Final Project DS5110

Import Data

```r
setwd("D:\\Northeastern\\Spring 2024\\DS5110\\Project\\")

# UCI data
cleveland <- read.csv("uci\\processed.cleveland.data")
hungarian <- read.csv("uci\\processed.hungarian.data")
va <- read.csv("uci\\processed.va.data")
switzerland <- read.csv("uci\\processed.switzerland.data")
```

Clean Data

```r
# tidy data
dataLists <- list(cleveland, hungarian, va, switzerland)
columnNames <- c("age", "sex", "cp", "trestbps", "chol", "fbs", "restecg",
                 "thalach", "exang", "oldpeak", "slope", "ca", "thal",
                 "have_heart_disease")

# Rename function
renameColumns <- function(df) {
  names(df) <- columnNames
  return(df)
}

cleveland <- renameColumns(cleveland)
hungarian <- renameColumns(hungarian)
va <- renameColumns(va)
switzerland <- renameColumns(switzerland)

# merge all  dataframe into 1
uci <- rbind(cleveland, hungarian, va, switzerland)

uci <- data.frame(uci)

# get unique values
uniqueValues <- sapply(uci, unique)

uniqueValues
```

```
## $age
##  [1] 67 37 41 56 62 57 63 53 44 52 48 54 49 64 58 60 50 66 43 40 69 59 42 55 61
## [26] 65 71 51 46 45 39 68 47 34 35 29 70 77 38 74 76 30 31 32 33 36 72 75 73
##
## $sex
## [1] 1 0
##
```

