Department of Geography

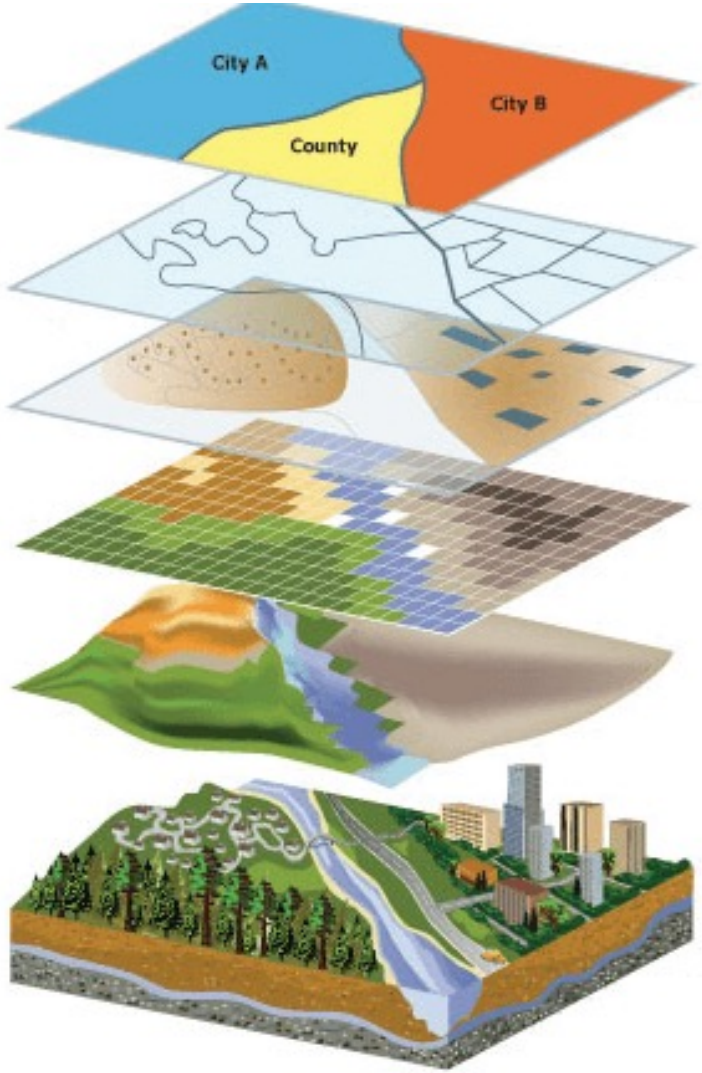
UCL

GEOG0114: The Principles of Spatial Analysis

Aims of Module

Broadly, the following learning outcomes:

- To introduce you to key principles of spatial data
- Provide an introduction and knowledge of methods for exploring various types of spatial data (i.e., point, areal, line segments and gridded/pixeled data)
- You will know how to adopt various spatial analytical techniques for testing out hypothesis, and for addressing problems related to social phenomena and its spatial components.
- You will learn to how to apply various families of spatial models (e.g., geographic weighted regressions, Global & Local Moran's I, Kriging and many more) for making spatial predictions and studying patterns of associations between risk factors and outcomes
- You will gain programming skills for carry out data managing, geoprocessing and analysis of spatial data using the software package R/RStudio. You will gain expert knowledge on how to use R/RStudio as a GIS software to perform high-level map visualization



Module Content

1.) Learning the basic key concepts of spatial data, and using R as GIS for visualization, and theory

- Week 1: Introduction to Spatial Analysis for Data Science
- Week 2: Graphical Representation
- Week 3: Spatial Dependence and Autocorrelation

