DATA ANALYSIS - THE DATA TABLE WAY

INTRODUCTION

What is data.table?

- Think data.frame as a set of columns
- Every column is the same length but different type
- Goal 1: Reduce programming time
  (fewer function calls, less variable name repetition)
- Goal 2: Reduce compute time
  (fast aggregation, update by reference)
- Currently in-memory: 64bit and 100GB is routine
- Ordered joins: useful in finance (time series) but also in other fields e.g. genomics

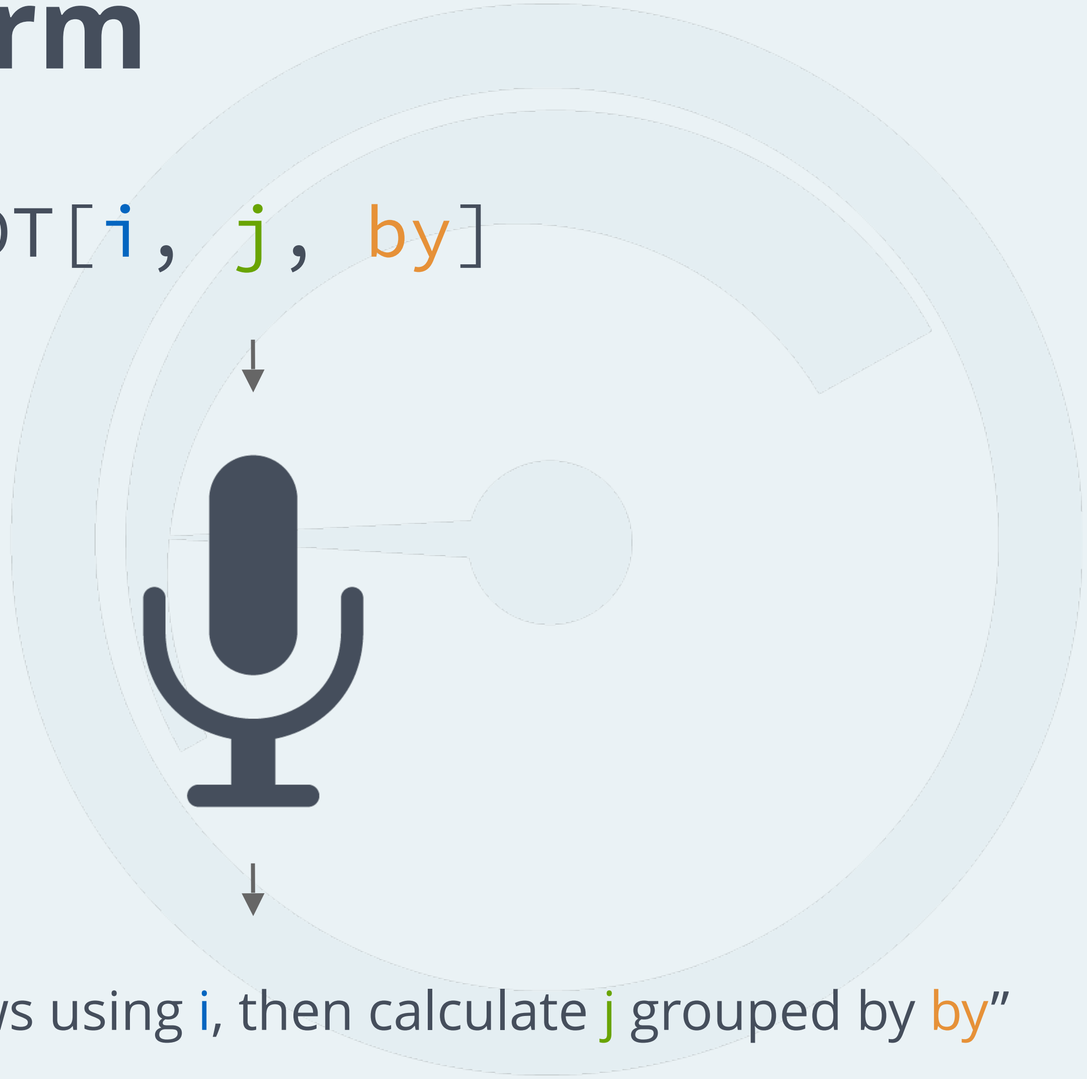
General form

DATA.TABLE

```
mtcarsDT[
    mpg > 20,
    .(AvgHP = mean(hp),
      "MinWT(kg)" = min(wt*453.6)),   # wt lbs
    by = .(cyl, under5gears = gear < 5)
]
```