```
## $cp
## [1] 4 3 2 1
##
## $trestbps
##  [1] "160" "120" "130" "140" "172" "150" "110" "132" "117" "135" "112" "105"
## [13] "124" "125" "142" "128" "145" "170" "155" "104" "180" "138" "108" "134"
## [25] "122" "115" "118" "100" "200" "94"  "165" "102" "152" "101" "126" "174"
## [37] "148" "178" "158" "192" "129" "144" "123" "136" "146" "106" "156" "154"
## [49] "114" "164" "98"  "190" "?"   "113" "92"  "116" "0"   "96"  "127" "95"
## [61] "80"  "185"
##
## $chol
##   [1] "286" "229" "250" "204" "236" "268" "354" "254" "203" "192" "294" "256"
##  [13] "263" "199" "168" "239" "275" "266" "211" "283" "284" "224" "206" "219"
##  [25] "340" "226" "247" "167" "230" "335" "234" "233" "177" "276" "353" "243"
##  [37] "225" "302" "212" "330" "175" "417" "197" "198" "290" "253" "172" "273"
##  [49] "213" "305" "216" "304" "188" "282" "185" "232" "326" "231" "269" "267"
##  [61] "248" "360" "258" "308" "245" "270" "208" "264" "321" "274" "325" "235"
##  [73] "257" "164" "141" "252" "255" "201" "222" "260" "182" "303" "265" "309"
##  [85] "307" "249" "186" "341" "183" "407" "217" "288" "220" "209" "227" "261"
##  [97] "174" "281" "221" "205" "240" "289" "318" "298" "564" "246" "322" "299"
## [109] "300" "293" "277" "214" "207" "223" "160" "394" "184" "315" "409" "244"
## [121] "195" "196" "126" "313" "259" "200" "262" "215" "228" "193" "271" "210"
## [133] "327" "149" "295" "306" "178" "237" "218" "242" "319" "166" "180" "311"
## [145] "278" "342" "169" "187" "157" "176" "241" "131" "?"   "161" "173" "194"
## [157] "297" "292" "339" "147" "291" "358" "412" "238" "163" "280" "202" "328"
## [169] "129" "190" "179" "272" "100" "468" "320" "312" "171" "365" "344" "85"
## [181] "347" "251" "287" "156" "117" "466" "338" "529" "392" "329" "355" "603"
## [193] "404" "518" "285" "279" "388" "336" "491" "331" "393" "0"   "153" "316"
## [205] "458" "384" "349" "142" "181" "310" "170" "369" "165" "337" "333" "139"
## [217] "385"
##
## $fbs
## [1] "0" "1" "?"
##
## $restecg
## [1] "2" "0" "1" "?"
##
## $thalach
##   [1] "108" "129" "187" "172" "178" "160" "163" "147" "155" "148" "153" "142"
##  [13] "173" "162" "174" "168" "139" "171" "144" "132" "158" "114" "151" "161"
##  [25] "179" "120" "112" "137" "157" "169" "165" "123" "128" "152" "140" "188"
##  [37] "109" "125" "131" "170" "113" "99"  "177" "141" "180" "111" "143" "182"
##  [49] "150" "156" "115" "149" "145" "146" "175" "186" "185" "159" "130" "190"
##  [61] "136" "97"  "127" "154" "133" "126" "202" "103" "166" "164" "184" "124"
##  [73] "122" "96"  "138" "88"  "105" "194" "195" "106" "167" "95"  "192" "117"
##  [85] "121" "116" "71"  "118" "181" "134" "90"  "98"  "176" "135" "110" "?"
##  [97] "100" "87"  "102" "92"  "91"  "82"  "119" "94"  "86"  "84"  "80"  "107"
## [109] "69"  "73"  "93"  "104" "60"  "83"  "63"  "70"  "77"  "72"  "78"  "67"
##
## $exang
## [1] "1" "0" "?"
##
## $oldpeak
##  [1] "1.5"  "2.6"  "3.5"  "1.4"  "0.8"  "3.6"  "0.6"  "3.1"  "0.4"  "1.3"
## [11] "0"    "0.5"  "1.6"  "1"    "1.2"  "0.2"  "1.8"  "3.2"  "2.4"  "2"
## [21] "2.5"  "2.2"  "2.8"  "3"    "3.4"  "6.2"  "4"    "5.6"  "2.9"  "0.1"
## [31] "2.1"  "1.9"  "4.2"  "0.9"  "1.1"  "3.8"  "0.7"  "0.3"  "2.3"  "4.4"
## [41] "5"    "-0.5" "?"    "1.7"  ".2"   "-1.1" "-1.5" ".5"   "-.1"  "-2.6"
## [51] ".7"   "-.7"  ".1"   ".3"   "-2"   "-1"   ".9"   ".4"   "-.8"  "-.5"
## [61] "-.9"  "3.7"
##
## $slope
## [1] "2" "3" "1" "?"
##
## $ca
## [1] "3.0" "2.0" "0.0" "1.0" "?"   "0"   "1"   "2"
##
## $thal
## [1] "3.0" "7.0" "6.0" "?"   "6"   "3"   "7"
##
## $have_heart_disease
## [1] 2 1 0 3 4
```

```
str(uci)
```

