

Maps 1

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Introduction

Getting Started

Combining ggplot and sf

Introduction

Intro

- ▶ maps are used in a variety of fields to express data in an appealing and interpretive way
- ▶ maps can add vital context by incorporating many variables into an easy to read and applicable context
- ▶ they allow the general public to gain better insight

Elements of a map

1. Basic elements:
 - ▶ polygons: closed shapes such as country borders
 - ▶ points: specific positions (city landmarks)
 - ▶ lines: linear shapes that are not filled (highways, rivers, etc)
 - ▶ text
2. Extra elements to make your map as effective as possible:
 - ▶ layout
 - ▶ formatting

Why use R for maps?

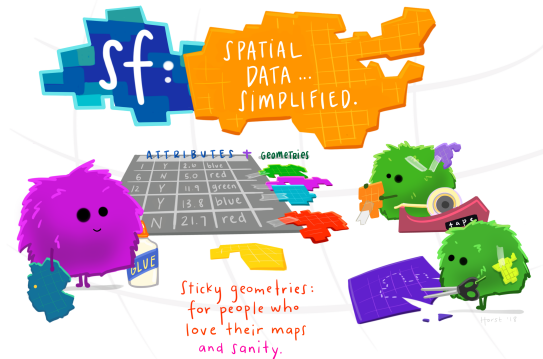
- ▶ GIS is nice but expensive
- ▶ R is free and open source
- ▶ not need to export your data to outside software
- ▶ ggplot2 !!
- ▶ sf package to deal with spatial data

Getting Started

Packages and libraries

```
#install.packages("sf")  
# install.packages("rnatu  
earth")  
# Remember ggplot2 is inside tidyverse  
library(tidyverse)  
library(sf)  
library(rnatu  
earth)  
library(rnatu  
earthdata)
```


sf package?



want more cool R illustrations click [here](#)

rnaturalearth package

- ▶ access to pre-downloaded subset of Natural Earth vector data (world mapping)
- ▶ easy to subset by region or country
- ▶ data in `sf` format

Load your first map

```
world <- ne_countries(scale = "medium",  
                      returnclass = "sf")  
class(world)
```

```
## [1] "sf"          "data.frame"  
typeof(world)
```

```
## [1] "list"
```

What does this world object contains?

```
colnames(world)
```

```
## [1] "scalerank" "featurecla" "labelrank" "sovereignty" "sov_a3"
## [6] "adm0_dif" "level" "type" "admin" "adm0_a3"
## [11] "geou_dif" "geounit" "gu_a3" "su_dif" "subunit"
## [16] "su_a3" "brk_diff" "name" "name_long" "brk_a3"
## [21] "brk_name" "brk_group" "abbrev" "postal" "formal_en"
## [26] "formal_fr" "note_adm0" "note_brk" "name_sort" "name_alt"
## [31] "mapcolor7" "mapcolor8" "mapcolor9" "mapcolor13" "pop_est"
## [36] "gdp_md_est" "pop_year" "lastcensus" "gdp_year" "economy"
## [41] "income_grp" "wikipedia" "fips_10" "iso_a2" "iso_a3"
## [46] "iso_n3" "un_a3" "wb_a2" "wb_a3" "woe_id"
## [51] "adm0_a3_is" "adm0_a3_us" "adm0_a3_un" "adm0_a3_wb" "continent"
## [56] "region_un" "subregion" "region_wb" "name_len" "long_len"
## [61] "abbrev_len" "tiny" "homepart" "geometry"
```

