STA5001 **Additional Workshop 1** **Week 2**

1. In this workshop we use the data form the cite `https://simplemaps.com/data/au-cities` about 543 cities in Australia. Each row includes a city's latitude, longitude, state and other variables of interest.

   (a) Use the READ.TABLE function to read in R the data file au.csv from the LMS folder Data. Pay attention that the field separator character is ",".

   (b) Use the proj4string to assign the projection string with CRS("+proj=longlat +datum=WGS84").

   (c) Create the spatial R object **df** with the coordinates of the cities.

   (d) Returns the bounding box of the created object **df**.

   (e) Sort and print values of all longitudes.

   (f) Find cities with two smallest longitudes. What are their coordinates?

   (g) Produce an image with locations of all cities.

   (h) Create the SpatialPointsDataFrame object **df1** with locations of cities, names of their states and populations.

   (i) Use the created object **df1** to determine names of states from which the cities were selected. How many different states were used?

   (j) Use the created object **df1** to determine the number of selected cities in each state.

   (k) Produce summary statistics for populations of all cities.

   (l) Produce summary statistics for populations of cities in Victoria.

   (m) Set proj4string(df1) to NA.

   (n) Use the R command **spplot** to visualise populations of the cities.

   (o) Produce an image with locations of cities in Victoria.

   (p) Change the type of the variable states to factor and use the R command **spplot** to visualise states of the cities.

   (q) Split all cities in two groups: with population more and less than 10000. Add the information about these groups to the object **df1** and use the R command **spplot** to visualise the groups.