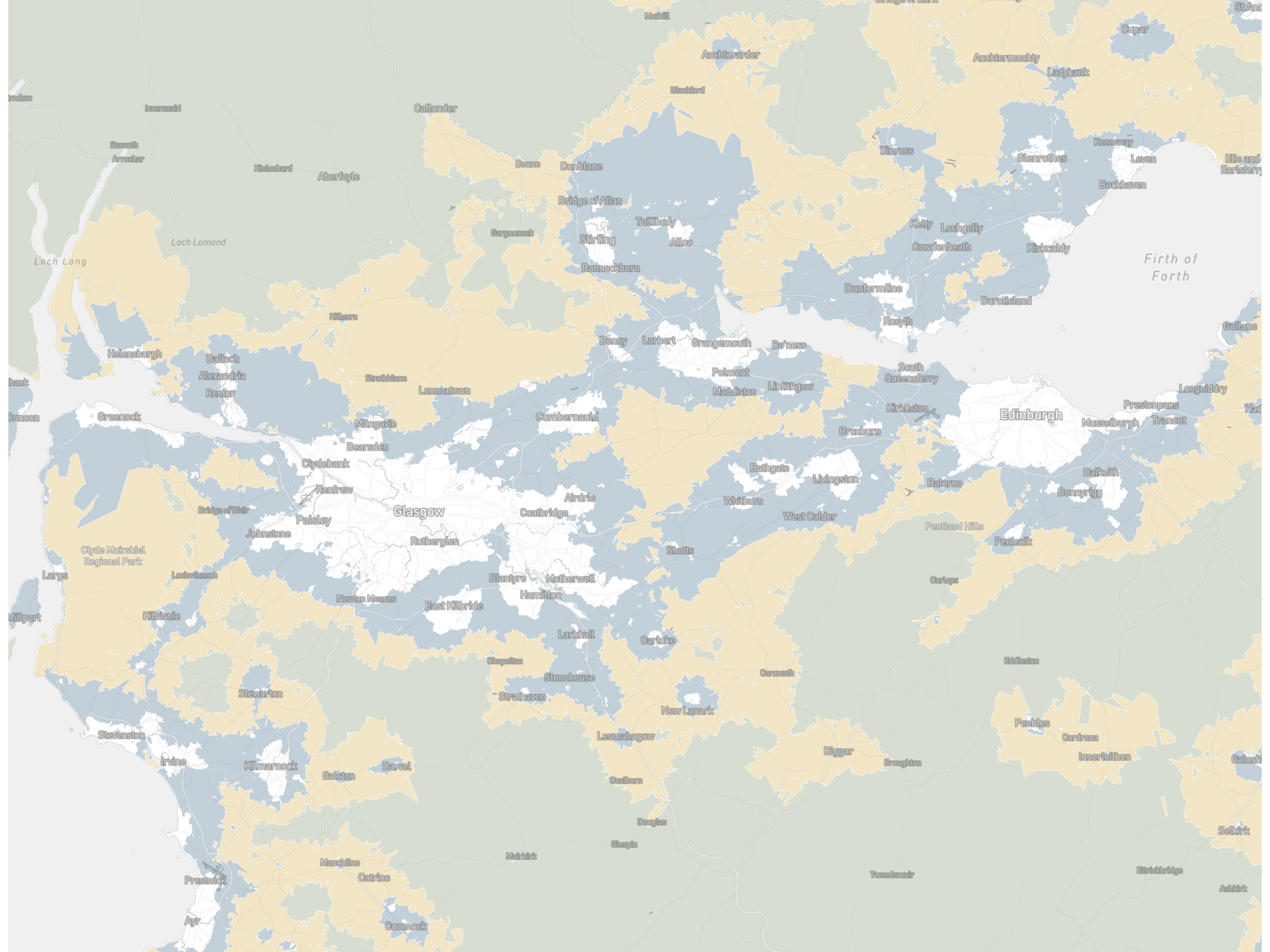
*Characterisations of space based on form and function
designed to understand urban environments*