2.) Foundational concepts for point and raster-based analysis

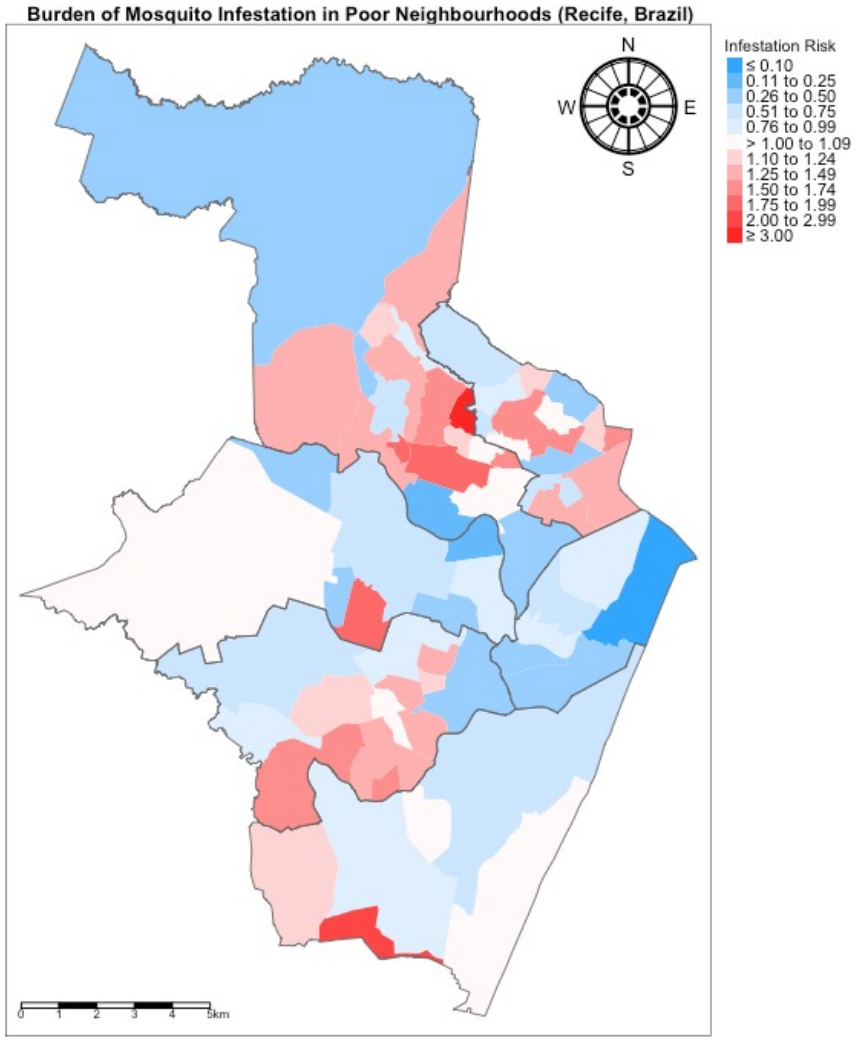
- Week 4: Analytical Hierarchy Process (AHP)
- Week 5: Ecological Niche Modelling
- Week 6: Geostatistical Analysis using Kriging

