Data Science for Operational Researchers Using R Online

8. Tibble Manipulation with purrr and tidyr

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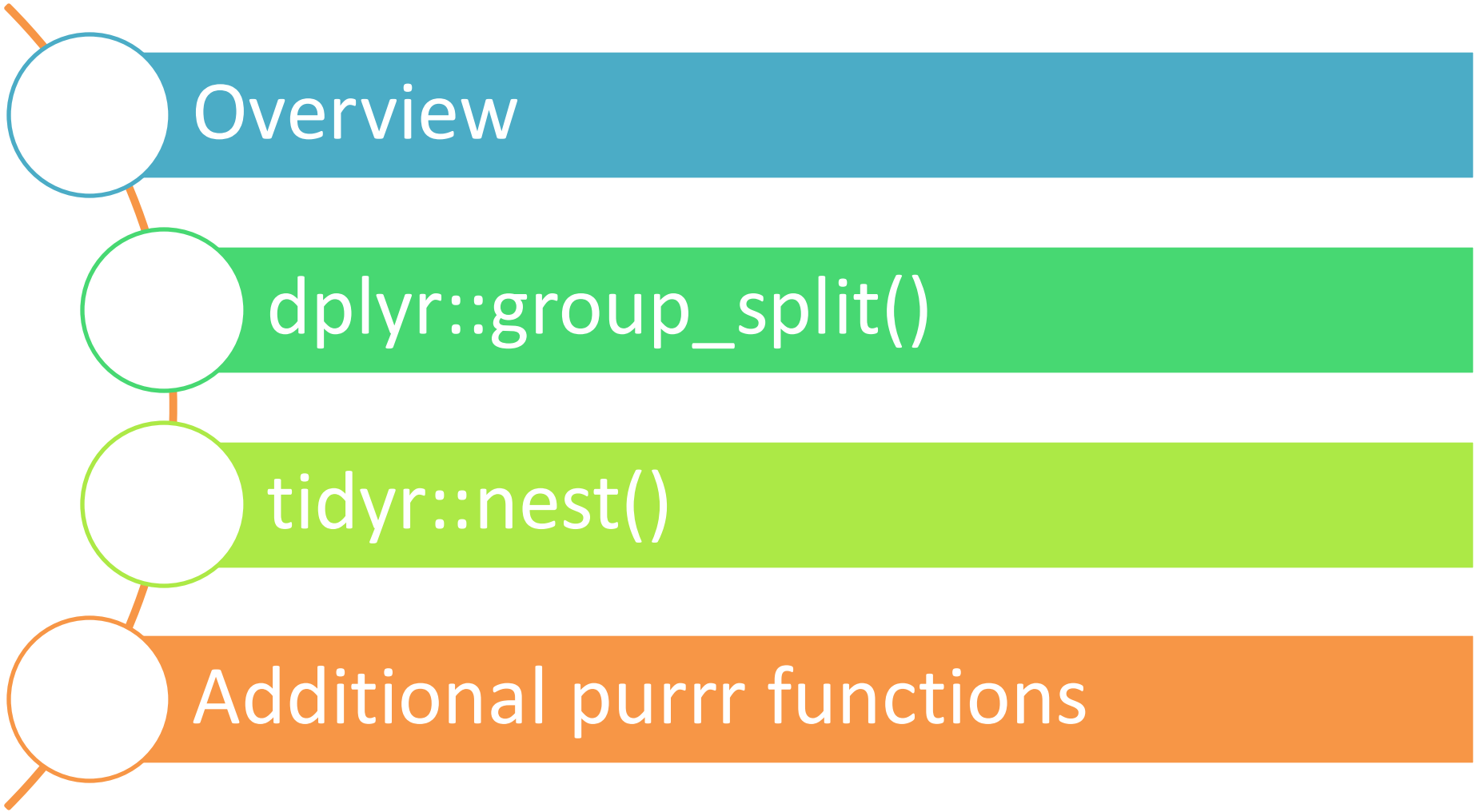
https://github.com/JimDuggan/explore_or

R has numerous ways to iterate over elements of a list (or vector), and Hadley Wickham aimed to improve on and standardise that experience with the `purrr` package.