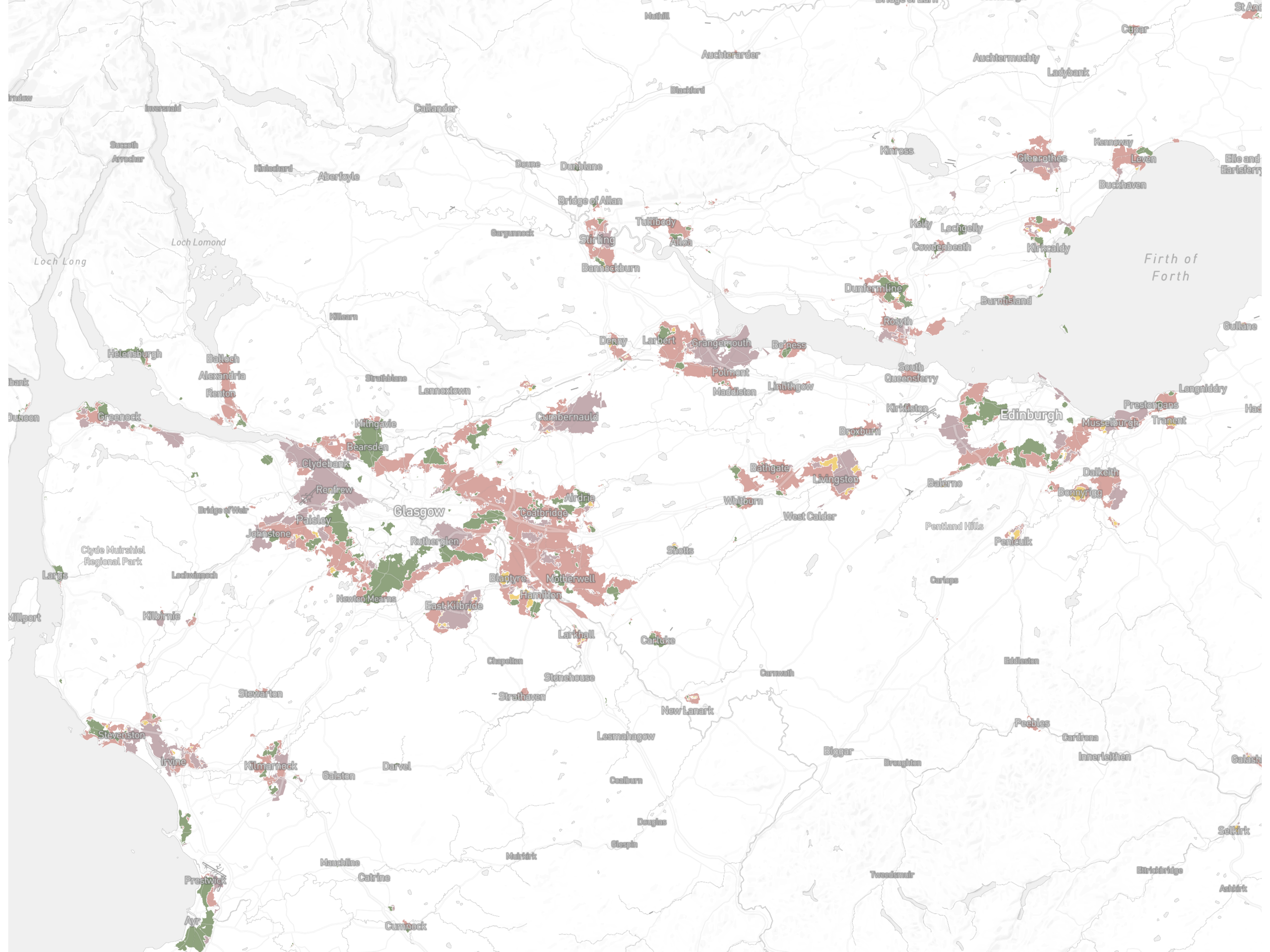
British Signatures

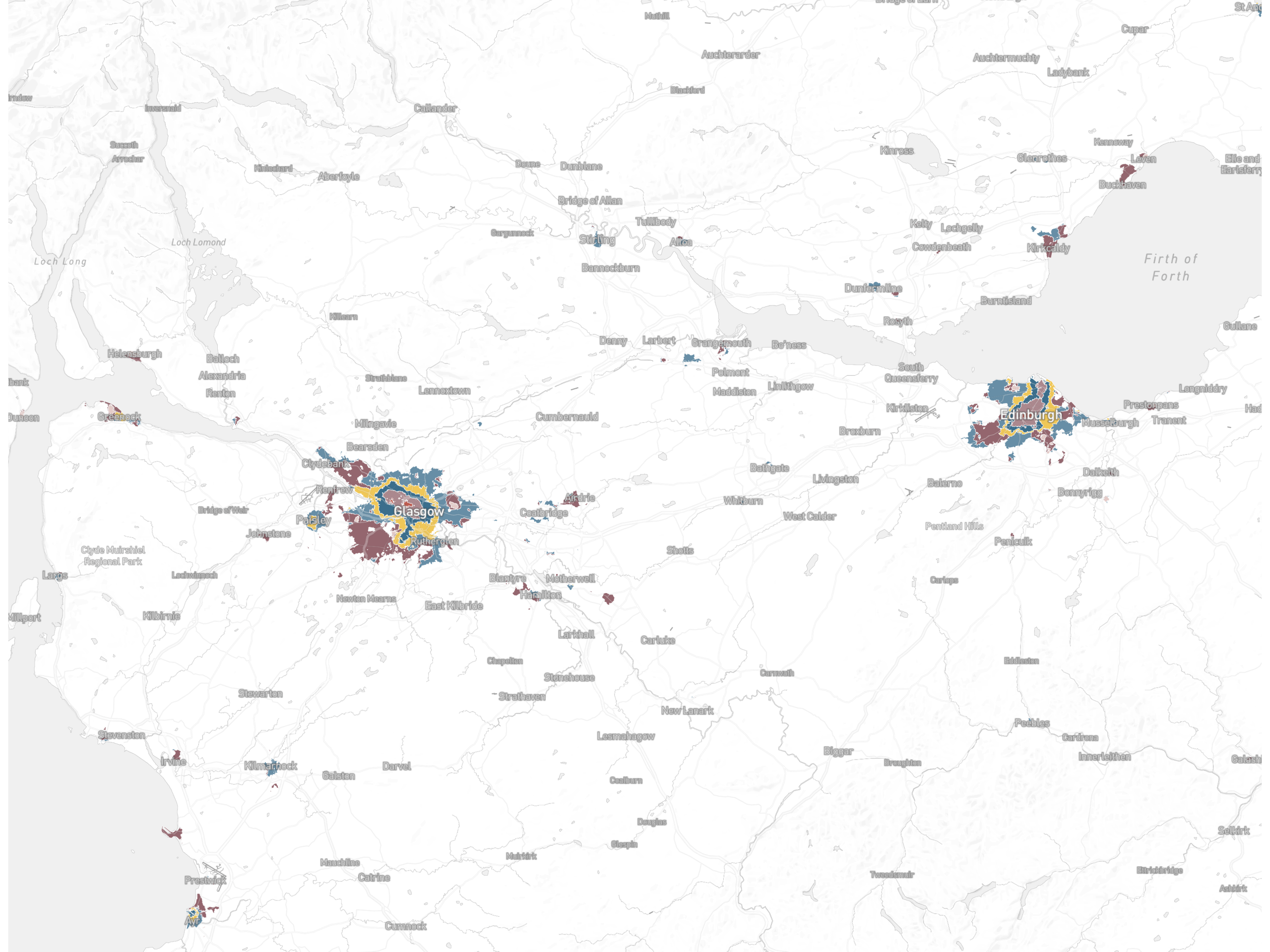


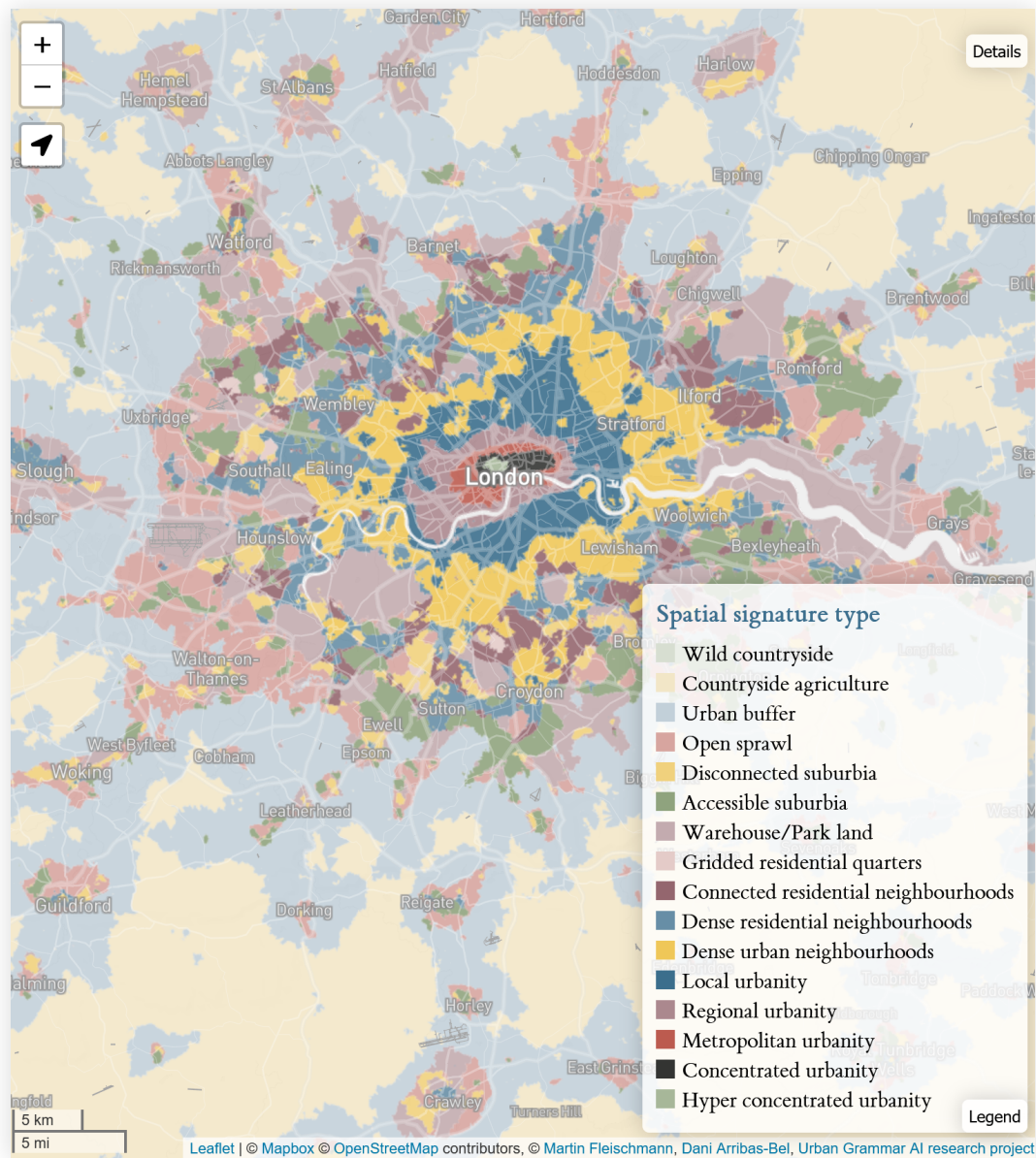
<https://urbangrammarai.xyz/story>














Consumer Data Research Centre



An ESRC Data Investment

search

CDRC Datasets Stories Tutorials Topics Geodata Packs About Data Log in Register

Home » Datasets » Spatial Signatures of Great Britain

Spatial Signatures of Great Britain

 Population & Mobility  Transport & Movement


Geographical Characterisation of British Urban Form and Function using the Spatial Signatures Framework

Spatial signatures characterise space based on form and function in a way designed to understand urban environments. This data product, part of the Urban Grammar project, contains a typology of spatial signatures in Great Britain. Each type has a distinct character capturing what the place looks like (form) and how it is used (function).

The data product contains bespoke Signature geometry with signature type, summary of input variables per each geometry and per each type, interpolation of signature types to OA and LSOA geometry and short pen portraits for the typology, shorthand descriptions of the characteristics of each signature type.