3.) Specialised spatial analytical techniques

- Week 7: Geodemographics
- Week 8: Transport Network Analysis

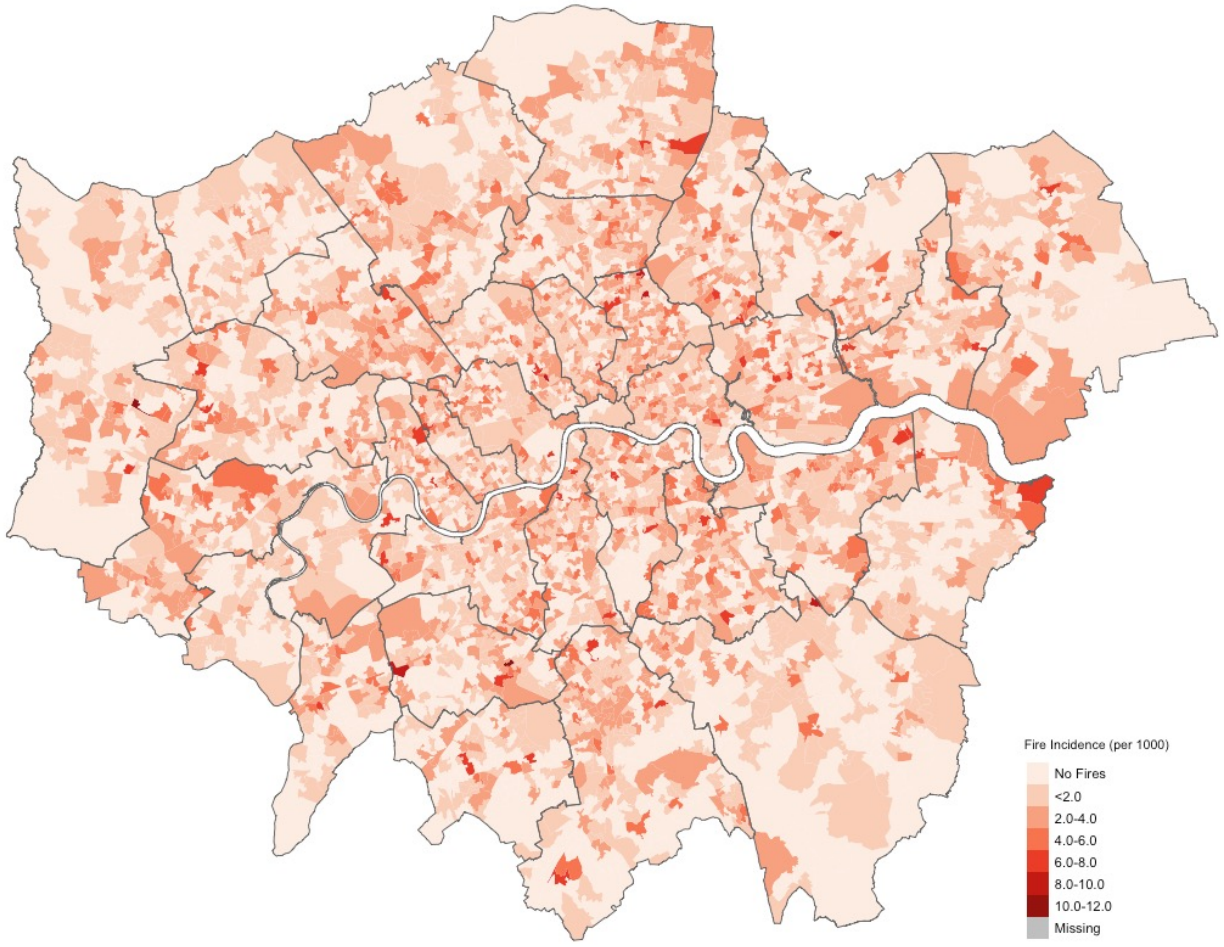
4.) Spatial modelling for inferential statistics

