ECON-320-Lab-3

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Introduction

- Data visualization and presentation is a key tool for economists and data scientists.
- With R and ggplot, we can visualize for instance cross-sectional, time series, panel, spatial data.
- Can read the "The Grammar of Graphics: Wilkinson, 1999", "Cartographies of Time: A History of the Timeline" by Daniel Rosenberg, Anthony Grafton, 2012".

Common R Packages

Below, I have some common libraries loaded in R.

```
library(WDI)

library(tidyverse)

library(dslabs)

library(gapminder)

library(dplyr)

library(ggplot2)
```

World Bank Data:

- How to import data from World Bank repository?

```
#setwd("C:/users/sonan/Documents/ECON-320-Fall-2025-GE")

# Define countries and indicators

countries <- c("US", "CN")  # USA and China

indicators <- c(
  GDP = "NY.GDP.MKTP.CD",              # GDP in current US$
  NetExports = "NE.EXP.GNFS.CD",       # Net exports
  GDPGrowth = "NY.GDP.MKTP.KD.ZG", # GDP annual growth
  GDPPerCapita = "NY.GDP.PCAP.CD", # GDP per capita
  GDPPerCapitaPPP = "NY.GDP.PCAP.PP.KD"  # GDP/capita-PPP-2
)

#data <- WDI(country = countries,
#indicator = indicators, start = 1970, end = 2023)
```

World Bank Data:

- Renaming variables and deleting variables:

```
# data <- data %>%
#  select(-iso3c, -iso2c)

# data <- data %>%
#  rename(
  #  GDP_USD = GDP,
  #  NetExports_USD = NetExports,
  #  GDP_Growth_Percent = GDPGrowth
 # ) %>%
 # mutate(NetExports_GDP_Ratio =
# (NetExports_USD/GDP_USD)*100)
#  arrange(country, year)


# write.csv(data, "US-China.csv", row.names = FALSE)
```

Plot with Simulated Data

```
species <- rep(x = c("turtle", "turkey", "tiger", "tuna"),

condition <- rep(x = c("thriving", "threatened", "extinct")

value <- abs(rnorm(n= 12, mean =0, sd=1))

data = data.frame(species, condition, value)
```

Plot with Simulated Data

```
ggplot(data, aes(x = species, y = value,
                 fill = condition)) +
geom_bar(stat = "identity", position = "dodge") +
theme_minimal()
```

