Enough R for Data Computing Fundamentals

dtkaplan.github.io/comp110/DCF-materials-book/Handouts/EnoughDCF.pdf

Getting Started Load the package whenever you start a new session.

```
library(DataComputing)
```

Don't have DataComputing? Install the package:

```
devtools::install_github(
  "DataComputing/DataComputing")
```

Overview The data verbs, summary functions, and transformation functions enable you to transfigure data into a glyph- or analysis-ready form.

The basic syntax:

```
Result <-
  DT %>%
  verb1( [some args] ) %>%
  verb2( [more args] ) %>%
  ... and so on as needed ...
```

- `<-` is the assignment symbol.
- `%>%` is the chaining symbol: take the output of the left expression and make it the input of the right expression.
- Lines that **end** with `<-` or `%>%` identify that the next line continues the expression.

Data Tables are organized into cases and variables. Variables are either quantitative or categorical: numbers or words. Two examples used here:

- First example data table: `DT`

```
##     name sex height weight
## 1   Alma   F   1.64     54
## 2 Junior   M   1.82     73
## 3   Gary   M   1.71     64
## 4 Kristy   F   1.75     61
```

`sex` is categorical, `height` and `weight` are quantitative.

- Second example data table: `Sports`

```
##   name      sport
## 1 Fred   Football
## 2 Alma Water Polo
## 3 Alma     Hockey
## 4 Gary   Football
```

Quick presentation of data tables

```
str(DT)  summary(DT)
nrow(DT) names(DT)
head(DT) tail(DT) View(DT)
```

Data Verbs take a data table as input and return as output a modified table.

Verb	Task	Argument(s)	Example
`filter()`	Winnow cases	Comparison	`filter(year>2000)`
`mutate()`	Adds vars.	Transformation	`mutate(bmi=weight/height^2)`
`summarise()`	Combines cases	Summary	`summarise(ave=mean(height))`
`select()`	Drops vars.	Var. Names	`select(sex, height)`
`arrange()`	Order cases	Var. Names	`arrange(height)`
Join	Combines tables	Data Table	See **Various Joins**
`group_by()`	Split into groups	Var. Names	`group_by(sex)`

All the examples assume a data table is being chained in, e.g. `DT %>% group_by(sex)`.

Grouping Operations

`group_by()` can be used with several data verbs.

Summarize within each group property

```
DT %>% group_by(sex) %>%
  summarise(tallest = max(height))
```

Compare each case to a group property

```
DT %>% group_by(sex) %>%
  mutate(rel = height-mean(height))
```

Choose cases from each group.

```
DT %>% group_by(sex) %>%
  filter(rank(height) == 1)
```

Various Joins differ mainly in how they deal with unmatched cases.
Cases matched with *all* variables that appear in both tables, just `name` in the example.

- Keep all cases that have a match:

`DT %>% inner_join(Sports)`

```
##   name sex height weight      sport
## 1 Alma   F   1.64     54 Water Polo
## 2 Alma   F   1.64     54     Hockey
## 3 Gary   M   1.71     64   Football
```

Note: output has *both* of Alma's sports.

- Keep all cases from left table:

`DT %>% left_join(Sports)`

- Keep unmatched cases:

`DT %>% anti_join( Sports )`

To Use in Arguments to Data Verbs

Reduction Functions take a variable as input and return a single number.

```
mean(height, na.rm = TRUE )
max(weight)  n()
min(weight)  n_distinct()
```

Transformation Functions, used with `mutate()`, take one or more variables as input and return a variable (with the same number of cases).

```
rank(var)
pmin(var1, var2) #smaller of the two
var1/(var1+var2) #division, addition
```

Comparison Expressions

`filter()` uses one or more comparison expression to determine which cases to pass through.

```
DT %>% filter(height < 1.8 )
DT %>% filter(name == "Junior" )
DT %>% filter(sex == "F", height < 1.8)
DT %>% filter(count >2000, count <10000)
DT %>% filter(name %in% c("Alma","Gary")
```

Variable Names

`group_by()`, `select()`, and `arrange()` take one or more variable names as arguments, in addition to the chained in data table.

Datasets in DataComputing

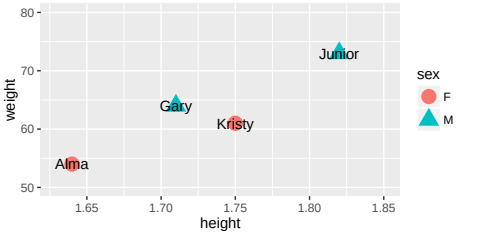
Get a listing with `data( package="DataComputing" )`. All those listed are available by name once the DCF package is loaded. See also `mosaicData` and `NHANES` packages.

Graphics with ggplot

- Create a new graphic: `ggplot()`
- Functions to add graphical layers `geom_point()` `geom_text()` `geom_bar()`, etc. Others: `xlab()`, `ylab`, `xlim(low,high)`, `ylim(low,high)`
- `aes()` to *map* variables to graphical attributes (aesthetics), e.g. Distinguish groups using color `aes(color=sex, ...)`. *Set* properties to constants outside `aes()`.

Example:

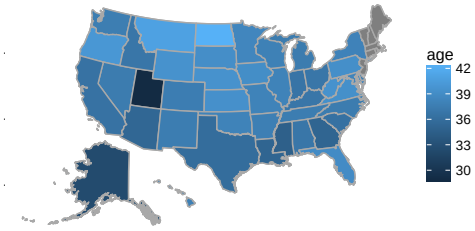
```
DT %>%
 ggplot(aes(x = height, y = weight)) +
 geom_point(size = 5,          #Setting
            aes(color=sex, shape=sex)) +
 geom_text(aes(label = name))
```



Choropleth Maps

`mUSMap()` has a `key=` argument identifies the variable naming the geographic entity. `fill=` specifies the quantity to be plotted.

```
mUSMap(data=StateData,
            key="State",fill="age")
```



`mWorldMap()` is used in the same way.