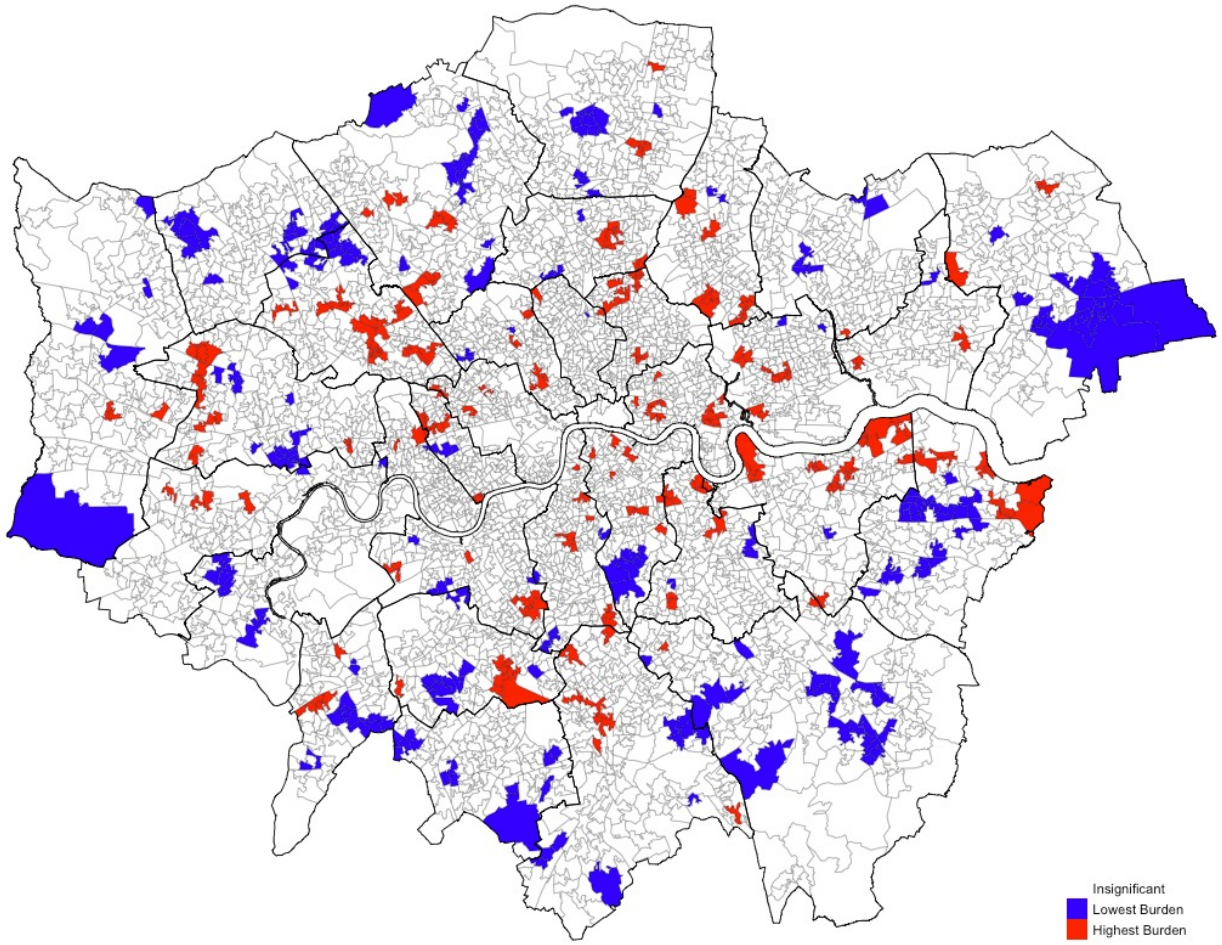
- Week 9: Spatial Lag and Error Multivariable Regression Models
- Week 10: Geographically Weighted Regression (GWRs) Models