The interactive map showing the typology is available at <https://urbangrammarai.xyz/great-britain/>. More details about the project can be found at the project website <https://urbangrammarai.xyz>.

Data Extent



License

UK Open Government Licence (OGL)



Sub-classifications

XXVIII International Seminar on Urban Form
ISUF2021: URBAN FORM AND THE SUSTAINABLE AND PROSPEROUS CITIES
29th June – 3rd July 2021, Glasgow

Classifying urban form at national scale: The British morphosignatures

Dr Martin Fleischmann¹, Dr Daniel Arribas-Bel¹

¹ Geographic Data Science Lab, Department of Geography and Planning, University of Liverpool, UK



Data in Brief
Volume 43, August 2022, 108335



Data Article

Functional signatures in Great Britain: A dataset

Krasen Samardzhiev ^a , Martin Fleischmann ^a , Daniel Arribas-Bel ^{a, b} , Alessia Calafiore ^a , Francisco Rowe ^a

[Show more](#)

Add to Mendeley Share Cite

<https://doi.org/10.1016/j.dib.2022.108335>

Under a Creative Commons [license](#)

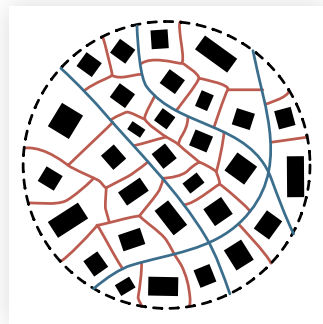
[Get rights and content](#)

Open access

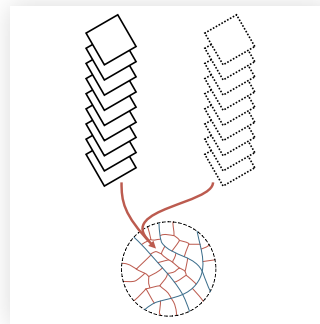
Building *Spatial Signatures*

[STAGE] Delimiters Enclosure Anchors Encl. Tess. Characters Clusters Signatures

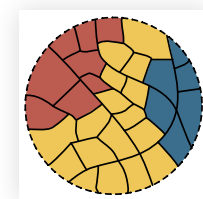
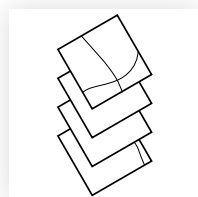
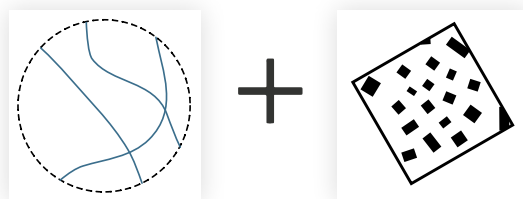
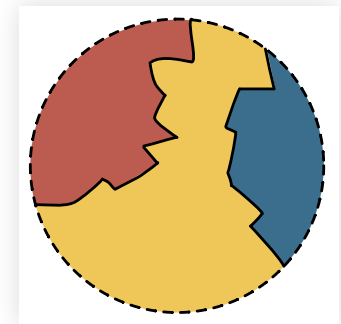
Enclosed
Tessellation