R :	**i**	**j**	**by**
SQL:	**WHERE**	**SELECT**	**GROUP BY**

General form



”Take DT, subset rows using i, then calculate j grouped by by”

General form


```
> DT <- data.table(A = 1:6, B = c("a", "b", "c"), C = rnorm(6), D = TRUE)
```

```
> DT
   A B          C    D
1: 1 a -0.6264538 TRUE
2: 2 b  0.1836433 TRUE
3: 3 c -0.8356286 TRUE
4: 4 a  1.5952808 TRUE
5: 5 b  0.3295078 TRUE
6: 6 c -0.8204684 TRUE
```

```
typeof(1)  == “double” i.e. “numeric”
typeof(1L) == “integer”

typeof(NA)            == “logical”
typeof(NA_integer_)   == “integer”
```

We like character columns due to R’s global cache

Selecting rows by number in i

DATA.TABLE

data.table

```
> DT
   A B
1: 1 a
2: 2 b
3: 3 c
4: 4 a
5: 5 b
6: 6 c
```

```
> DT[3:5,]
   A B
1: 3 c
2: 4 a
3: 5 b
```

```
> DT[3:5]
   A B
1: 3 c
2: 4 a
3: 5 b
```

data.frame

```
> DF
   A B
1: 1 a
2: 2 b
3: 3 c
4: 4 a
5: 5 b
6: 6 c
```

```
> DF[3:5,]
   A B
3: 3 c
4: 4 a
5: 5 b
```

```
> DF[3:5]

Error:

undefined columns selected
```

Compatibility

- data.table is a data.frame too

```
> class(DT)
[1] "data.table" "data.frame"
```

- Accepted as a data.frame by other packages
- **DT[...]** looks to see where it is called from
- Redirects to **DF[...]** for those packages which don't know about data.table

DATA.TABLE

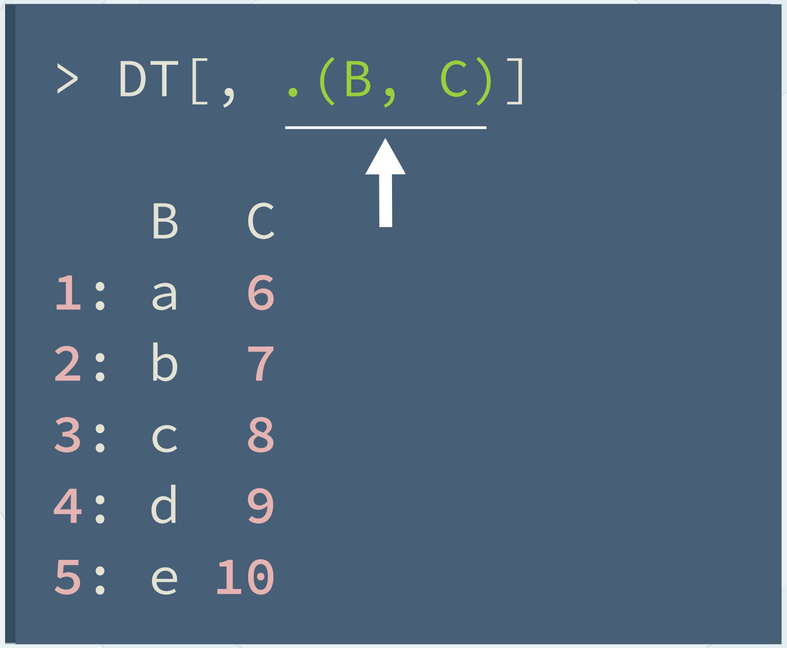
Let’s practice

DATA ANALYSIS - THE DATA TABLE WAY

SELECTING COLUMNS IN J

Selecting columns in j

```
> DT

   A  B  C
1: 1  a  6
2: 2  b  7
3: 3  c  8
4: 4  d  9
5: 5  e 10
```



```
> DT[, .(B, C)]

   B  C
1: a  6
2: b  7
3: c  8
4: d  9
5: e 10
```

NB: .() is an alias to list() in data.tables and they mean the same.