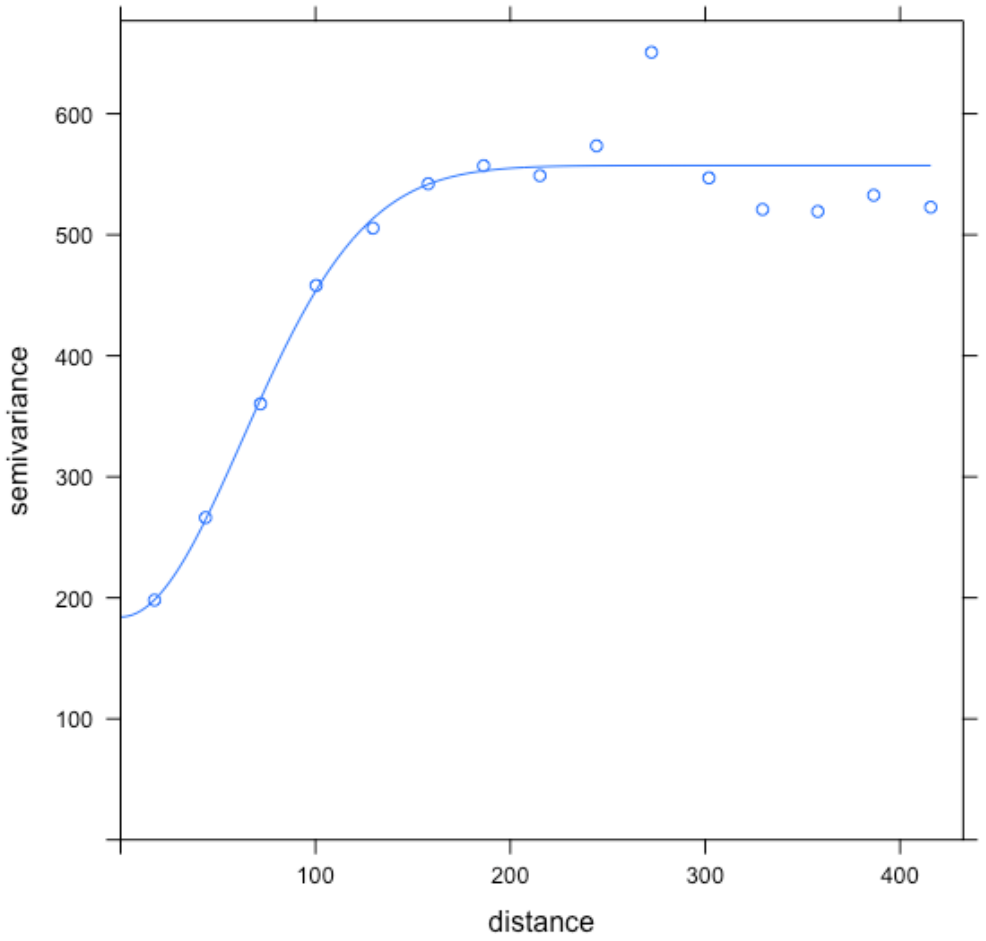

```
# comment: set directory to folder location of spatial datasets
setwd("~/Documents/Work/Afrimapr Community")

# comment: activate packages for performing GIS in R
library("sf")
library("tmap")

# comment: add neighbourhood shapefile w/mosquito infestation data using read_sf()
recife.neighbourhoods <- read_sf("Recife_neighb_epsg3857_fixed.shp")
recife.healthzone <- read_sf("Recife_regions_epsg3857_fixed.shp")

# comment: assigning labels for the risk estimate legends
RiskCategorylist <- c("\u2264 0.10", "0.11 to 0.25", "0.26 to 0.50", "0.51 to
0.75", "0.76 to 0.99",">1.00 to 1.09", "1.10 to 1.24", "1.25 to 1.49", "1.50 to
1.74", "1.75 to 1.99", "2.00 to 2.99", "\u2265 3.00")

# comment: generating the divergent color scheme from Blues to Red spectrum
RRPalette <- c("#33a6fe", "#65bafe", "#98cffe", "#cbe6fe", "#dfeffe", "#fef9f9",
"#fed5d5", "#feb1b1", "#fe8e8e", "#fe6a6a", "#fe4646", "#fe2424", "#fe0000")

# comment: map of risk of infestation
tm_shape(recife.neighbourhoods) +
  tm_fill("RelativeRiskCat",
          style = "cat",
          title = "Infestation Risk",
          palette = RRPalette,
          labels = RiskCategorylist) +
tm_shape(recife.healthzone) +
  tm_polygons(alpha = 0, border.alpha = 0.90) +
  tm_layout(frame = TRUE,
            main.title = "Mosquito Infestation in Neighbourhoods (Brazil)",
            main.title.size = 0.8,
            main.title.position = 0.02,
            main.title.fontface = 2,
            legend.outside = TRUE,
            legend.outside.position = "right",
            legend.title.size = 0.8,
            legend.text.size = 0.7) +
  tm_scale_bar(position = c("left", "bottom")) +
  tm_compass(type = "radar", show.labels = 2, position = c("right", "top"))
```