```
## 'data.frame':    916 obs. of  14 variables:
##  $ age               : num  67 67 37 41 56 62 57 63 53 57 ...
##  $ sex               : num  1 1 1 0 1 0 0 1 1 1 ...
##  $ cp                : num  4 4 3 2 2 4 4 4 4 4 ...
##  $ trestbps          : chr  "160" "120" "130" "130" ...
##  $ chol              : chr  "286" "229" "250" "204" ...
##  $ fbs               : chr  "0" "0" "0" "0" ...
##  $ restecg           : chr  "2" "2" "0" "2" ...
##  $ thalach           : chr  "108" "129" "187" "172" ...
##  $ exang             : chr  "1" "1" "0" "0" ...
##  $ oldpeak           : chr  "1.5" "2.6" "3.5" "1.4" ...
##  $ slope             : chr  "2" "2" "3" "1" ...
##  $ ca                : chr  "3.0" "2.0" "0.0" "0.0" ...
##  $ thal              : chr  "3.0" "7.0" "3.0" "3.0" ...
##  $ have_heart_disease: int  2 1 0 0 0 3 0 2 1 0 ...
```

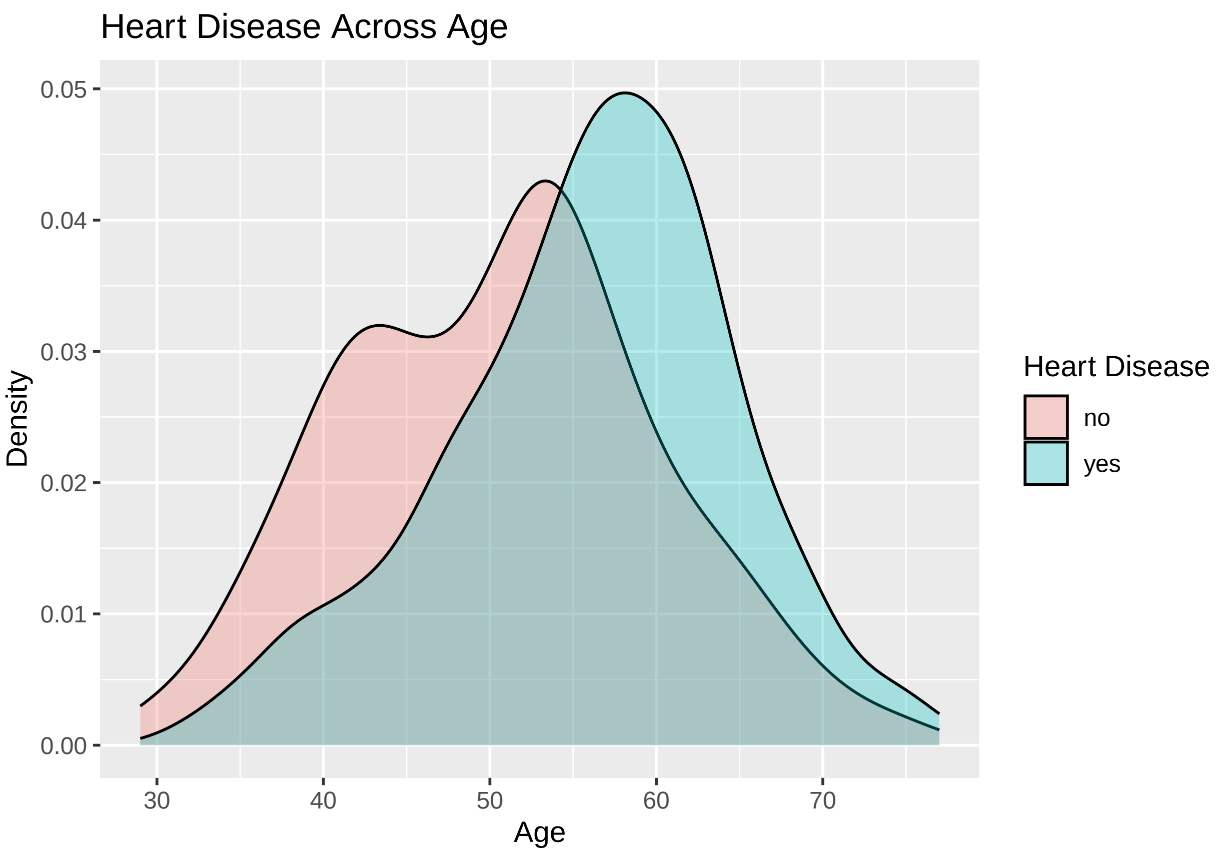
```
uci <- uci %>%
  mutate(sex = case_when(sex == 0 ~ "female",
                         sex == 1 ~ "males")) %>%
  mutate(cp = case_when(cp == 1 ~ "typical angina",
                        cp == 2 ~ "atypical angina",
                        cp == 3 ~"non-anginal pain",
                        cp == 4 ~"asymptomatic")) %>%
  mutate(fbs = case_when(fbs == "0" ~ "true",
                         fbs == "1" ~ "false",
                         TRUE ~ "false")) %>%
  mutate(restecg = case_when(restecg == 0 ~ "normal",
                             restecg == 1 ~ "ST-T wave abnormality",
                             restecg == 2 ~ "left ventricular hypertrophy",
                             TRUE ~ "normal")) %>%
  mutate(exang = case_when(exang == 0 ~ "no",
                           exang == 1 ~ "yes",
                           TRUE ~ "no")) %>%
```

```r
  mutate(thal = case_when(thal %in% c("3.0", "3") ~ "normal",
                          thal %in% c("6.0", "6") ~ "fixed defect",
                          thal %in% c("7.0", "7") ~ "reversable defect",
                          TRUE ~ "unknow")) %>%
  mutate(have_heart_disease = case_when(have_heart_disease == 0 ~ "no",
                                        have_heart_disease %in% c(1, 2, 3, 4) ~
                                          "yes"))
str(uci)
```

