

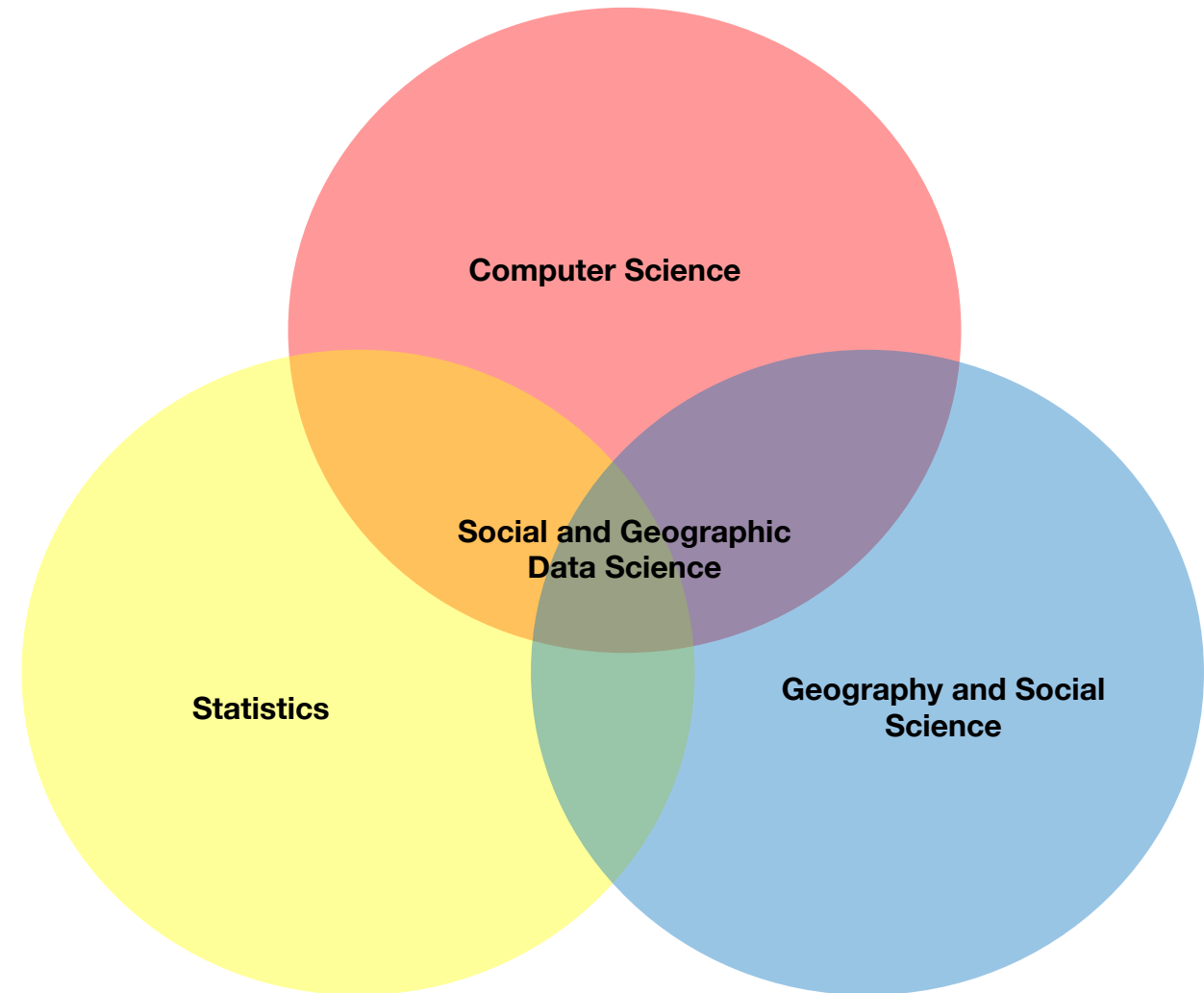
GEOG0125: Advanced Topics in Social and Geographic Data Science