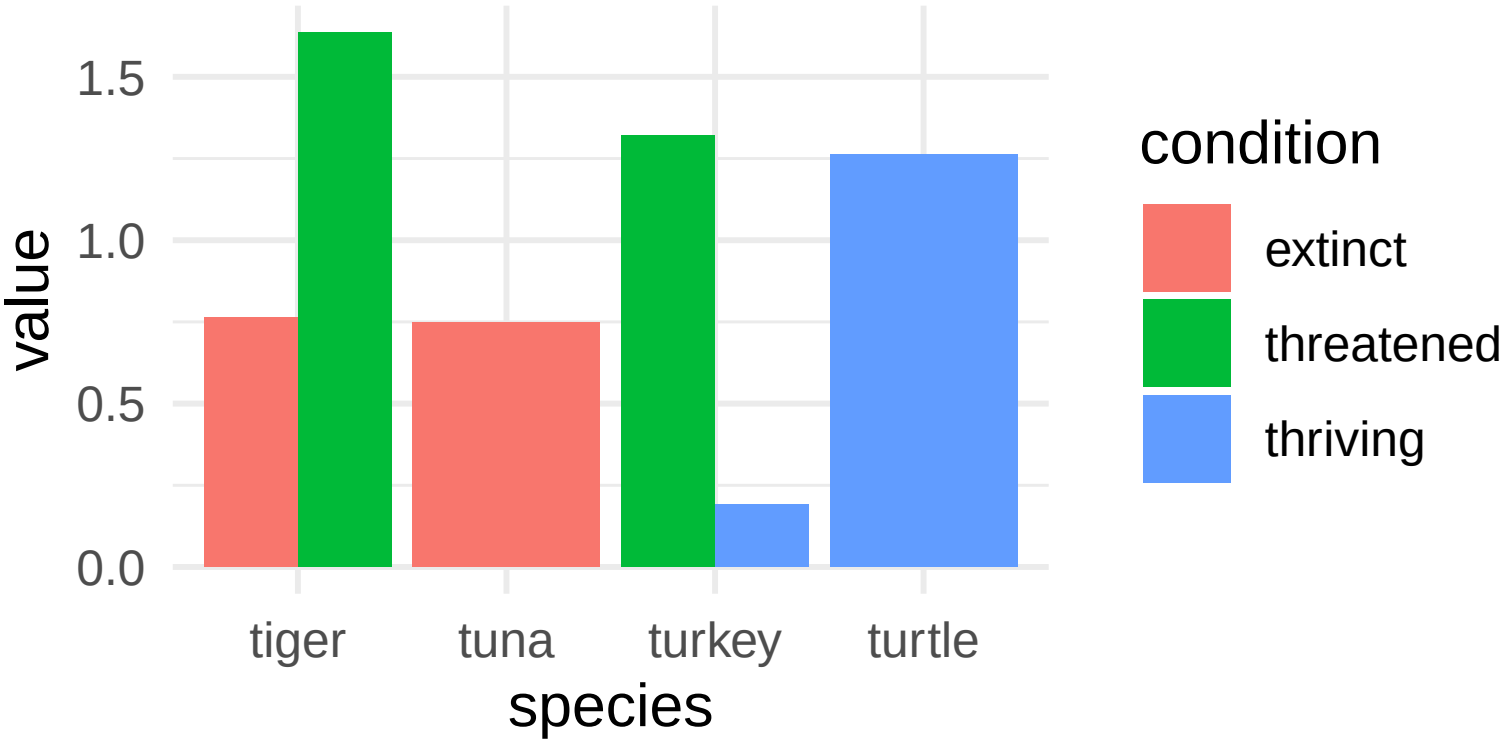
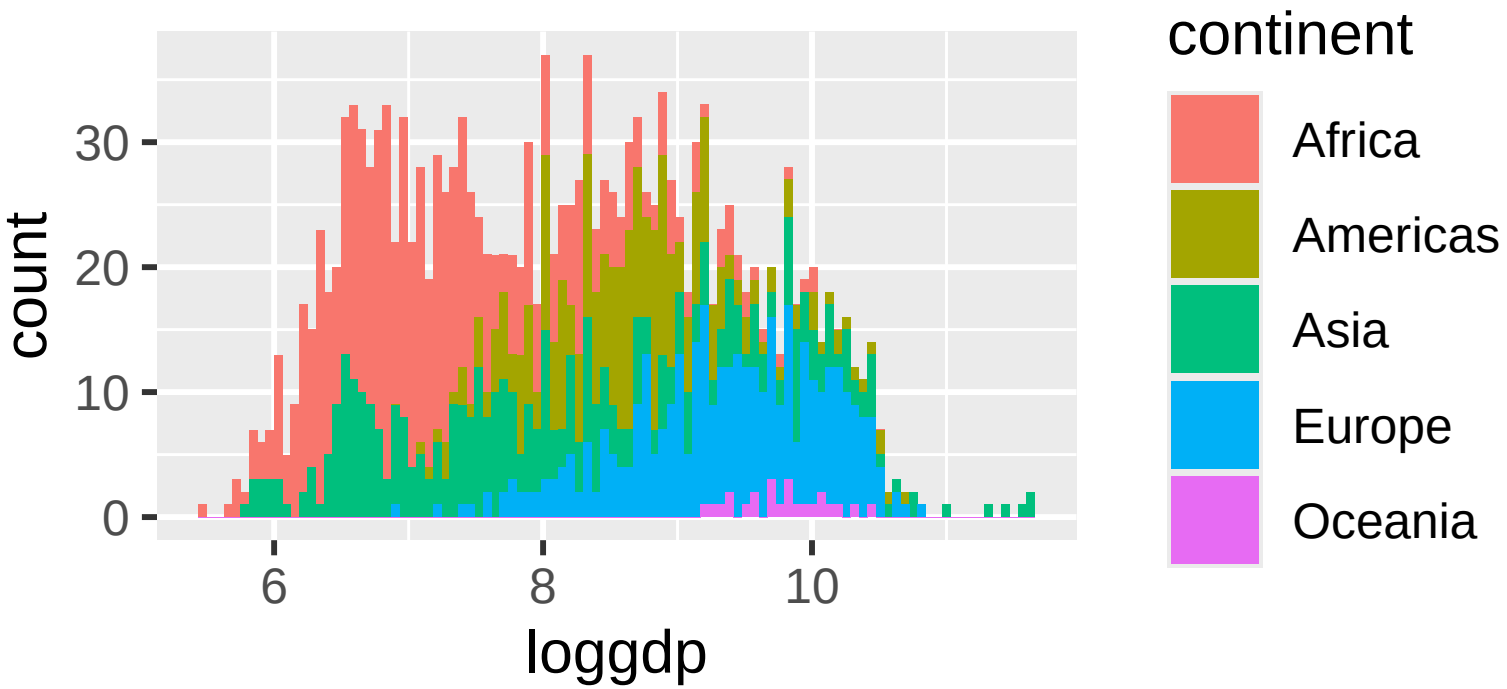