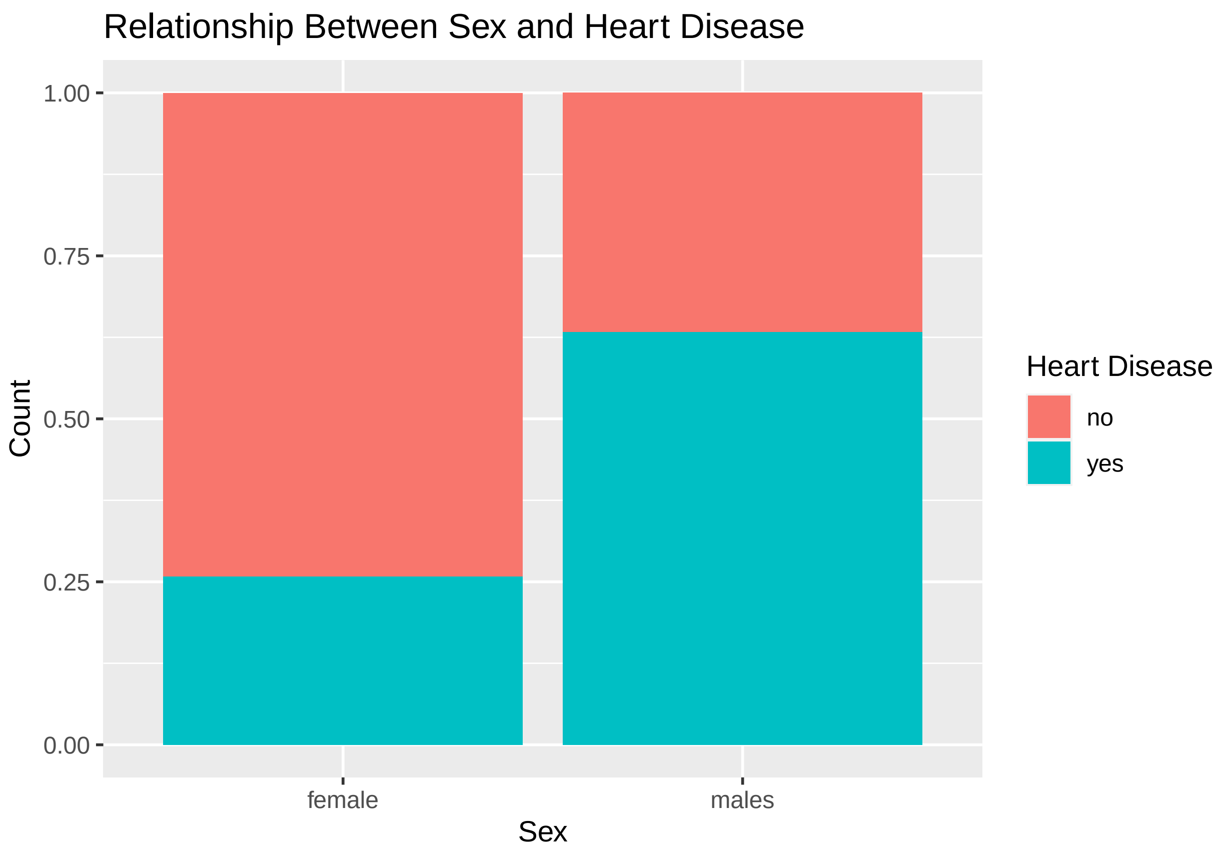
```
## 'data.frame':    916 obs. of  14 variables:
##  $ age               : num  67 67 37 41 56 62 57 63 53 57 ...
##  $ sex               : chr  "males" "males" "males" "female" ...
##  $ cp                : chr  "asymptomatic" "asymptomatic" "non-anginal pain" "atypical angina" ...
##  $ trestbps          : chr  "160" "120" "130" "130" ...
##  $ chol              : chr  "286" "229" "250" "204" ...
##  $ fbs               : chr  "true" "true" "true" "true" ...
##  $ restecg           : chr  "left ventricular hypertrophy" "left ventricular hypertrophy" "normal" "
##  $ thalach           : chr  "108" "129" "187" "172" ...
##  $ exang             : chr  "yes" "yes" "no" "no" ...
##  $ oldpeak           : chr  "1.5" "2.6" "3.5" "1.4" ...
##  $ slope             : chr  "2" "2" "3" "1" ...
##  $ ca                : chr  "3.0" "2.0" "0.0" "0.0" ...
##  $ thal              : chr  "normal" "reversable defect" "normal" "normal" ...
##  $ have_heart_disease: chr  "yes" "yes" "no" "no" ...
```

