cluster-destination-timeofday

```r
library(conflicted)
library(tidyverse)
library(rlang)
library(gt)
  library(gtExtras)
conflicts_prefer(dplyr::filter)
```

```r
unzip(zipfile = "passenger_data.zip")
data = "passenger_data.csv" |>
    read_csv(
        col_types = cols(
            Wait_Time = col_integer(),
            C_Start = col_integer(),
            C0 = col_integer(),
            C_avg = col_double(),
            BFO_Dest_City = col_factor(),
            BFO_Destination_Country_Code = col_factor(),
            order = col_integer(),
            Pass_ID = col_integer(),
            Time_of_Day = col_integer(),
            Period_of_Week = col_factor(),
            Day_of_Week = col_factor(),
            Month = col_factor(),
            Season = col_factor(),
            Year = col_factor(),
            Flight_ID = col_integer(),
            Delay_in_Seconds = col_integer(),
            .default = col_guess()
        )
    ) |>
  select(!Airfield) # all observations are from AUC
```

```r
data = data |>
  mutate(
    BFO_Dest_City_or_CC = if_else( # split cities in Borealia, Vespuchia
      BFO_Destination_Country_Code %in% c("BOR", "VES"),
      true = BFO_Dest_City,
      false = BFO_Destination_Country_Code
    ) |>
      as_factor(),
    .after = BFO_Destination_Country_Code
  )
```

```r
cl = data |>
  summarise(
    n = n(),
    .by = c(
      Time_of_Day,
      BFO_Dest_City_or_CC
    )
  ) |>
  mutate(
    hour_start = case_when(
      Time_of_Day == 1 ~ "0:00",
      Time_of_Day == 2 ~ "6:00",
      Time_of_Day == 3 ~ "12:00",
      Time_of_Day == 4 ~ "18:00"
    ),
    hour_end = case_when(
      Time_of_Day == 1 ~ "6:00",
      Time_of_Day == 2 ~ "12:00",
      Time_of_Day == 3 ~ "18:00",
      Time_of_Day == 4 ~ "0:00"
    ),
    hours = 732,
    type = if_else(
      BFO_Dest_City_or_CC %in% c("QUE", "AUC", "SAF", "CWL"),
      true = "Domestic",
      false = "International"
    ) |>
      as_factor(),
    rate = n/732 # number of hours: 732 apiece
  ) |>
  filter(n > 20) |>
  relocate(BFO_Dest_City_or_CC, .after = hours) |>
  relocate(n, .before = rate) |>
  arrange(
    Time_of_Day,
    BFO_Dest_City_or_CC
  ) |>
  mutate( # change how Time_of_Day is displayed, **after** it's been ordered
    Time_of_Day = case_when(
      Time_of_Day == 1 ~ "Night",
      Time_of_Day == 2 ~ "Morning",
      Time_of_Day == 3 ~ "Afternoon",
      Time_of_Day == 4 ~ "Evening"
    )
  ) |>
  group_by(Time_of_Day)

gt(cl) |>
  tab_header(
    title = "Average passenger arrival rates at **AUC**" |>
      md(),
    subtitle = "by destination and time of day"
  ) |>
```

```r
cols_label(
    Time_of_Day = "Time",
    hour_start = "",
    hour_end = "",
    BFO_Dest_City_or_CC = "Destination",
    hours = "Hours",
    type = "Type",
    n = "Count",
    rate = "Arrivals/hour"
  ) |>
  tab_options(
    row_group.as_column = TRUE
  )
```