Embedding
form & function

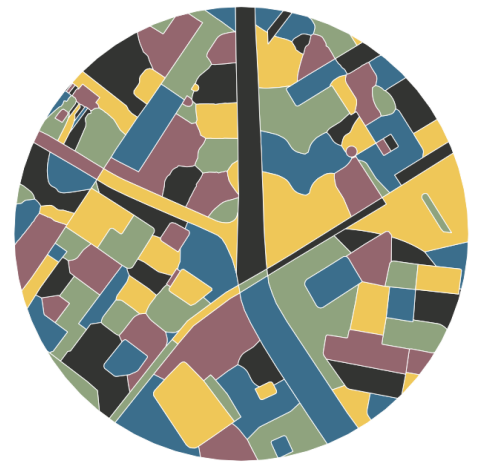
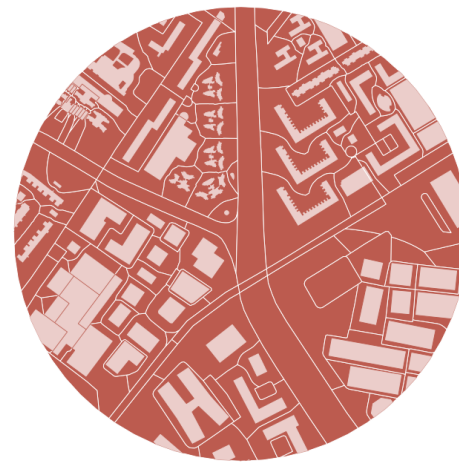


Spatial
Signatures

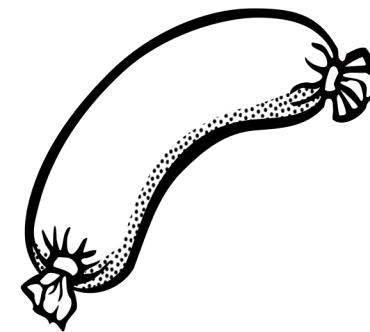


Meaningful spatial units

Enclosed tessellation



“Open by default”



- Data, data, data
- Methods, code
- Infrastructure

- Dissemination
- Open Data Products
-

Journaling/reporting

<https://urbangrammarai.xyz>

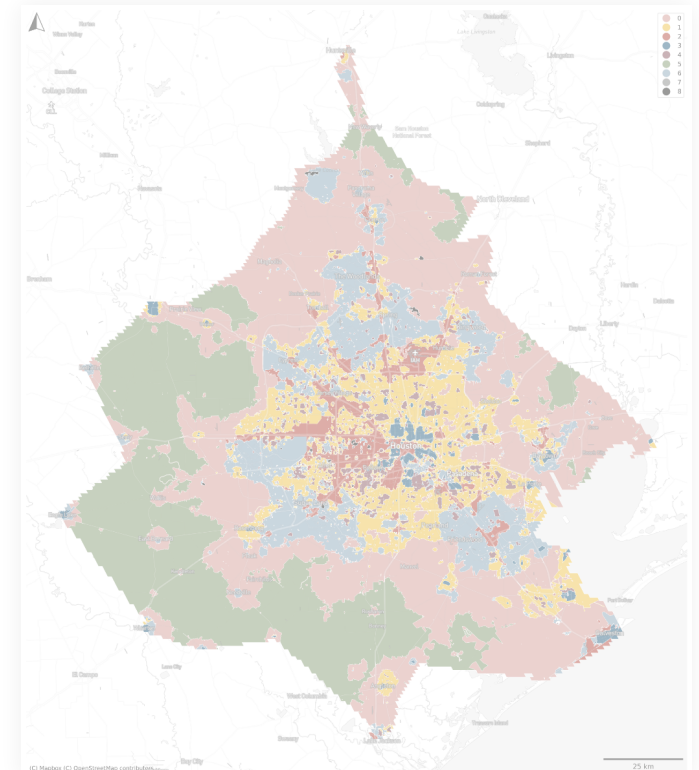
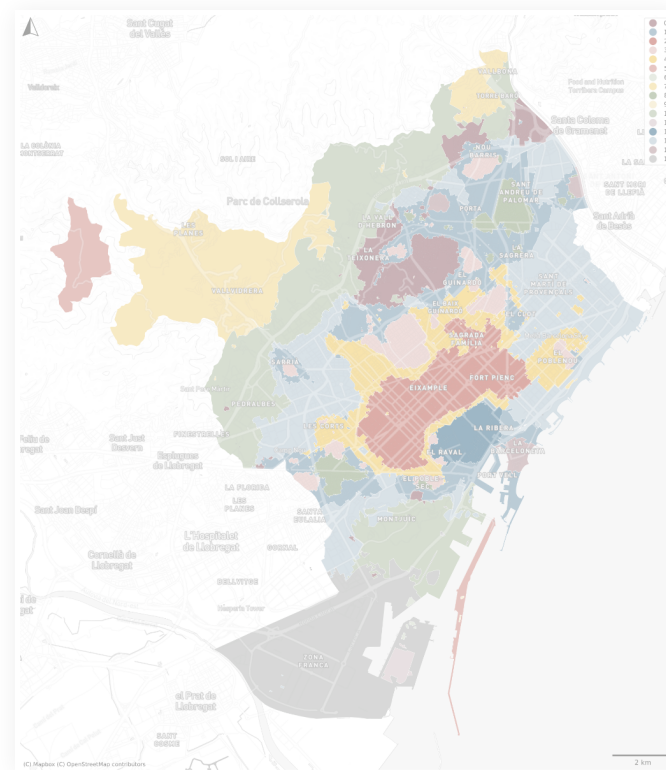
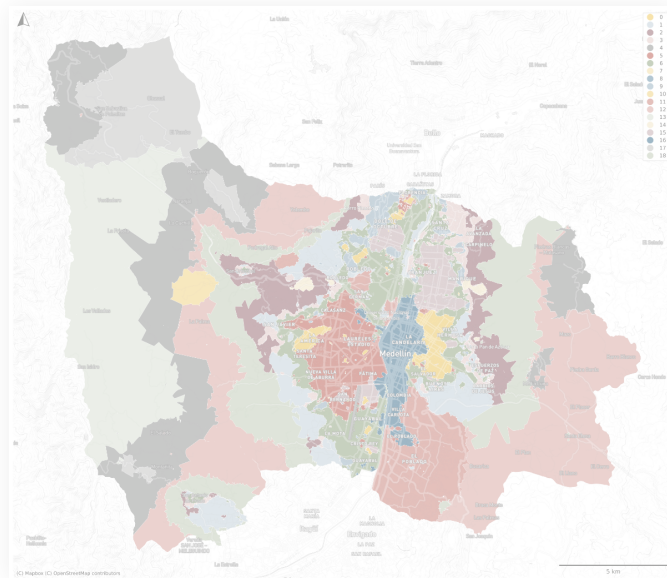
Lessons