Aims of Module

The following learning outcomes:

- To introduce you to advanced quantitative methodology through the following: 1.) Bayesian Statistics (7 weeks) and 2.) Machine Learning (3 weeks).
- From the Bayesian side, you will be introduced to probability theory for Bayesian inference. How to apply the various families of multivariable regression models within a Bayesian framework for carrying out risk assessments in making spatial (& non-spatial) predictions and studying the associations between social-risk factors and outcomes
- From the Machine Learning side, you will be introduced to the application of various types of computer vision and machine learning techniques for image processing and classification
- With the increase in use of AI, these Bayesian and ML techniques are highly applicable for tackling challenges.
- You will know how to carry out data analysis in software packages such as Stan with R/RStudio, and Pytorch that's interfaced with Python.



Module Content

1.) Introduction to Bayesian Inference & Stan for Multivariable Models (Dr Anwar Musah)

- Week 1: Introduction to Bayesian Statistics
- Week 2: Bayesian Generalised Linear Modelling (GLMs)
- Week 3: Bayesian Generalised Additive Modelling (GAMs)



2.) Introduction to Image Classification using Pytorch (Dr Stephen Law)

- Week 4: Introduction to Deep Learning in Python (DL)
- Week 5: Introduction to Convolutional Neural Networks in Python (CNN)
- Week 6: GeoAI



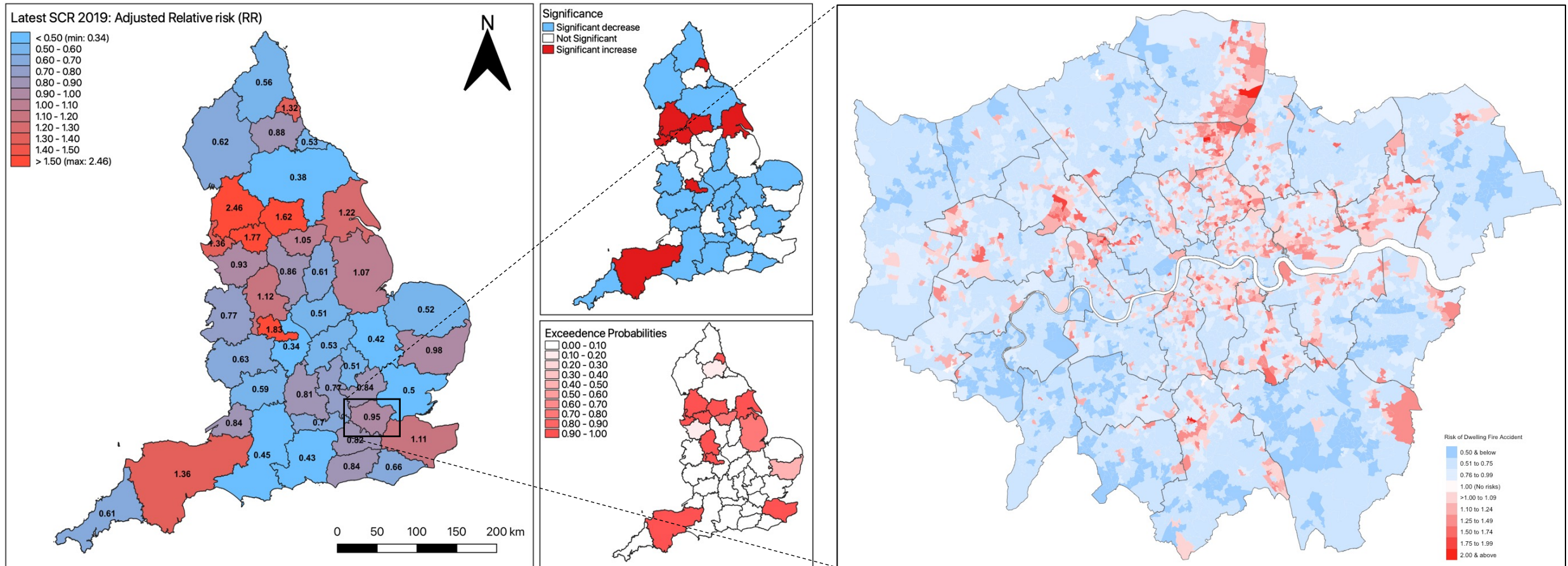
3.) Spatial Bayesian Risk Modelling (Dr Anwar Musah)