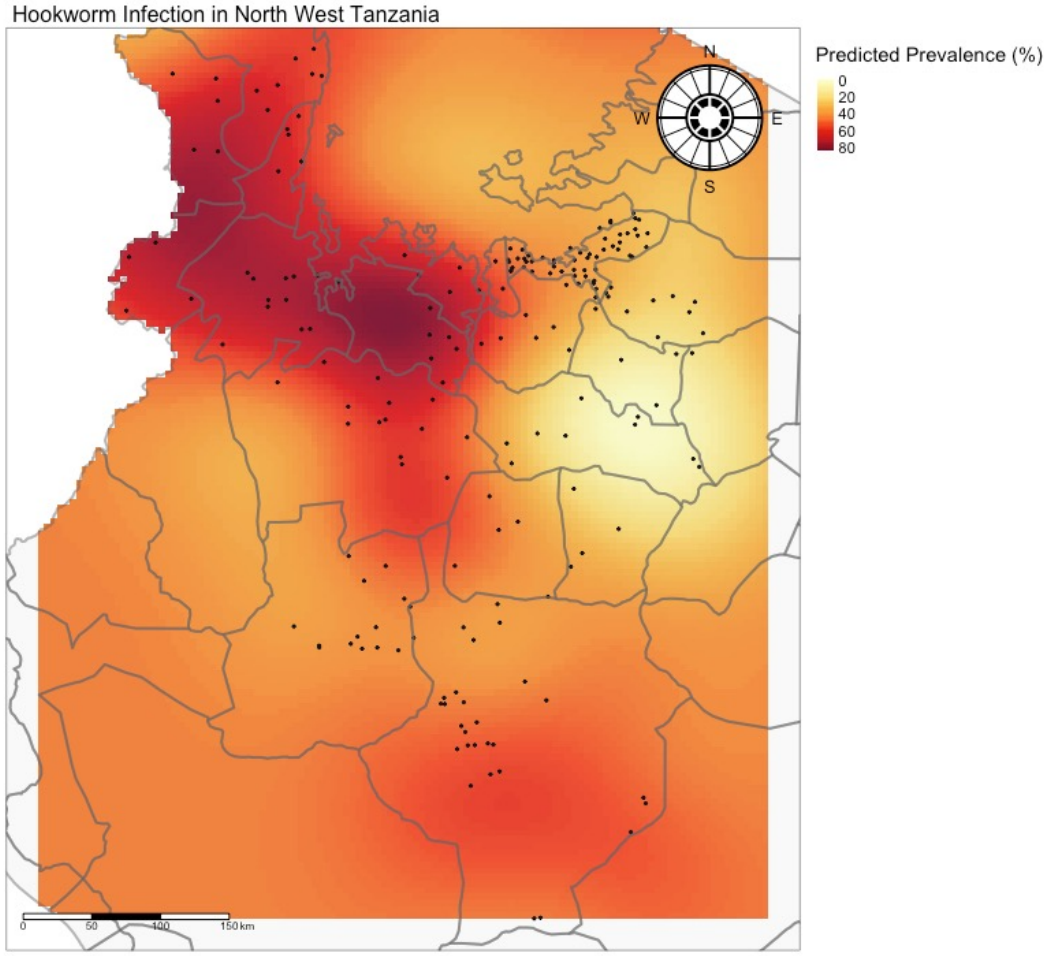
Determining the location of residential-related fire hazards across postcodes in London, and those which show the highest or lowest burden