DATA.TABLE

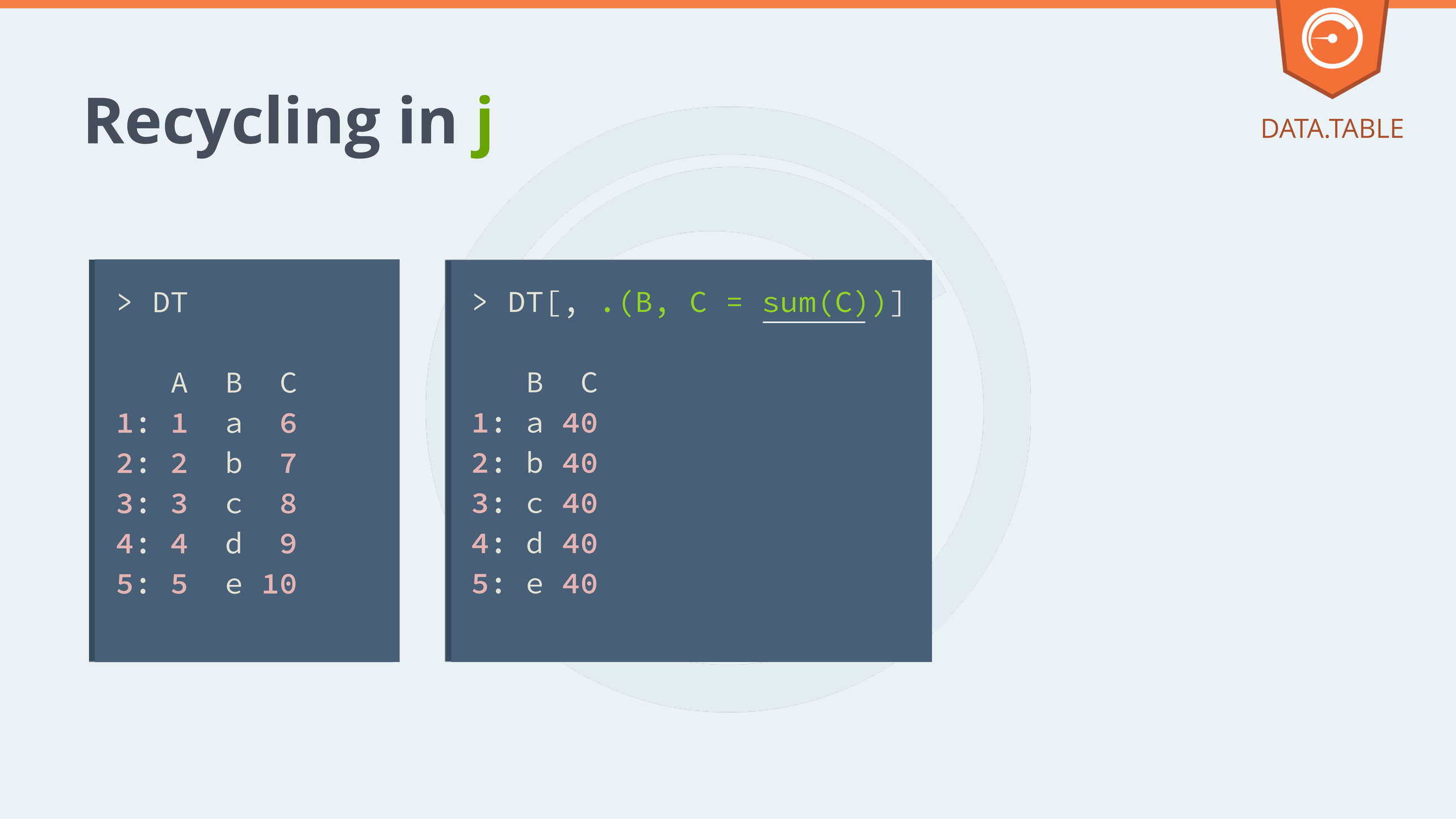
Computing on columns

DATA.TABLE

```
> DT

   A  B  C
1: 1  a  6
2: 2  b  7
3: 3  c  8
4: 4  d  9
5: 5  e 10
```

```
> DT[, .(Total = sum(A), Mean = mean(C))]

   Total   Mean
1:    15      8
```