— Jared P. Lander (Lander, 2017)

Overview


Overview
dplyr::group_split()
tidyr::nest()
Additional purrr functions

1. Overview

- A benefit of using the tidyverse is having the facility to combine tools from different packages, and switching between the use of lists and tibbles where appropriate.
- A common task is to divide a tibble into sub-groups, and perform operations on these.
- We have already seen how this can work using the package dplyr, which allows you to use the functions group_by() and summarize() to aggregate data
- The two functions we use with purrr are dplyr:: group_split() tidyr::nest()

2. group_split()

- This function, contained in the package dplyr, can be used to split a tibble into a list of tibbles, based on groupings specified by group_by().
- This list can be processed using the map() family of functions.

Create a subset of mpg

```
set.seed(100)
test <- mpg %>%
        dplyr::select(manufacturer:displ,cty,class) %>%
        dplyr::filter(class %in% c("compact","midsize")) %>%
        dplyr::sample_n(5)
test
```

```
#> # A tibble: 5 x 5
#>   manufacturer model  displ   cty class
#>   <chr>        <chr>  <dbl> <int> <chr>
#> 1 volkswagen   jetta    2      21 compact
#> 2 volkswagen   jetta    2.5    21 compact
#> 3 chevrolet    malibu   3.6    17 midsize
#> 4 volkswagen   gti      2      21 compact
#> 5 audi         a4       2      21 compact
```

Use group_by() and group_split()

```
test_s <- test %>%
            dplyr::group_by(class) %>%
            dplyr::group_split()
```

```
#> [[1]]
#> # A tibble: 4 x 5
#>   manufacturer model displ   cty class
#>   <chr>        <chr> <dbl> <int> <chr>
#> 1 volkswagen   jetta   2      21 compact
#> 2 volkswagen   jetta   2.5    21 compact
#> 3 volkswagen   gti     2      21 compact
#> 4 audi         a4      2      21 compact
```

```
#> [[2]]
#> # A tibble: 1 x 5
#>   manufacturer model  displ   cty class
#>   <chr>        <chr>  <dbl> <int> <chr>
#> 1 chevrolet    malibu   3.6    17 midsize
```

Processing the list with purrr::map_int()

```
test_s %>% purrr::map_int(~nrow(.x))
#> [1] 4 1
```

```
#> [[1]]
#> # A tibble: 4 x 5
#>   manufacturer model displ   cty class
#>   <chr>        <chr> <dbl> <int> <chr>
#> 1 volkswagen   jetta   2      21 compact
#> 2 volkswagen   jetta   2.5    21 compact
#> 3 volkswagen   gti     2      21 compact
#> 4 audi         a4      2      21 compact
```

```
#> [[2]]
#> # A tibble: 1 x 5
#>   manufacturer model  displ   cty class
#>   <chr>        <chr>  <dbl> <int> <chr>
#> 1 chevrolet    malibu   3.6    17 midsize
```