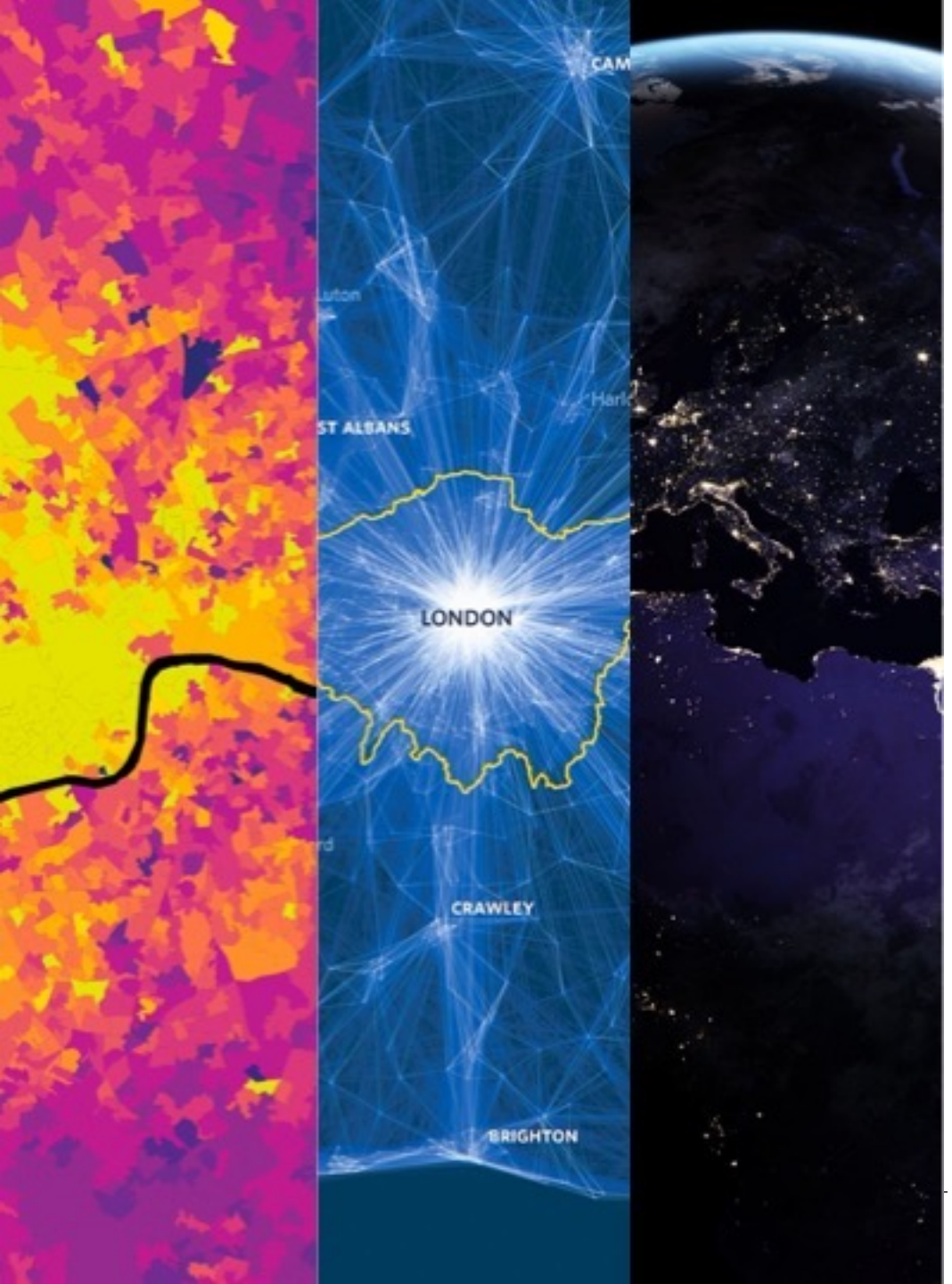




Using Kriging to spatially predict areas with intense hookworm infection associated with socioeconomic deprivation in Northwestern Tanzania







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