Figure 1: Barchart

Data Visualisation: Histogram

```
gapminder <- gapminder %>%
  mutate(loggdp = log(gdpPercap))

ggplot(data = gapminder, aes(x = loggdp,
                             fill = continent)) +
geom_histogram(bins = 100)
```



Data Visualisation: Scatterplot

```r
data <- read.csv("US-China.csv")

# Rename:
data <- data %>% rename(GDP_Growth = GDP_Growth_Percent)


data$Period <- with(data, ifelse(year <= 1990,
                                 "1970-1990",
                                 ifelse(year <= 2010, "1990-2010",

data$log_gdp <- log(data$GDPPerCapita)

data$nx_gdp <- data$NetExports_GDP_Ratio
```

Data Visualisation: Scatterplot

```
x <- ggplot() +
  geom_point(data = data, aes(x = nx_gdp, y = log_gdp,
    color = country), alpha = 0.7) +
  geom_smooth(data = data, aes(x = nx_gdp,
      y = log_gdp, color = country),
    method = "lm", se = FALSE, linewidth = 1.2) +
  labs(
    title = "Net Exports and GDP",
    x = "Net Exports / GDP Ratio",
    y = "GDP Per Capita",
    color = "Country"
  ) +
  theme_minimal() +
  theme(plot.title = element_text(hjust = 0.5))
```