Encoding

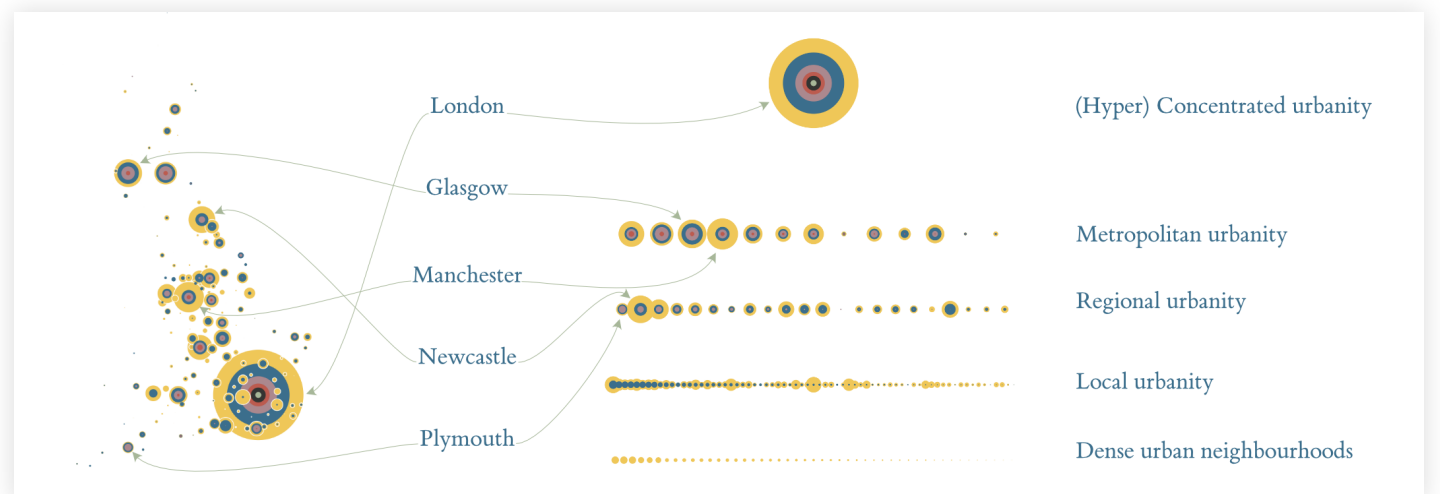
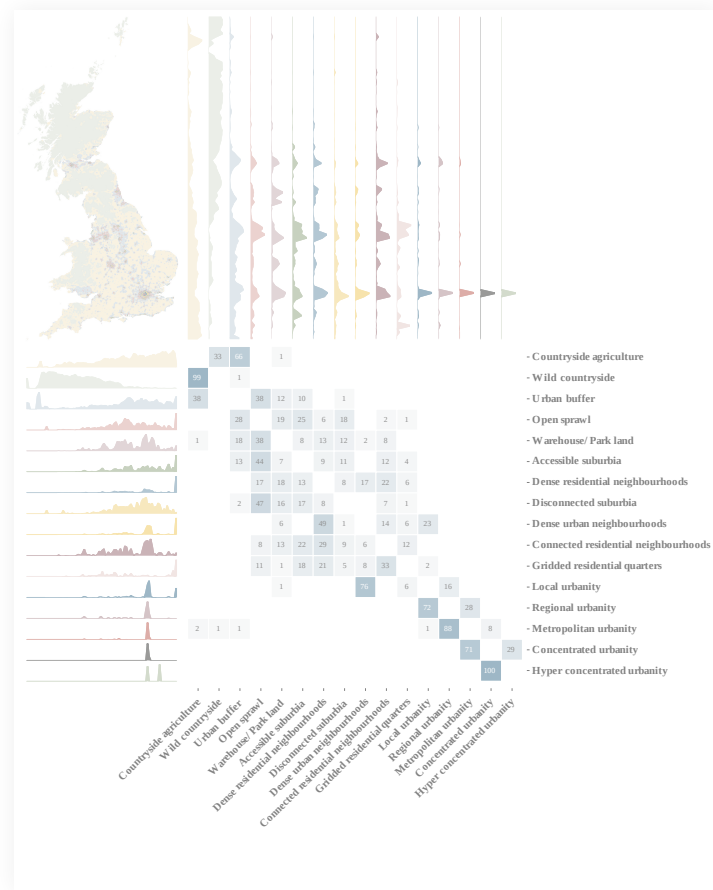
Geography