More detailed example…

- Our goal is to calculate the correlation coefficient between two variables: mean sea level pressure and average wind speed.
- We simplify the dataset to daily values, where we take (1) the maximum wind speed (wdsp) recorded and (2) the average mean sea level pressure (msl).
- Our first task is to use dplyr to generate a summary tibble, and we also exclude any cases that have missing values, by combining complete.cases() within filter().
- Note that the function complete.cases() returns a logical vector indicating which rows are complete.
- The new tibble is stored in the variable d_data.

```
d_data <- observations %>%
           dplyr::filter(complete.cases(observations)) %>%
           dplyr::group_by(station,month,day) %>%
           dplyr::summarize(MaxWdsp=max(wdsp,na.rm=TRUE),
                            DailyAverageMSL=mean(msl,na.rm=TRUE)) %>%
           dplyr::ungroup()
d_data
#> # A tibble: 8,394 x 5
#>    station month   day MaxWdsp DailyAverageMSL
#>    <chr>   <dbl> <int>   <dbl>           <dbl>
#>  1 ATHENRY     1     1      12           1027.
#>  2 ATHENRY     1     2       8           1035.
#>  3 ATHENRY     1     3       6           1032.
#>  4 ATHENRY     1     4       4           1030.
#>  5 ATHENRY     1     5       9           1029.
#>  6 ATHENRY     1     6       9           1028.
#>  7 ATHENRY     1     7       6           1032.
#>  8 ATHENRY     1     8       9           1029.
#>  9 ATHENRY     1     9      16           1015.
#> 10 ATHENRY     1    10      13           1013.
#> # ... with 8,384 more rows
```

```
cor7 <- d_data %>%
         dplyr::group_by(station) %>%
         dplyr::group_split() %>%
         purrr::map_df(~{
                  corr <- cor(.x$MaxWdsp,.x$DailyAverageMSL)
                  tibble(Station=first(.x$station),
                         CorrCoeff=corr)
         }) %>%
         dplyr::arrange(CorrCoeff) %>%
         dplyr::slice(1:7)
```

```
cor7
#> # A tibble: 7 x 2
#>   Station              CorrCoeff
#>   <chr>                    <dbl>
#> 1 SherkinIsland           -0.589
#> 2 VALENTIA OBSERVATORY    -0.579
#> 3 ROCHES POINT            -0.540
#> 4 MACE HEAD               -0.539
#> 5 MOORE PARK              -0.528
```

Using summarize()

```
cor7_b <- d_data %>%
          dplyr::group_by(station) %>%
          dplyr::summarize(CorrCoeff=cor(MaxWdsp,DailyAverageMSL)) %>%
          dplyr::arrange(CorrCoeff) %>%
          dplyr::slice(1:7)
cor7_b
#> # A tibble: 7 x 2
#>   station              CorrCoeff
#>   <chr>                    <dbl>
#> 1 SherkinIsland           -0.589
#> 2 VALENTIA OBSERVATORY    -0.579
#> 3 ROCHES POINT            -0.540
#> 4 MACE HEAD               -0.539
#> 5 MOORE PARK              -0.528
```

3. nest()

- The function nest(), which is part of the package tidyr, can be used to create a list column within a tibble that contains a tibble.
- Nesting generates one row for each defined group, which is identified using the function group_by().
- The second column is named data, and is a list, and each list element contains all of the tibble's data for a particular group.

```
data_n <- d_data %>%
          dplyr::group_by(station) %>%
          tidyr::nest()

data_n %>% head()
#> # A tibble: 6 x 2
#> # Groups:   station [6]
#>   station       data
#>   <chr>         <list>
#> 1 ATHENRY       <tibble [365 x 4]>
#> 2 BALLYHAISE    <tibble [365 x 4]>
#> 3 BELMULLET     <tibble [365 x 4]>
#> 4 CASEMENT      <tibble [365 x 4]>
#> 5 CLAREMORRIS   <tibble [365 x 4]>
#> 6 CORK AIRPORT <tibble [365 x 4]>
```

```
data_n %>% head()
#> # A tibble: 6 x 2
#> # Groups:   station [6]
#>   station      data
#>   <chr>        <list>
#> 1 ATHENRY      <tibble [365 x 4]>
#> 2 BALLYHAISE   <tibble [365 x 4]>
#> 3 BELMULLET    <tibble [365 x 4]>
#> 4 CASEMENT     <tibble [365 x 4]>
#> 5 CLAREMORRIS  <tibble [365 x 4]>
#> 6 CORK AIRPORT <tibble [365 x 4]>
```

```
data_n %>%
  dplyr::pull(data) %>%
  dplyr::first()
#> # A tibble: 365 x 4
#>    month   day MaxWdsp DailyAverageMSL
#>    <dbl> <int>   <dbl>           <dbl>
#>  1     1     1      12           1027.
#>  2     1     2       8           1035.
#>  3     1     3       6           1032.
#>  4     1     4       4           1030.
#>  5     1     5       9           1029.
#>  6     1     6       9           1028.
#>  7     1     7       6           1032.
#>  8     1     8       9           1029.
#>  9     1     9      16           1015.
#> 10     1    10      13           1013.
#> # ... with 355 more rows
```