Average passenger arrival rates at **AUC**
by destination and time of day

			Hours	Destination	Type	Count	Arrivals/hour
Night	0:00	6:00	732	QUE	Domestic	77	0.1051913
Morning	6:00	12:00	732	QUE	Domestic	16461	22.4877049
	6:00	12:00	732	VES033	International	3694	5.0464481
	6:00	12:00	732	VES064	International	2983	4.0751366
	6:00	12:00	732	CWL	Domestic	11117	15.1871585
	6:00	12:00	732	SAF	Domestic	2001	2.7336066
	6:00	12:00	732	NEN	International	1064	1.4535519
	6:00	12:00	732	SCO	International	230	0.3142077
Afternoon	12:00	18:00	732	QUE	Domestic	20379	27.8401639
	12:00	18:00	732	VES033	International	7272	9.9344262
	12:00	18:00	732	VES064	International	3312	4.5245902
	12:00	18:00	732	CWL	Domestic	9153	12.5040984
	12:00	18:00	732	SAF	Domestic	533	0.7281421
	12:00	18:00	732	SCO	International	727	0.9931694
Evening	18:00	0:00	732	QUE	Domestic	15151	20.6980874
	18:00	0:00	732	VES033	International	3308	4.5191257
	18:00	0:00	732	VES064	International	2258	3.0846995
	18:00	0:00	732	CWL	Domestic	4634	6.3306011
	18:00	0:00	732	SAF	Domestic	3045	4.1598361
	18:00	0:00	732	NEN	International	1678	2.2923497
	18:00	0:00	732	SCO	International	4679	6.3920765

```r
dist = data |>
  summarise(
    avg_servers = mean(CO),
    .by = c(
      Time_of_Day,
      BFO_Dest_City_or_CC
    )
  ) |>
  filter(BFO_Dest_City_or_CC %in% cl$BFO_Dest_City_or_CC) |>
  filter(Time_of_Day != 1 | BFO_Dest_City_or_CC != "VES033") |>
  arrange(
```

```r
      Time_of_Day,
      BFO_Dest_City_or_CC
    )
dist2 = data |>
  summarise(
    n = n(),
    .by = c(
      Time_of_Day,
      BFO_Dest_City_or_CC,
      CO
    )
  ) |>
  filter(BFO_Dest_City_or_CC %in% cl$BFO_Dest_City_or_CC) |>
  filter(Time_of_Day != 1 | BFO_Dest_City_or_CC != "VES033")
dist2 = dist2 |>
  mutate(
    total = sum(n),
    srv1 = if_else(
      CO == 1,
      true = n/total*100,
      false = 0
    ),
    srv2 = if_else(
      CO == 2,
      true = n/total*100,
      false = 0
    ),
    srv3 = if_else(
      CO == 3,
      true = n/total*100,
      false = 0
    ),
    .by = c(
      Time_of_Day,
      BFO_Dest_City_or_CC
    )
  ) |>
  arrange(
    Time_of_Day,
    BFO_Dest_City_or_CC,
    CO
  ) |>
  summarise(
    across(srv1:srv3, sum),
    .by = c(
      Time_of_Day,
      BFO_Dest_City_or_CC
    )
  )

joindist = dist |>
  left_join(
    dist2,
```

```r
    by = join_by(
      Time_of_Day,
      BFO_Dest_City_or_CC
    )
  )

cl2 = joindist |>
  mutate(
    hour_start = case_when(
      Time_of_Day == 1 ~ "0:00",
      Time_of_Day == 2 ~ "6:00",
      Time_of_Day == 3 ~ "12:00",
      Time_of_Day == 4 ~ "18:00"
    ),
    hour_end = case_when(
      Time_of_Day == 1 ~ "6:00",
      Time_of_Day == 2 ~ "12:00",
      Time_of_Day == 3 ~ "18:00",
      Time_of_Day == 4 ~ "0:00"
    ),
    .after = Time_of_Day
  ) |>
  mutate(
    type = if_else(
      BFO_Dest_City_or_CC %in% c("QUE", "AUC", "SAF", "CWL"),
      true = "Domestic",
      false = "International"
    ),
    .after = BFO_Dest_City_or_CC
  ) |>
  arrange(
    Time_of_Day,
    BFO_Dest_City_or_CC
  ) |>
  mutate( # change how Time_of_Day is displayed, **after** it's been ordered
    Time_of_Day = case_when(
      Time_of_Day == 1 ~ "Night",
      Time_of_Day == 2 ~ "Morning",
      Time_of_Day == 3 ~ "Afternoon",
      Time_of_Day == 4 ~ "Evening"
    )
  ) |>
  group_by(Time_of_Day)

gt(cl2) |>
  tab_header(
    title = "Average number of servers at **AUC**" |>
      md(),
    subtitle = "by destination and time of day"
  ) |>
  cols_label(
    Time_of_Day = "Time",
    hour_start = "",
```

```
    hour_end = "",
    BFO_Dest_City_or_CC = "Destination",
    type = "Type",
    avg_servers = "Avg. # Servers",
    srv1 = "1",
    srv2 = "2",
    srv3 = "3"
) |>
tab_spanner(
    label = "Customers served with # of active servers",
    columns = c(srv1:srv3)
) |>
tab_options(
    row_group.as_column = TRUE
)
```

Average number of servers at **AUC**
by destination and time of day

			Destination	Type	Avg. # Servers	Customers served with # of active servers		
						1	2	3
Night	0:00	6:00	QUE	Domestic	1.220779	77.92208	22.07792	0.00000000
Morning	6:00	12:00	QUE	Domestic	1.678634	34.53618	63.06421	2.39961120
	6:00	12:00	VES033	International	1.811586	23.01029	72.82079	4.16892258
	6:00	12:00	VES064	International	1.658733	36.00402	62.11867	1.87730473
	6:00	12:00	CWL	Domestic	1.442296	57.58748	40.59548	1.81703697
	6:00	12:00	SAF	Domestic	1.593203	40.72964	59.22039	0.04997501
	6:00	12:00	NEN	International	1.173872	82.80075	17.01128	0.18796992
	6:00	12:00	SCO	International	1.469565	53.04348	46.95652	0.00000000
Afternoon	12:00	18:00	QUE	Domestic	1.210707	79.38564	20.15801	0.45635213
	12:00	18:00	VES033	International	1.092959	90.70407	9.29593	0.00000000
	12:00	18:00	VES064	International	1.066425	93.59903	6.15942	0.24154589
	12:00	18:00	CWL	Domestic	1.236971	76.77264	22.75757	0.46979133
	12:00	18:00	SAF	Domestic	1.341463	65.85366	34.14634	0.00000000
	12:00	18:00	NEN	International	1.000000	100.00000	0.00000	0.00000000
	12:00	18:00	SCO	International	1.588721	48.83081	43.46630	7.70288858
Evening	18:00	0:00	QUE	Domestic	1.245726	76.36460	22.69817	0.93723187
	18:00	0:00	VES033	International	1.370314	65.08464	32.79927	2.11608222
	18:00	0:00	VES064	International	1.405669	61.38175	36.66962	1.94862710
	18:00	0:00	CWL	Domestic	1.361027	65.12732	33.64264	1.23003884
	18:00	0:00	SAF	Domestic	1.678161	35.04105	62.10181	2.85714286
	18:00	0:00	NEN	International	1.302741	70.50060	28.72467	0.77473182
	18:00	0:00	SCO	International	1.589228	45.22334	50.63048	4.14618508