Data Visualisation: Scatterplot

```
x
```

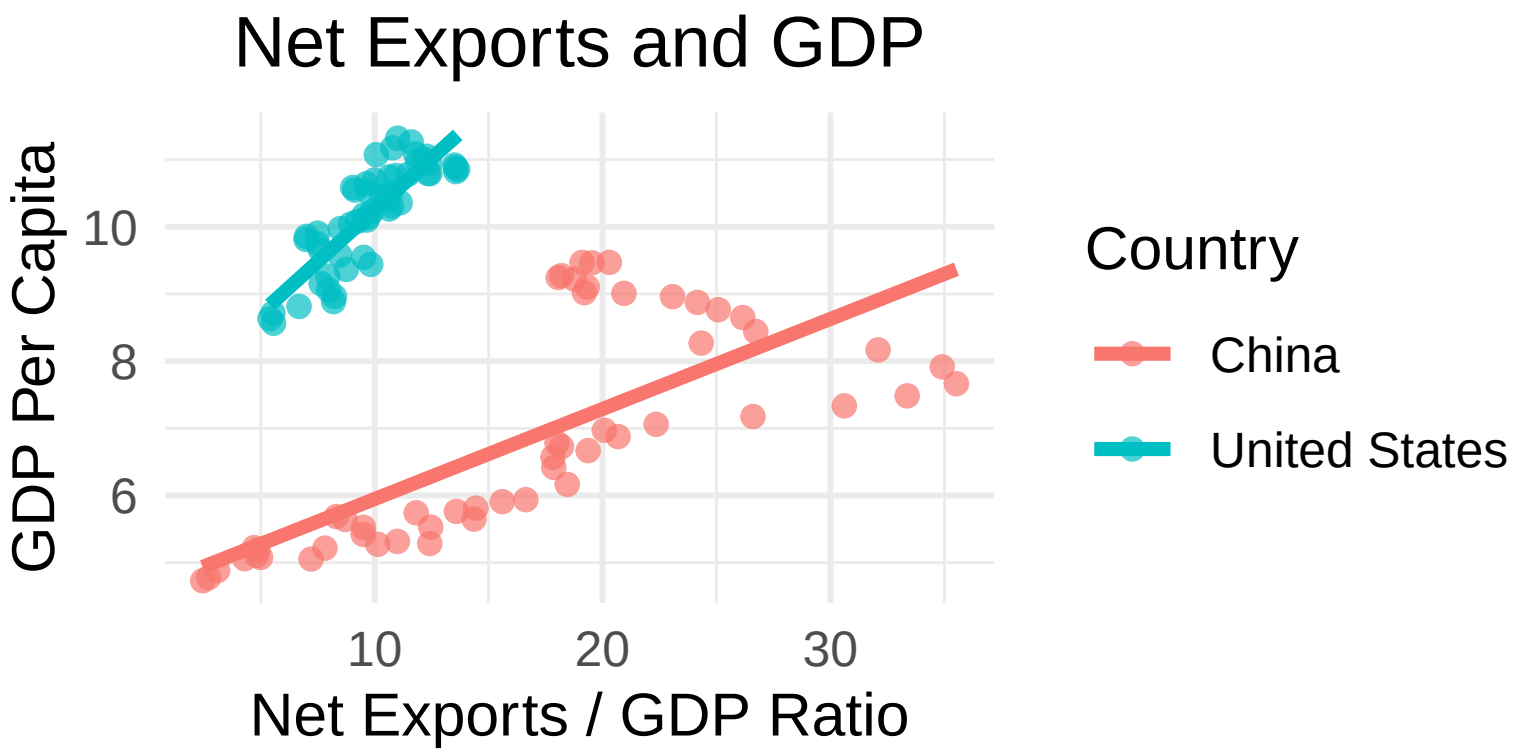


Figure 3: Scatterplots

Data Visualisation: Facet Wrap

```r
china_data <- subset(data, country == "China")
usa_data <- subset(data, country == "United States")

facet <- ggplot(china_data, aes(x = nx_gdp, y = log_gdp))+
  geom_point(alpha = 0.7, color = "blue") +
  geom_smooth(data = china_data, aes(x = nx_gdp,
           y = log_gdp),
  method = "lm", color = "green", se = FALSE,
  linetype = "dashed") +
  facet_wrap(~ Period) +
  labs(
    title = "Net-Exports & GDP per Capita: China",
    x = "Net Exports/GDP Ratio",
    y = "GDP Per Capita"
  ) +
  theme_minimal() +
  theme(plot.title = element_text(hjust = 0.5))
```