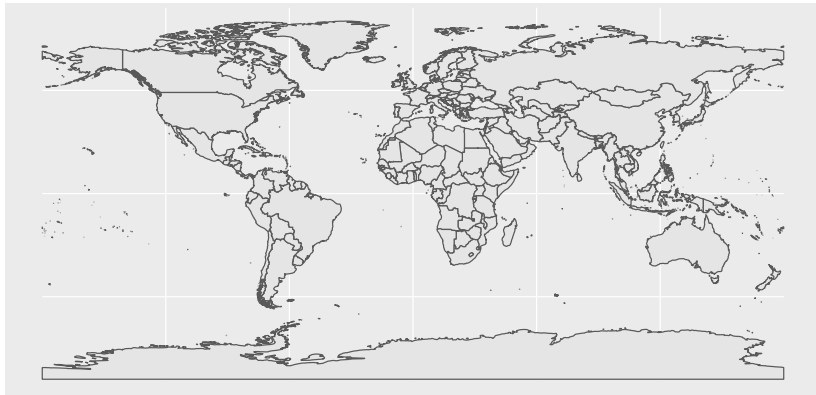
```
head(world)
```

```
## Simple feature collection with 6 features and 63 fields
## Geometry type: MULTIPOLYGON
## Dimension: XY
## Bounding box: xmin: -70.06611 ymin: -18.01973 xmax: 74.89131 ymax: 60.40581
## CRS: +proj=longlat +datum=WGS84 +no_defs +ellps=WGS84 +towgs84=0,0,0
## scalerank featurecla labelrank sovereignty sov_a3 adm0_dif level
## 0 3 Admin-0 country 5 Netherlands NL1 1 2
## 1 1 Admin-0 country 3 Afghanistan AFG 0 2
## 2 1 Admin-0 country 3 Angola AGO 0 2
## 3 1 Admin-0 country 6 United Kingdom GB1 1 2
## 4 1 Admin-0 country 6 Albania ALB 0 2
## 5 3 Admin-0 country 6 Finland FI1 1 2
## type admin adm0_a3 geou_dif geounit gu_a3 su_dif
## 0 Country Aruba ABW 0 Aruba ABW 0
## 1 Sovereign country Afghanistan AFG 0 Afghanistan AFG 0
## 2 Sovereign country Angola AGO 0 Angola AGO 0
## 3 Dependency Anguilla AIA 0 Anguilla AIA 0
## 4 Sovereign country Albania ALB 0 Albania ALB 0
```

Combining ggplot and sf

Base map

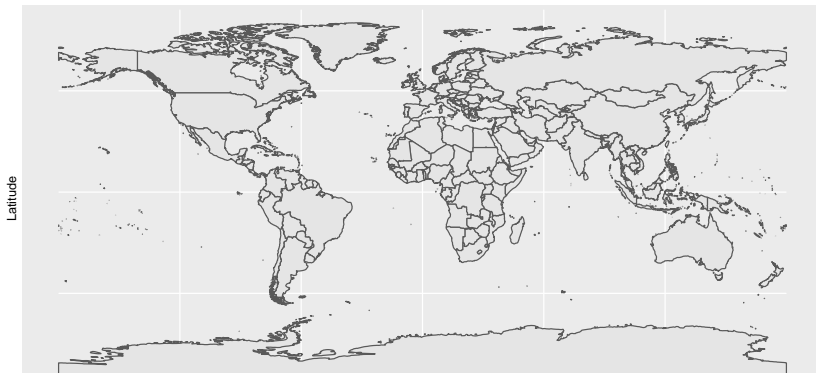
```
ggplot(data = world) +  
  geom_sf()
```



Add labels: same as before because of ggplot2

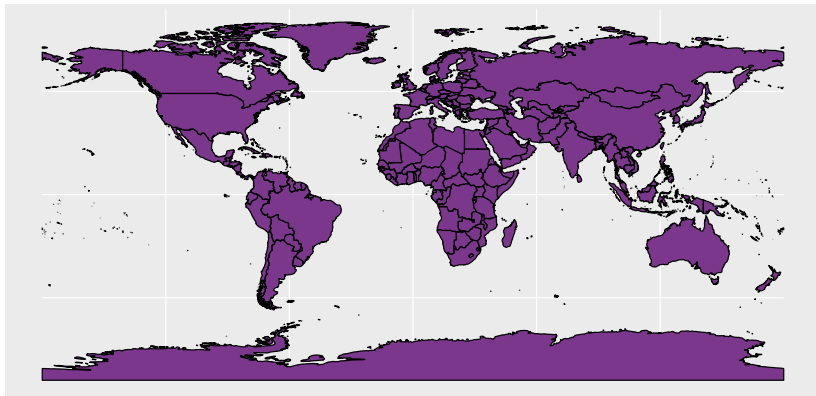
```
ggplot(data = world) +  
  geom_sf() +  
  labs(x = "Longitude",  
        y = "Latitude",  
        title = "World Map",  
        subtitle = "241 countries")
```

World Map
241 countries



Change map color

```
ggplot(data = world) +  
  geom_sf(color = "black", fill = "mediumorchid4")
```



Add population to the map: color gradients

```
ggplot(data = world) +  
  geom_sf(aes(fill = pop_est), color = NA) +  
  scale_fill_viridis_c(trans = "sqrt", )
```