- Week 7: Hierarchical Regression Models
- Week 8: Spatial Intrinsic Conditional Autoregressive (ICARs) Models for Areal data
- Week 9: Bayesian Updating for Spatiotemporal Analysis for Areal data

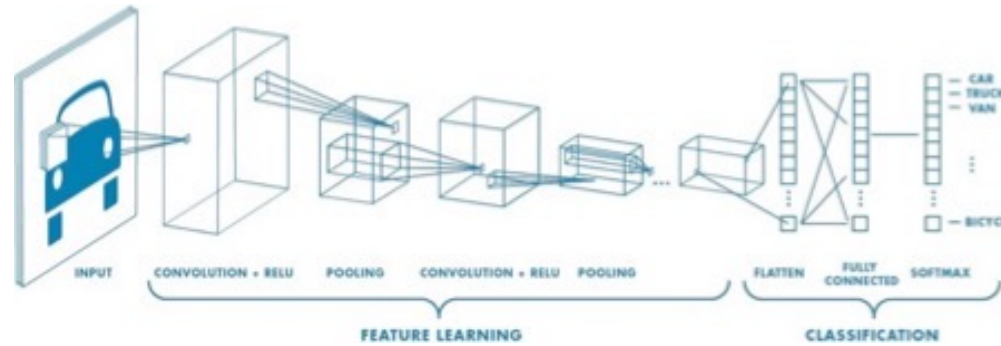
4.) Wrap-up: Research Methodology

- Week 10: Study Design and Revision

*The concepts from term 1's GEOG0114 Principles of Spatial Analysis and GEOG0115 Introduction to Social Data Science will be carried over into GEOG0125 Advanced topics in Social Geographic Data Science



Li, L., Musah, A., Thomas M.G., Kostkova, P., (2021). An ecological study exploring the geospatial associations between socioeconomic deprivation and fire-related casualties in England (2010-2019) [Applied Geography Journal (see: <https://doi.org/10.1016/j.apgeog.2022.102718>)]



Convolutional Neural Networks (CNNs)