Data Visualisation: Facet Wrap

```
facet
```

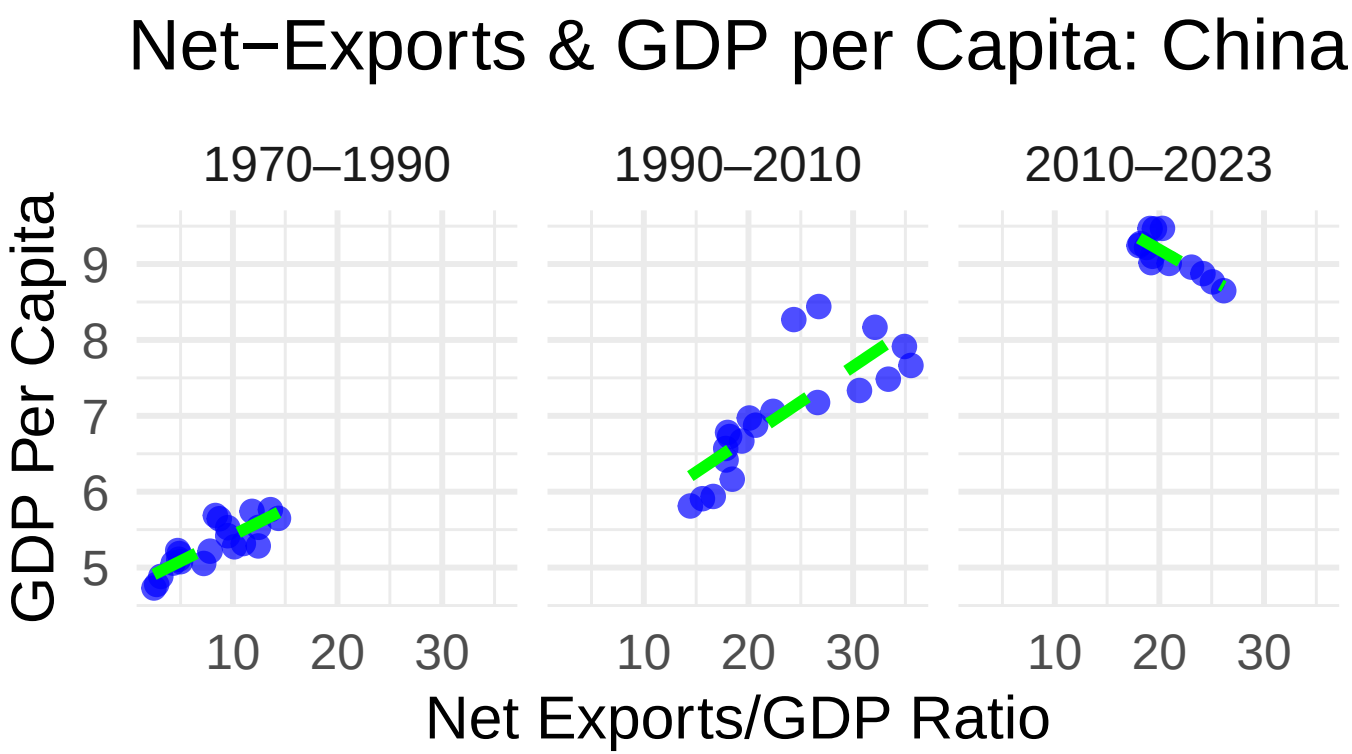


Figure 4: Scatterplots

Data Visualization: Density Plot

```
density <- ggplot(data, aes(x = GDP_Growth, fill = country)
  geom_density(alpha = 0.4) +
  scale_x_continuous(breaks = seq(-1, 20, by = 3)) +
  labs(
    title = "Densities of Growth: China vs USA",
    x = "GDP Growth Rate (%)",
    y = "Density"
  ) +
  theme_minimal()
```