Recycling in j



DATA.TABLE

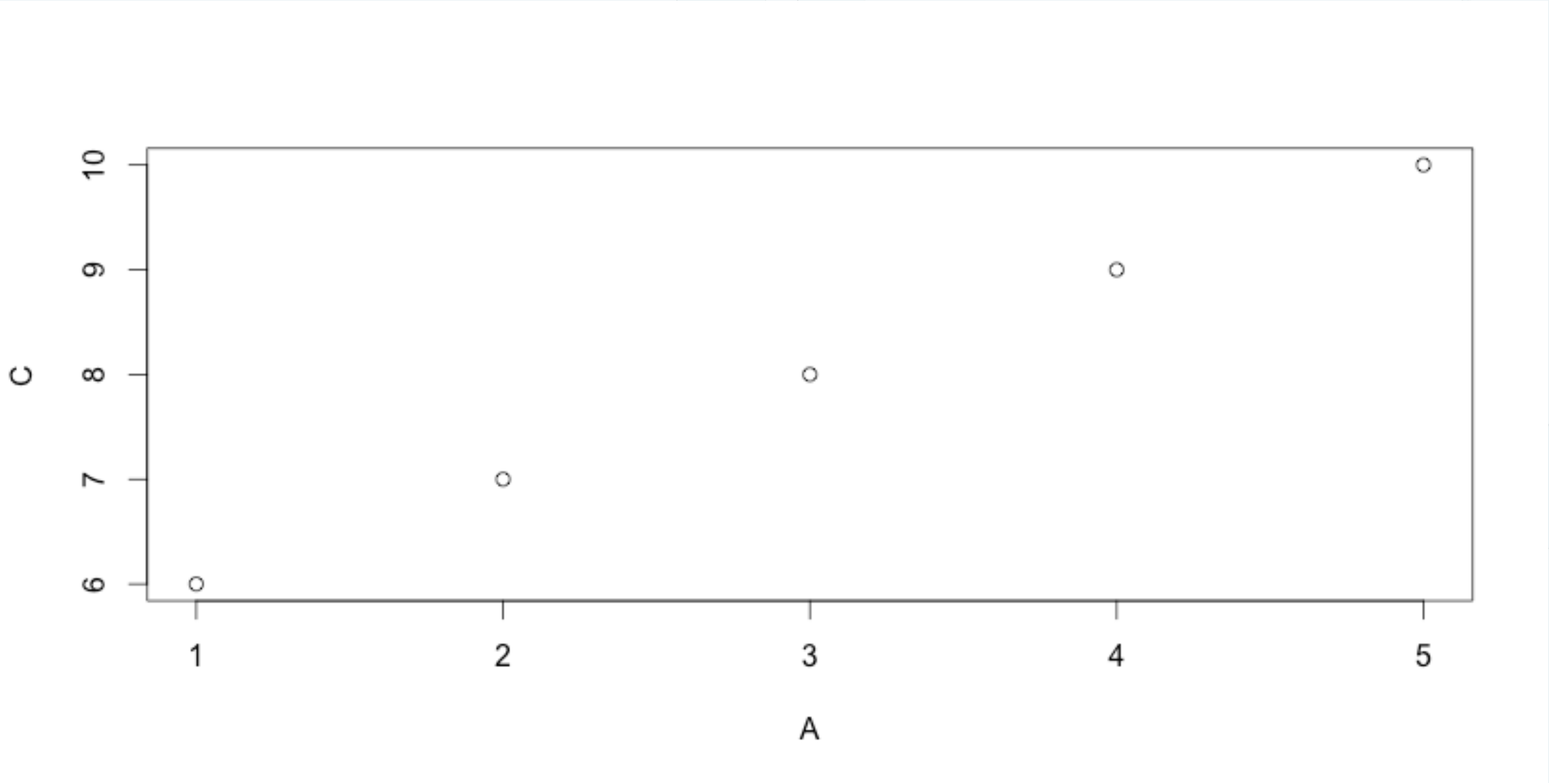
```
> DT

   A  B  C
1: 1  a  6
2: 2  b  7
3: 3  c  8
4: 4  d  9
5: 5  e 10
```

```
> DT[, .(B, C = sum(C))]

   B  C
1: a 40
2: b 40
3: c 40
4: d 40
5: e 40
```