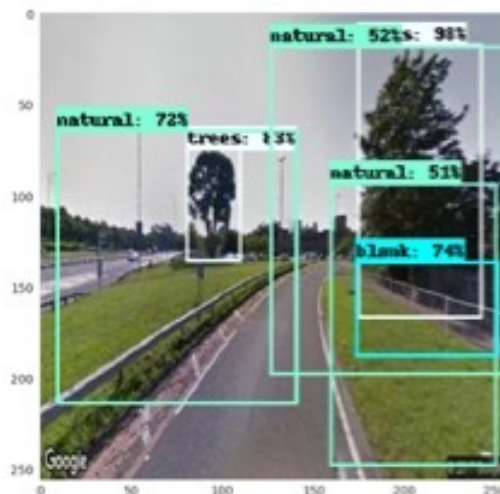
Blank Frontages



Single-Active Frontages

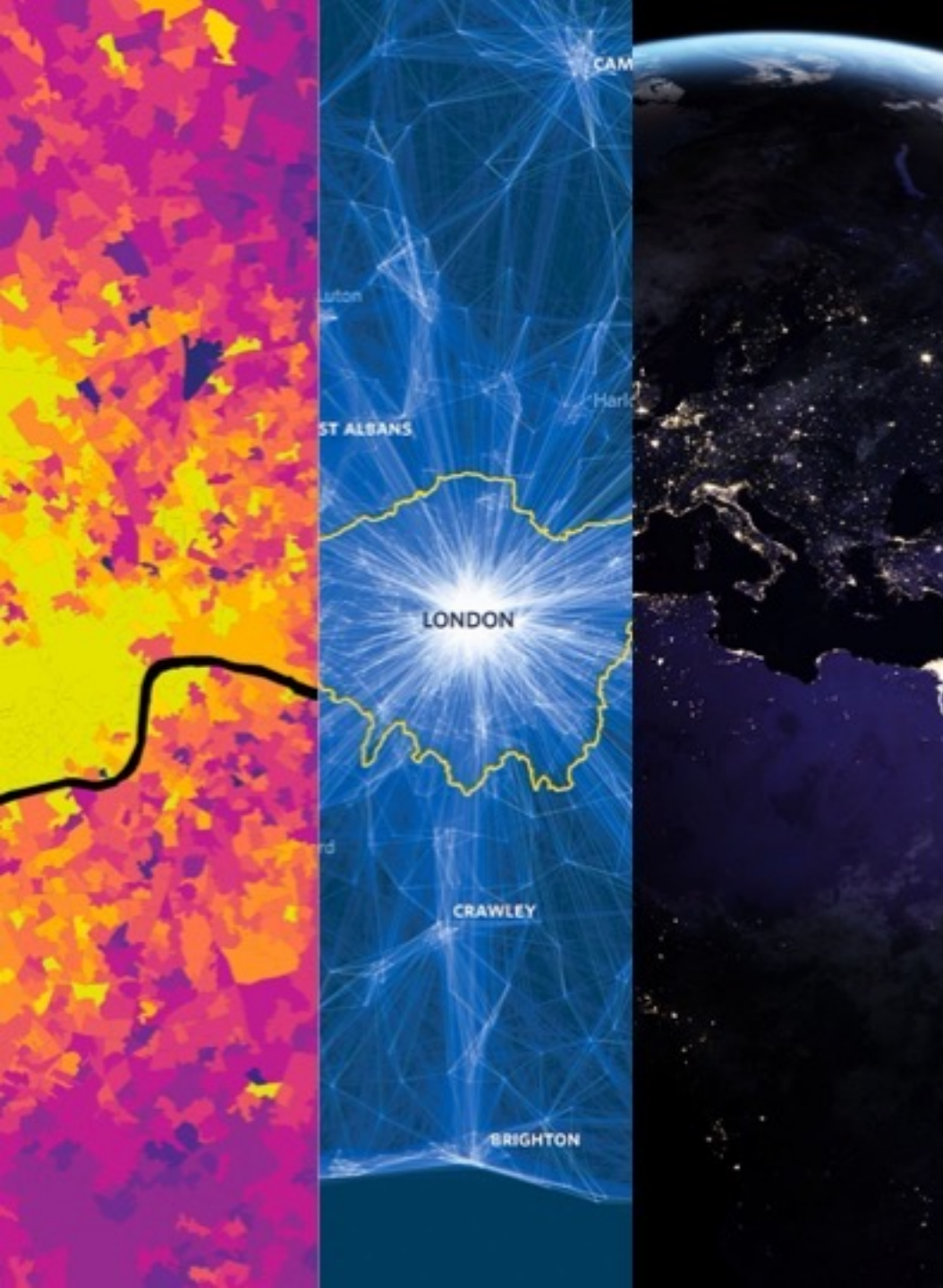


Both-Active Frontages



Non-Urban Frontages

Law, S., Shen, Y. and Seresinhe, C., (2017). An Application of Convolutional Neural Network in Street Image Classification: The Case Study of London. [ACM DL (see: <https://doi.org/10.1145/3149808.3149810>)]



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