

MAS2908 - Computer Assessment (Solutions)

Clement Lee

Semester 2, 2025/2026

1 Introduction

In this computer assessment you will build a single **Shiny app** containing two interactive visualisations of Northern Ireland census geography data. The content assessed is:

- Downloading a shapefile from an online source and reading it into R using `read_sf()`
- Creating geospatial visualisations with polygon geometry using `geom_sf()`
- Overlaying multiple spatial layers
- Colouring the interior of geographic areas/regions using the `fill` aesthetic
- Using `selectInput` in conjunction with `filter()` from the package `dplyr` to make both visualisations react to a single user input

Total marks: 10

2 Creating the deliverable

2.1 Packages

Ensure the following packages are installed, installing any that are missing:

```
install.packages(c("shiny", "ggplot2", "dplyr", "sf"))
```

Load them at the top of your `app.R`:

```
library(shiny)
library(ggplot2)
library(dplyr)
library(sf)
```

2.2 Creating `app.R`

In RStudio, go to **File** → **New File** → **Shiny Web App**. Set the app name to `computer-assessment` and choose **Single File (app.R)**. RStudio will create a new folder called `computer-assessment/` in your working directory containing `app.R`. All your work for this assessment goes inside that `app.R`.

The two visualisations required by Questions 1 and 2 must both live in this **single app**, sharing the same input control. Place the two plots side by side using `fluidRow()` and `column()` (each `column` with `width = 6`).

3 Question 1: Geospatial map (6 marks)

Download the Northern Ireland Super Data Zone (SDZ) boundaries from NISRA at <https://www.nisra.gov.uk/publications/super-data-zone-boundaries-gis-format> (choose the ESRI Shapefile option). Extract the downloaded zip file directly into your `computer-assessment/` folder, so that the path `computer-assessment/geography-sdz2021-esri-shapefile/SDZ2021.shp` exists.

At the top of `app.R`, above the `ui` and `server` definitions, add the following line to load the data once when the app starts:

```
ni <- read_sf("geography-sdz2021-esri-shapefile/SDZ2021.shp")
```

The object `ni` is a simple feature collection with 850 rows (one per Super Data Zone) and the following columns relevant to this assessment:

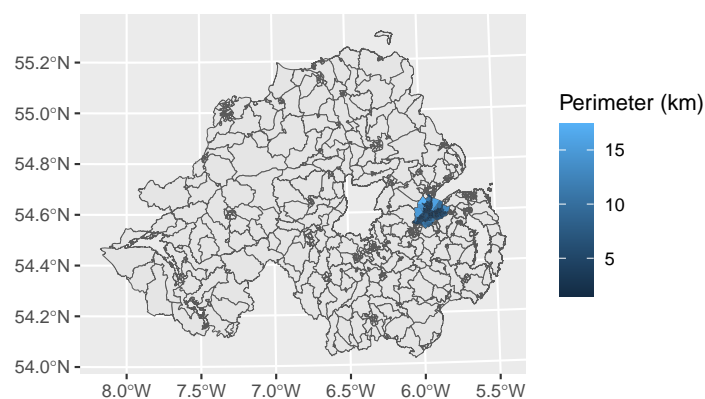
Column	Description
<code>SDZ2021_cd</code>	SDZ code
<code>SDZ2021_nm</code>	SDZ name
<code>LGD2014_nm</code>	Local Government District name (11 districts)
<code>Area_ha</code>	Area in hectares
<code>Perim_km</code>	Perimeter in kilometres

Add a `selectInput` to the UI that lets the user choose one of the 11 Local Government Districts from `LGD2014_nm`. Use the unique values of `ni$LGD2014_nm` as the choices.

In the server, create a `renderPlot()` that produces a map with **two layers**:

1. A base layer showing **all 850 Super Data Zones** in grey boundary, using `geom_sf(data = ni)`.
2. A top layer showing only the Super Data Zones belonging to the district selected by the user, with the `fill` aesthetic according to the variable `Perim_km` and the boundaries not shown, meaning that you will have `aes(fill = Perim_km)` and `colour = NA` somewhere in the code.

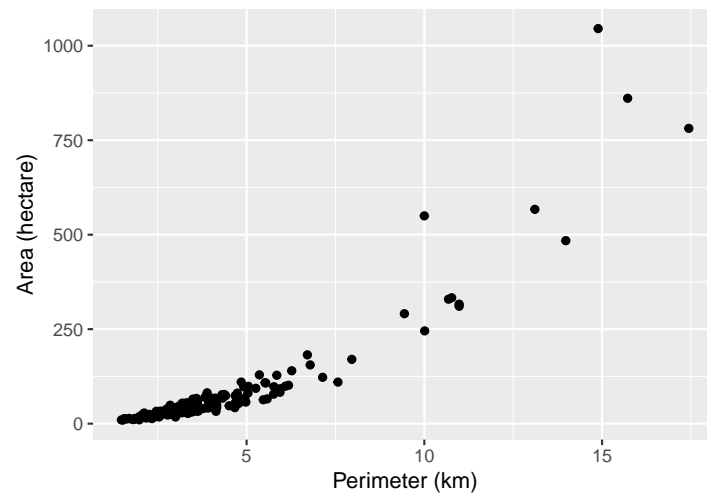
For reference, if the selected Local Government District is “Belfast”, your map should look like this:



4 Question 2: Scatterplot (4 marks)

Using the **same** `selectInput` from Question 1, add a second `renderPlot()` to the server that produces a scatterplot of `Area_ha` (y-axis) against `Perim_km` (x-axis) for the Super Data Zones belonging to the selected Local Government District only.

For reference, if the selected Local Government District is “Belfast”, your map should look like this:



5 Question 3: Labels and titles (0 marks)

Add meaningful labels and titles to both plots. Although this question carries no marks, clear labels are expected in professional data visualisation. Use `labs()` to set `x`, `y`, `fill` and `title` for each plot. The title could, for example, display the currently selected district name.