History

Technology



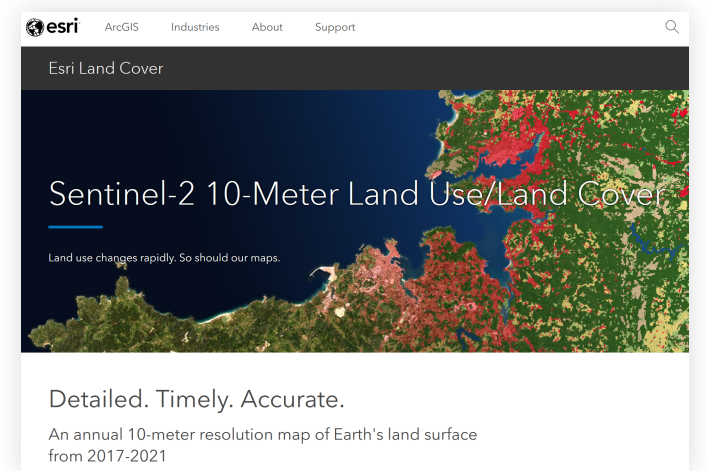
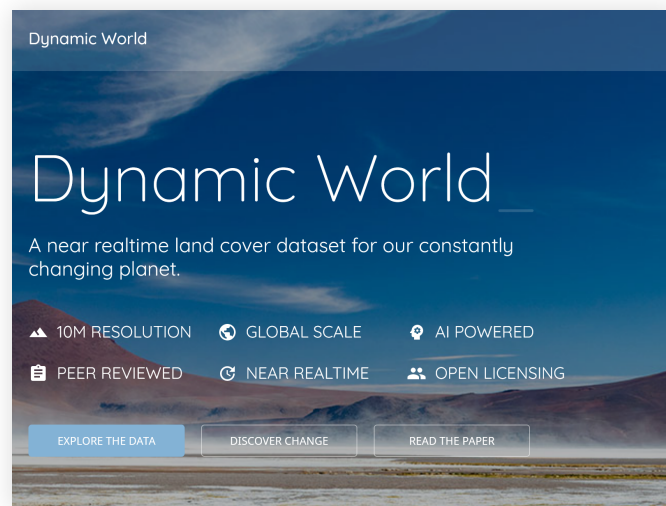
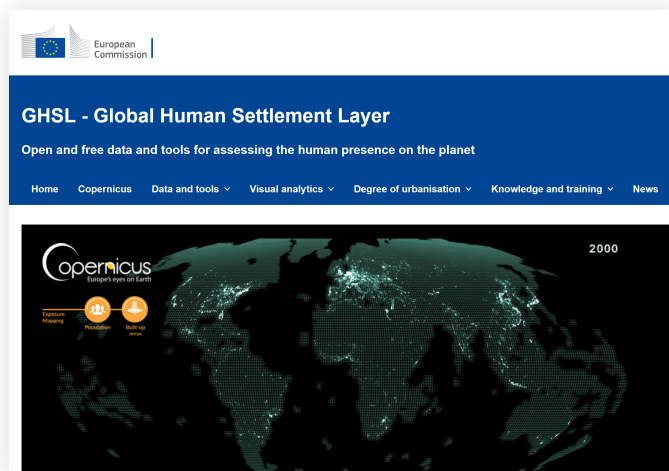
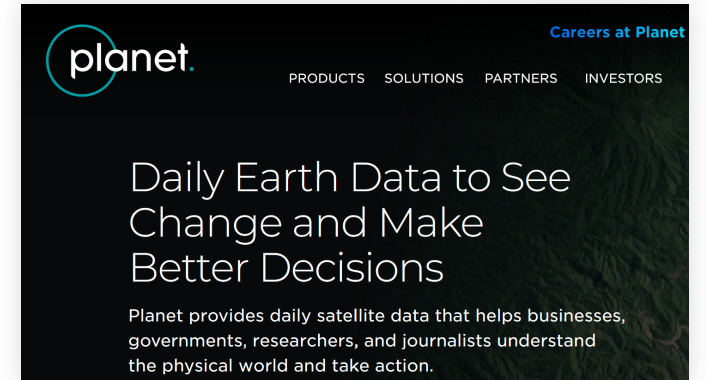
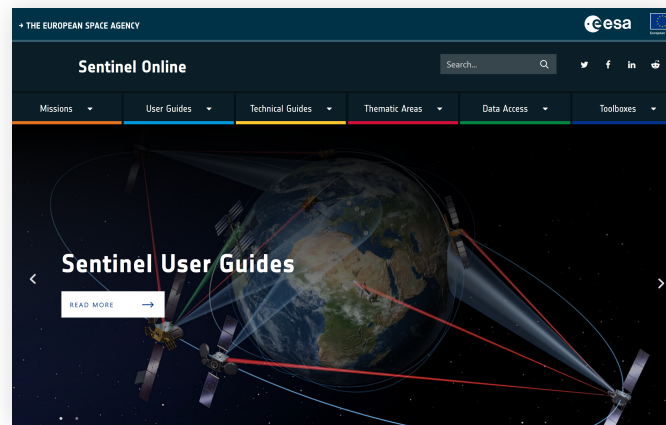
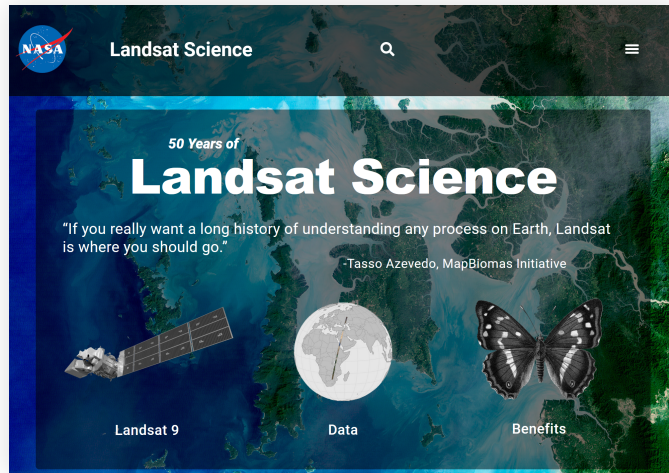
Hierarchy



Framing?

A peek into the future

+ +



Two examples on Form & Function...



Satellite Classification of GB Postcode Context

A map supporting the output of this paper:
Singleton, A., Arribas-Bel, D., Murray, J., & Fleischmann, M. (2022). Estimating generalized measures of local neighbourhood context from multispectral satellite images using a convolutional neural network. Computers, Environment and Urban Systems, 95, 101802. <https://doi.org/10.1016/j.compenvurbsys.2022.101802>

Stirling

Legend

- Postcode
- Group
- A: Inner City and Town Centres
 - B: Spacious Residential Properties
 - C: High Density Urban Core
 - D: Rural Residences
 - E: Rural Properties and Farms
 - F: Inner Suburban Townhouses and Large Terraces
 - G: Outer Suburbs