Visualization

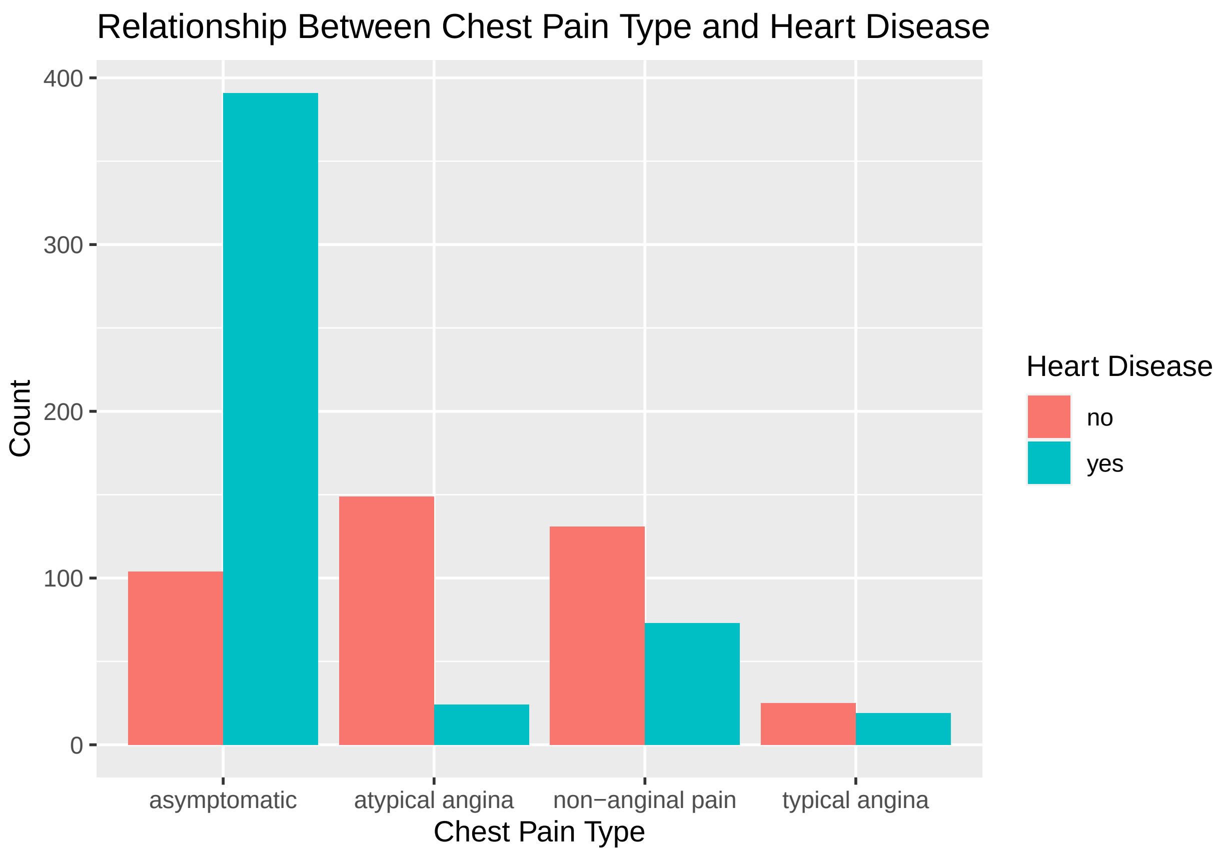
```r
ggplot(uci, aes(x = age, fill = as.factor(have_heart_disease))) +
  geom_density(alpha = 0.3) +
  labs(x = "Age", y = "Density", fill = "Heart Disease") +
  ggtitle("Heart Disease Across Age")
```



```
ggplot(uci, aes(x = sex, fill = as.factor(have_heart_disease))) +
  geom_bar(position = "fill") +
  labs(x = "Sex", y = "Count", fill = "Heart Disease") +
  ggtitle("Relationship Between Sex and Heart Disease")
```



```
ggplot(uci, aes(x = cp, fill = as.factor(have_heart_disease))) +
  geom_bar(position = "dodge") +
  labs(x = "Chest Pain Type", y = "Count", fill = "Heart Disease") +
  ggtitle("Relationship Between Chest Pain Type and Heart Disease")
```


Relationship Between Chest Pain Type and Heart Disease
Count
400
300
200
100
0
asymptomatic
atypical angina
non−anginal pain
typical angina
Chest Pain Type
Heart Disease
no
yes