Throw anything into j

DATA.TABLE

```
> DT[, plot(A, C)]
```



Throw anything into j


```
> DT[, plot(A, C)]
```

```
> DT[, { print(A)
         hist(C)
         NULL    }]

[1] 1 2 3 4 5
```

DATA.TABLE

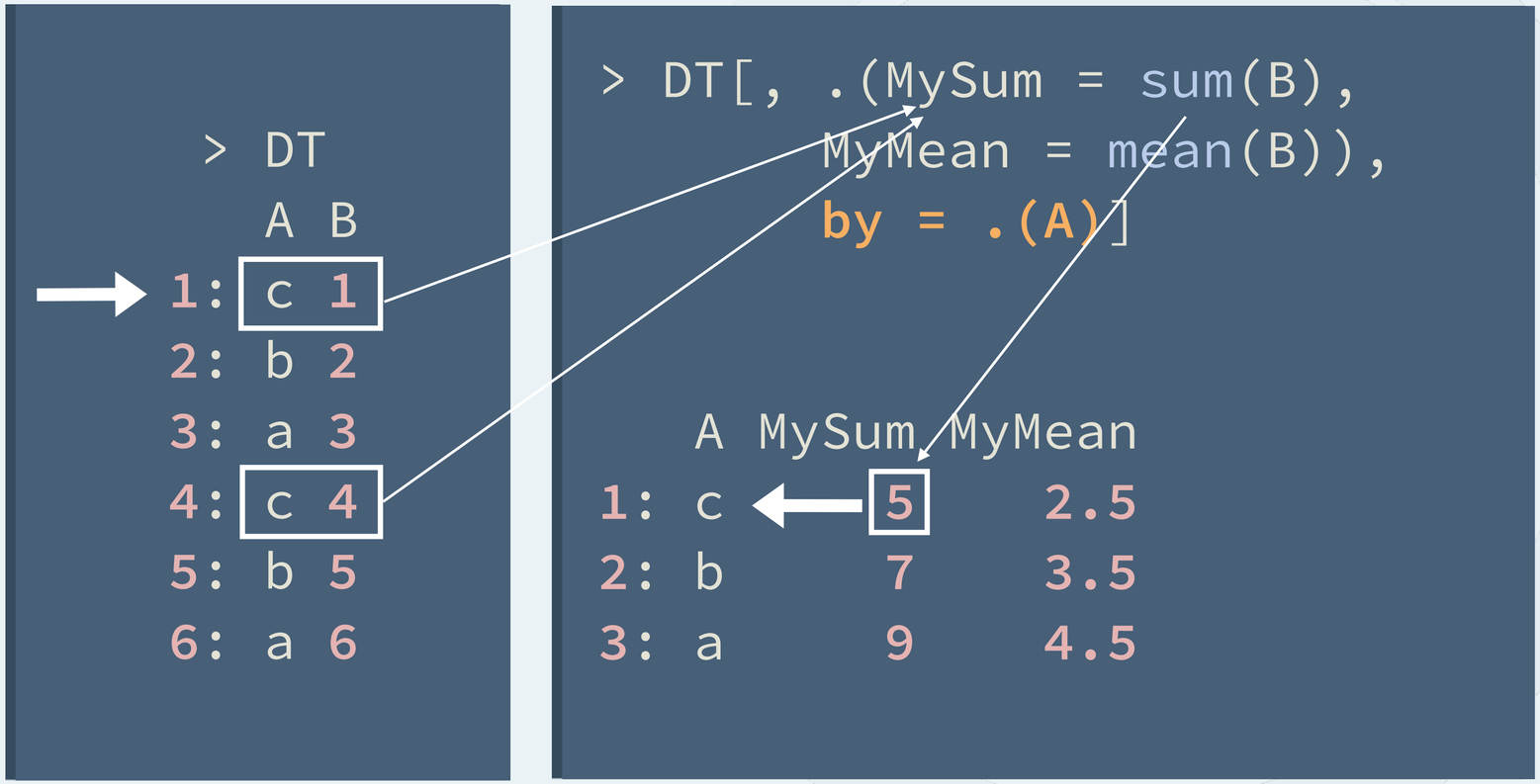
Let’s practice

DATA ANALYSIS - THE DATA TABLE WAY

DOING J BY GROUP

Doing j by group

DATA.TABLE



Function calls in by

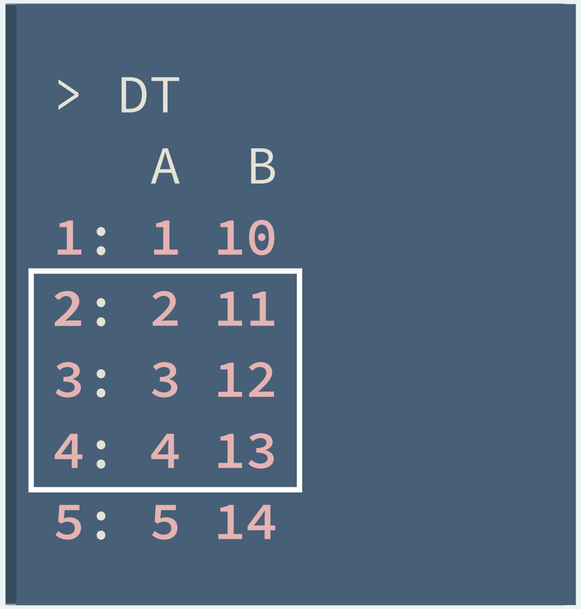
