Exercise: Tidyverse

Load the movie ratings data set from `http://www.stern.nyu.edu/~wgreene/Text/Edition7/TableF4-3.csv`. Do all operations in `tidyverse` style.

1. Select the first five variables only. Change the variable `BOX` which measures the box office return in US$ to millions.
2. Create a new factor called `MPAA` from `MPRATING` with the levels 1=G, 2=PG, 3=PG13, and 4=R.
3. Compute the average `BOX`, `BUDGET`, and `BOX/BUDGET` ratio for each `MPAA` value. Which rating class recovers most of the initial investment during the first US run?
4. Join this data back to the original data frame. Find the top 6 over and under-performers as measured in deviations from the box office over budget ratio in each class.
5. Could you have done 3. and 4. directly in the tibble without using a join? If so, do it and show that it is equivalent.

Exercise: Road densities

Start a new script and open the African boundaries layer (`africa_scale.shp`). Then,

1. Open the African roads data (`africa_roads.shp`). Make a map of Africa's roads by `type` and overlay this map with the country boundaries (`plot(..., add=T, col=NA)`).
2. Add the length of each African road as a new variable in the data set. Set the units of the length vector to *km*.
3. Copy the roads data and delete the geometry column (`st_set_geometry(NULL)`). Use `dplyr` verbs to calculate the total length of the road network by country (`adm0_a3`).
4. Add the area of each country as a new variable to the Africa countries data. Set the units to km^2. What is the correlation between country area and the length of the road network?
5. Calculate the road density (length of the road network divided by country area) and plot these data on a map.

Exercise: Projections

Start a new script. Load the required packages.

1. Google the coordinates for Dar es Salaam and Moshi. Create a tibble and then a simple feature data set containing both cities in EPSG 4326.
2. Calculate the distance between these two cities using `st_distance()`. Compare this to the Euclidean distance (use `dist()` from base *R* with `st_coordinates()` and think about angles).
3. Transform the cities feature into a Mollweide projection ("`moll`") and an Azimuthal equidistant projection ("`aeqd`"). Calculate the distances using `st_distance` and using the Euclidean distance (don't mind the angles). Compare your answers to those from 2. Is this what you expected?

Always save your work (e.g. `Exercise_Projections.R`)!

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