Share

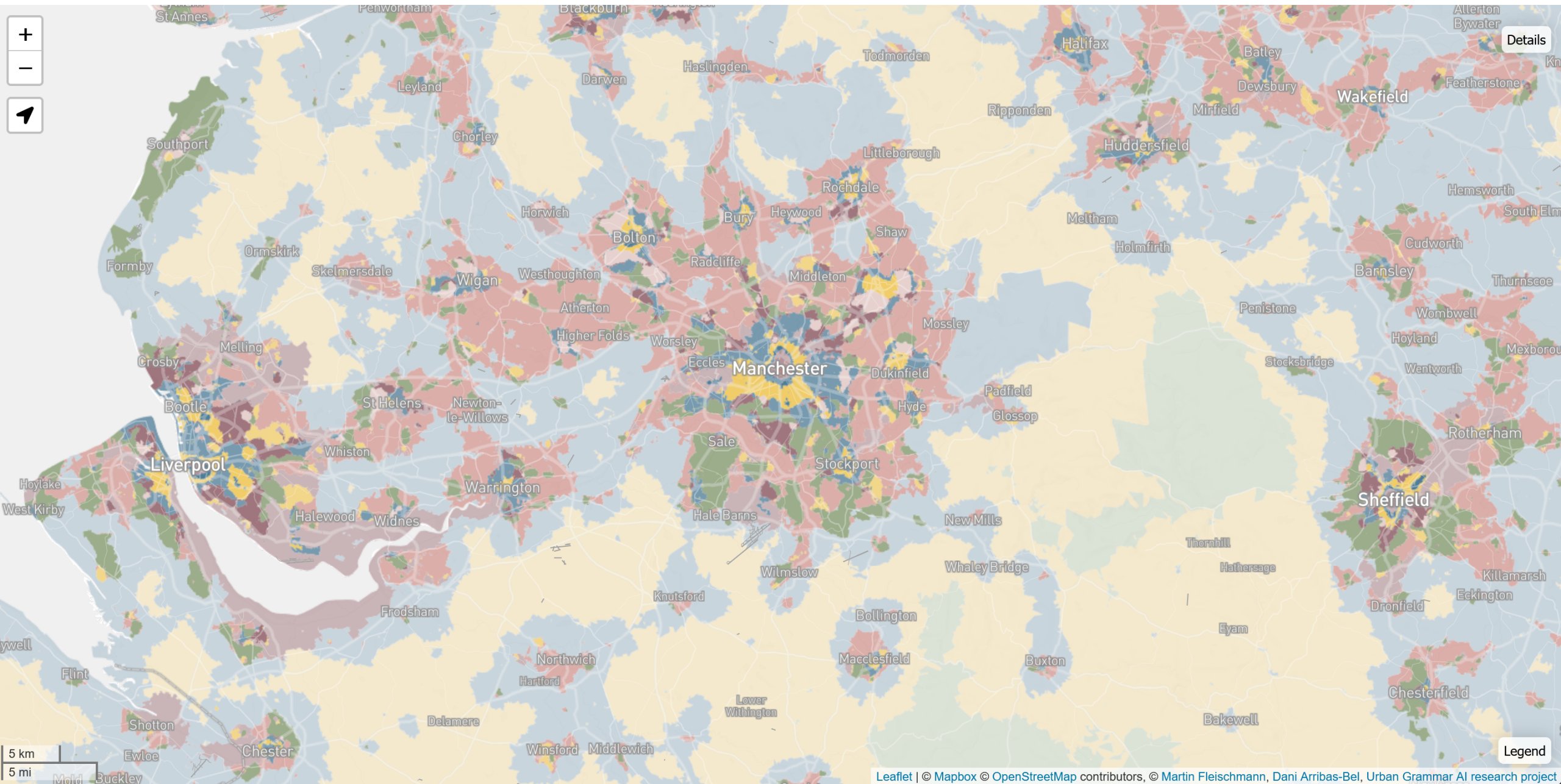
Docs

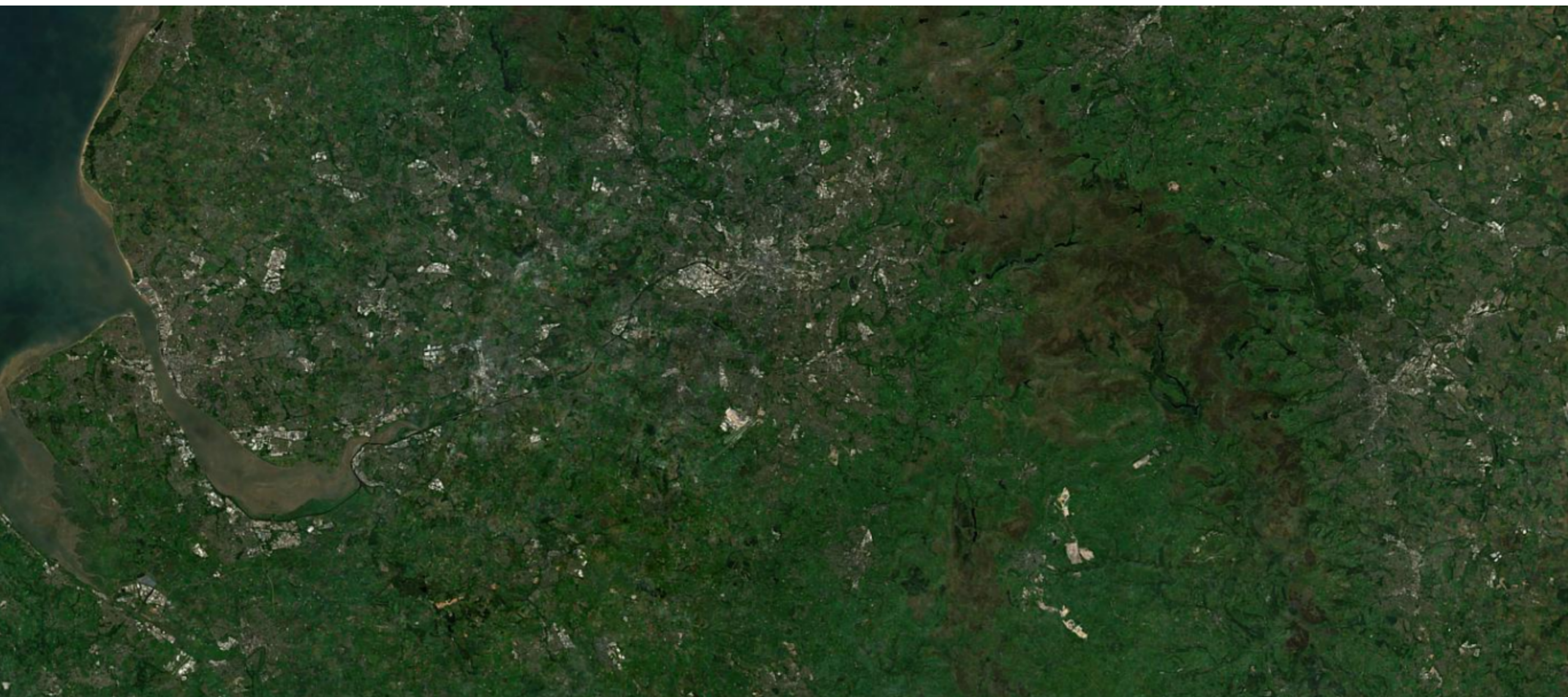
Help

LETHIRD
WOOD

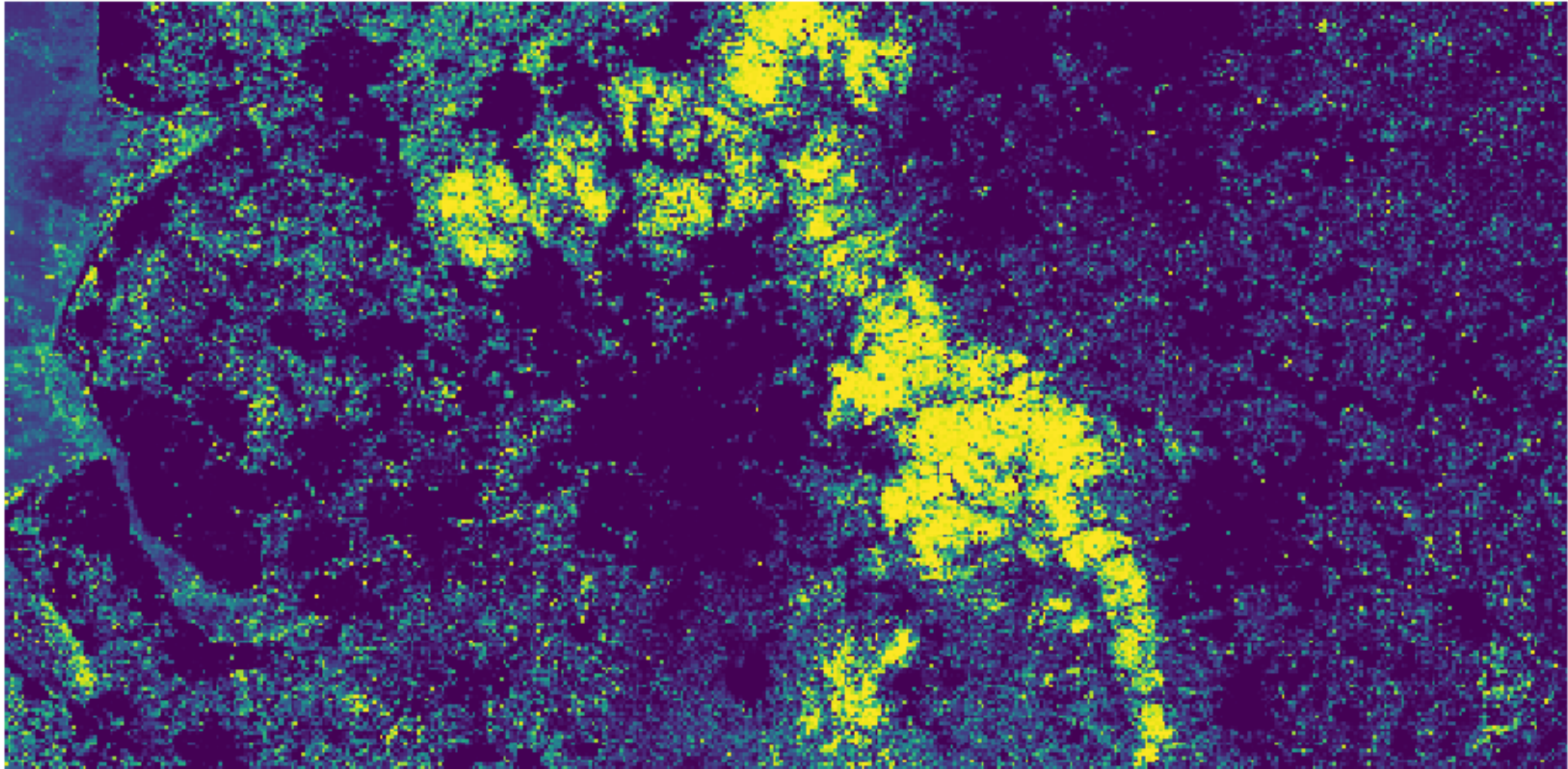
Unfolded

© Mapbox | Improve this map | Basemap by: mapbox

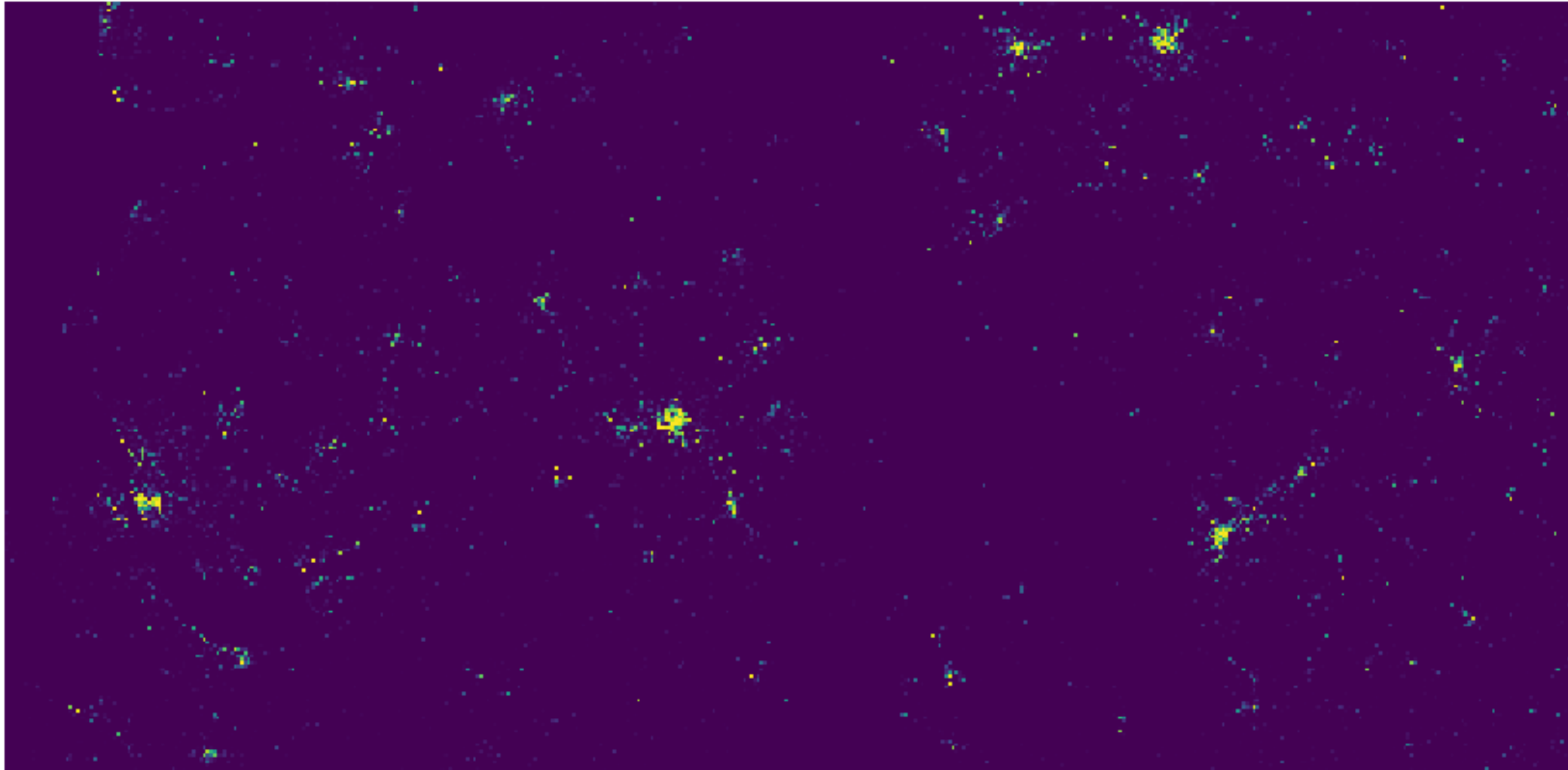




Source: Sentinel-2 cloudless



Wild countryside (320x320m)



Urbanity (320x320m)



Predicted class (320x320m)

The Future

- *Are we there yet?* Certainly not
- *Can we even get there?* Maybe
- *Worth trying?* Absolutely!

Wrap up

(Urban) form & function...

- underpin much of Regional Science
- are becoming easier to measure better
- You should use them more in your work!

Urban Grammar

*Making it easy for Regional Scientists to consider (urban)
form & function*

SEA Lecture'22

Dani Arribas-Bel

@darribas

Martin Fleischmann

@martinfleis



**The
Alan Turing
Institute**



Geographic
Data Science
Lab