Data Visualization: Density Plot

```
density
```

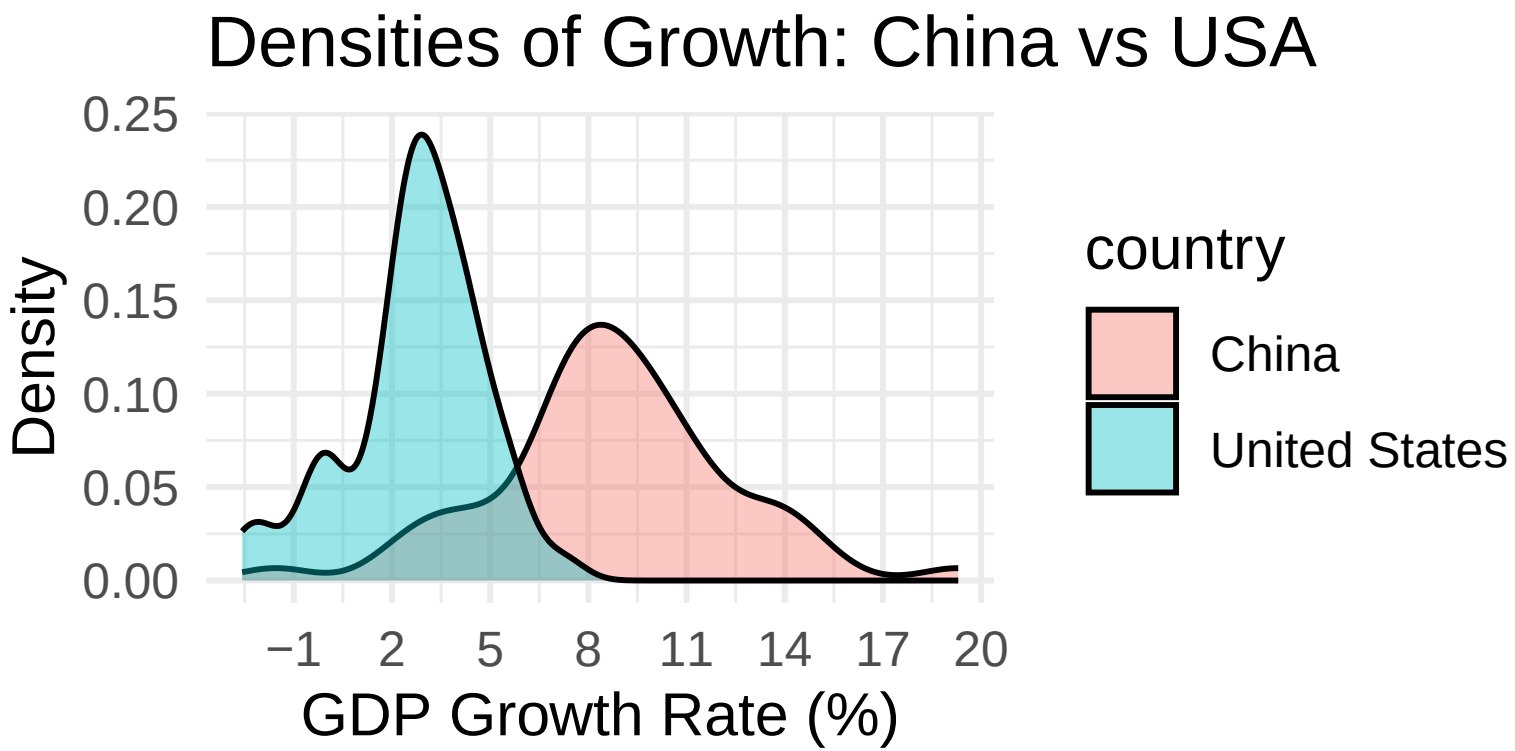


Figure 5: Density Plot

Conclusion:

- This is merely the tip of an iceberg; there is a lot more that can be done using R in the domain of data visualization.
- Don't shy away from using chatgpt and stackoverflow for debugging your code but try to write your code yourself to develop ability to code independently.

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