DATA.TABLE

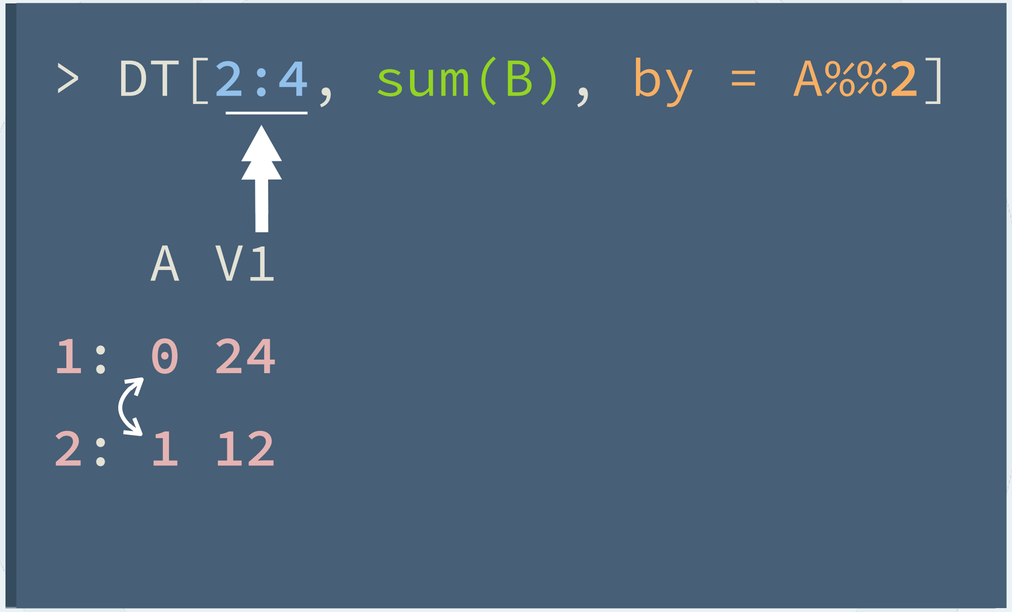
```
> DT

    A  B
1:  1 10
2:  2 11
3:  3 12
4:  4 13
5:  5 14
```

```
> DT[, .(MySum = sum(B)), by = .(Grp = A%%2)]

   Grp MySum
1:   1    36
2:   0    24
```

```
> DT[, sum(B), by = A%%2]

   A V1
1: 1 36
2: 0 24
```

Grouping only on a subset





You've now seen the 3 main parts of data.table syntax: i, j and by.

DATA.TABLE

Let’s practice