Candidate Information

Position:	Research Fellow
School/Department:	School of Medicine, Dentistry and Biomedical Sciences
Reference:	22/110357
Closing Date:	Monday 5 December 2022
Salary:	£35,333 - £40,931 per annum
Anticipated Interview Date:	Thursday 15 December 2022
Duration:	Available until 30 September 2024

JOB PURPOSE:

This exciting position will allow the successful candidate to work on an international project exploring how a variety of environmental exposures over the life-course shape health outcomes, including Alzheimer's Disease. This project particularly focuses on air pollution, temperature, light pollution and green/blue spaces, and derivation of environmental exposure variables from vertical aerial and satellite imagery data.

To advance this agenda, we aim to expand our characterisation of the exposome by compiling additional environmental data from open-sources, vertical aerial and satellite imagery data, and to link them to survey data from eight countries, including Northern Ireland, the U.S., England, Ireland, Mexico, Chile, Dominican Republic, and India.

The post will be based in the Centre for Public Health, School of Medicine, Dentistry and Biomedical Sciences and School of Electronics, Electrical Engineering and Computer Science, and work with a team of international researchers.

MAJOR DUTIES:

1. To develop a semantic segmentation system using a visual transformer architecture to detect the presence in spatial environment data (including vertical aerial and satellite imagery data, geo-spatial data, remote sensing and soil tracer data, modelled air and noise pollution data, and other open data sources) of urban infrastructure e.g., roads, cycling networks, parks, trees and greenspace. This will build on existing work in this area using self-supervised learning.
2. Develop a method to count features within a given area and label neighborhoods based on the combination of features they contain and categorized into groups using factor analysis or k-means clustering techniques.
3. To present regular progress reports to the research team and external audiences to publicise research findings.
4. To maintain links with collaborators, project mentors and commercial partners.
5. Carry out routine administrative tasks associated with the research project to ensure that the project is completed on time and within budget. These might include organisation of project meetings and documentation, financial control, risk assessment of research activities.
6. To carry out occasional supervision of other research staff and students associated with the project.
7. Read academic papers, journals and textbooks to keep abreast of developments in own specialism and related disciplines.
8. Any other reasonable duties within the general remit of the post.

ESSENTIAL CRITERIA:

1. Have or be about to obtain a PhD in computer science, environmental epidemiology, public health, geography, urban planning or related research area.
2. 3 years relevant experience and knowledge in recent deep-learning based computer vision techniques.
3. Demonstrable proficiency in programming and experimental analyses using deep-learning / machine learning frameworks in python or other relevant programming language.
4. Experience working with vertical aerial and satellite imagery data.
5. Ability to manage own research project including working to deadlines and being accountable for deliverables.
6. Sufficient breadth and depth of specialist knowledge in the discipline and of research methods and techniques to work within established research programme.
7. Ability to communicate complex information clearly.

8. Ability to build contacts and participate in internal and external networks.
9. Demonstrable intellectual ability.
10. Ability to assess and organise resources.
11. Ability to work efficiently as a team member and be highly motivated.
12. Must be willing and able to travel.
13. Irregular hours, including weekend working, might be a component of the research at times.

DESIRABLE CRITERIA:

1. A relevant primary degree (1st or 2:1 classification) related to the duties of the post such as computer science, environmental epidemiology, public health, geography, urban planning or related research area.
2. Experience in the development of geodatabases and online GIS platforms.
3. Recent relevant experience and knowledge in Geographical Information Science (GIS) and the use of ESRI ArcGIS Pro and/or open source QGIS.
4. Recent relevant experience applying statistical analysis techniques (e.g. regression models, Bayesian approaches) to environmental exposure data.
5. Relevant experience in the integration of large spatial databases.

ADDITIONAL INFORMATION:

The number of people worldwide living with dementia and cognitive impairment is increasing, mainly due to people living longer, so we want to figure out how where we live affects dementia and brain health as we get older. Some research suggests that where we live might influence our brain health. For example, poor air quality in towns and cities, can lead to a decline in brain health. As more of us now live in towns and cities, it is important that the environment where we live is scientifically designed and improved to maximise our brain health.

The complex social and physical environments where we live make some people more vulnerable than others to developing cognitive impairment. In other words, the factors that account for who is most likely to develop cognitive ill-health due to the environment has less to do with 'how' we live and more to do with 'where' we live. We do not know how these factors interact to make urban environments a problem for brain health, nor which are the best policies and interventions for promoting healthy ageing and brain health for our poorest communities.

Our project will provide evidence for policies and practices that provide supportive urban environments to promote healthy ageing, including promoting brain health. This could include using creative urban designs to support people to adopt and maintain healthier lifestyles such as being more active. However, this needs a strong evidence base exploring how supportive urban environments can improve brain health.

Our research has the following steps:

1. By analysing data from over 8,000 older people in Northern Ireland, and linking this to information about where they live, such as the amount of air pollution and light pollution, access to green and blue spaces, and ambient temperature, we will explore how different environmental factors relate to brain health in Northern Ireland.
2. Using recent advances in artificial intelligence/machine learning, we aim to develop an approach of capturing urban environment factors from vertical aerial and satellite imagery data that can be applied to process large volumes of data without the need for large quantities of hand labelled data.
3. Working closely with our computer vision experts, to derive refined, readily-harmonisable measures of factors of the urban environment associated with Alzheimer’s Disease risk across different countries at scale using vertical aerial and high-resolution satellite imagery.