



Company / Organisation Name:	NOKIA Bell Labs
Team / Department:	Responsible AI Team, AI Research Lab
Address:	21 JJ Thomson Avenue, CB3 0FA, Cambridge UK

Provisional title for project:

Analyzing Prescription Outcomes through Spatial Signatures

Short description of the problem that would be addressed by the project:

The environment's significant influence on public health has been underscored by events such as the 2022 UK heatwaves, which caused increased mortality in vulnerable populations like the elderly and those with respiratory conditions. Geographic Data Science has introduced innovative ways to classify environmental quality. Spatial Signatures, a new conceptual approach, characterizes in a detailed, consistent and scalable way urban environments based on their function and form. However, this methodology has not yet been applied in public health research.

This study expands on our MedSat dataset (introduced at NeurIPS Datasets and Benchmarks 2023), covering 2019 and 2020 across England. MedSat integrates health data based on medical prescriptions across 33,000 small areas in England (LSOAs), covering diseases such as diabetes, hypertension, anxiety, depression, asthma, and opioid usage. It includes over 100 sociodemographic variables, primarily from the latest UK census, and over 40 environmental factors, like annual solar radiation. Our goal is to merge MedSat with Spatial Signatures to reveal new links between urban environment's function and form, as defined by the British classification released in 2022, and health outcomes. Our methods include: 1) applying regression models to forecast health outcomes in LSOAs using Urban Grammar classes, and 2) employing and evaluating various established explainability models (like SHAP) to identify which urban classes significantly relate to specific health outcomes. This project is a collaborative effort with Prof. Daniel Arribas-Bel of the University of Liverpool and the Alan Turing Institute, the creator of the Spatial Signatures, and with Dr Stephen Law from UCL Geography.

Short description of the data sources that would be used in the project, and how they would be used

MedSat: A unique public health dataset for England featuring medical prescriptions and satellite composite images.
Spatial Signatures: A British classification of (urban) form and function (<https://doi.org/10.1038/s41597-022-01640-8>).

Would any work by the student need to be carried out on site at the Company (with the exception of supervisory Meetings)?

Not necessary

Any issues of data confidentiality and IPR that would need to be resolved

No

Essential skills

Machine Learning, GIS, computer vision

Desirable skills

Explainability or Interpretability in Machine Learning

Preferred degree programmes (if any)

Urban Geography, Remote Sensing, Environmental Science, Public Health

Preferred selection method

Interview

Support and training offered by the company

The work will be advised by Sanja Šćepanović and Daniele Quercia of Nokia Bell Labs in collaboration with Prof. Arribas-Bel Daniel of University of Liverpool and Alan Turing Institute, and Dr Stephen Law from UCL Geography.

Financial assistance offered by the company

Yes

Any other comments

No

If there are any questions about the 2024 programme, please contact Richard Arnold at richard.arnold@ucl.ac.uk. The completed form should also be returned to this address.