JOINING DATA IN R WITH DATA.TABLE

data.table syntax

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Recap of the data.table syntax

General form of `data.table` syntax

```
DT[i, j, by]
   |  |  |
   |  |  --> grouped by what?
   |  -----> what to do?
   --------> on which rows?
```

Joins

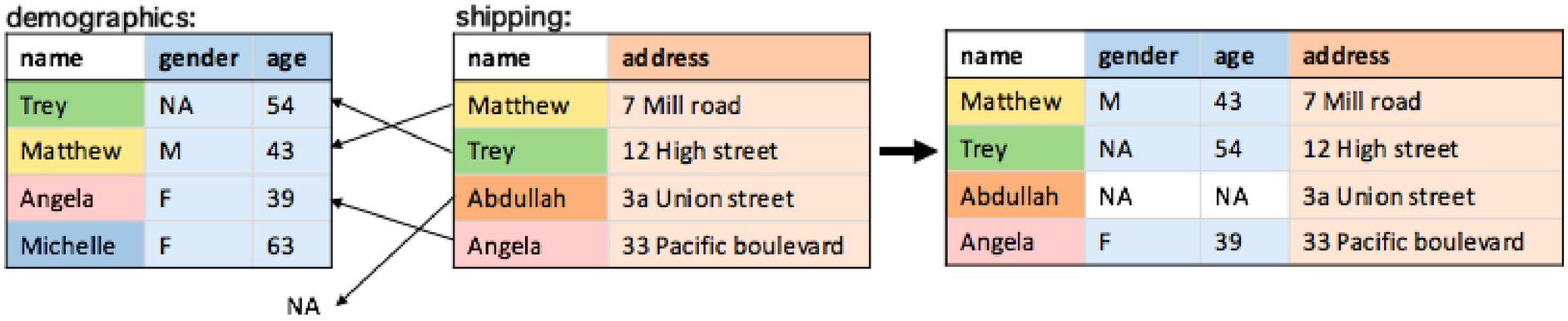
General form of `data.table` syntax joins

```
DT[i, on]
   |   |
   |   ----> join key columns
   --------> join to which data.table?
```

Right joins

The default join is a right join

```
demographics[shipping, on = .(name)]
```



The on argument

Variables inside `list()` or `.()` are looked up in the column names of both `data.tables`

```
shipping[demographics, on = list(name)]
shipping[demographics, on = .(name)]
```

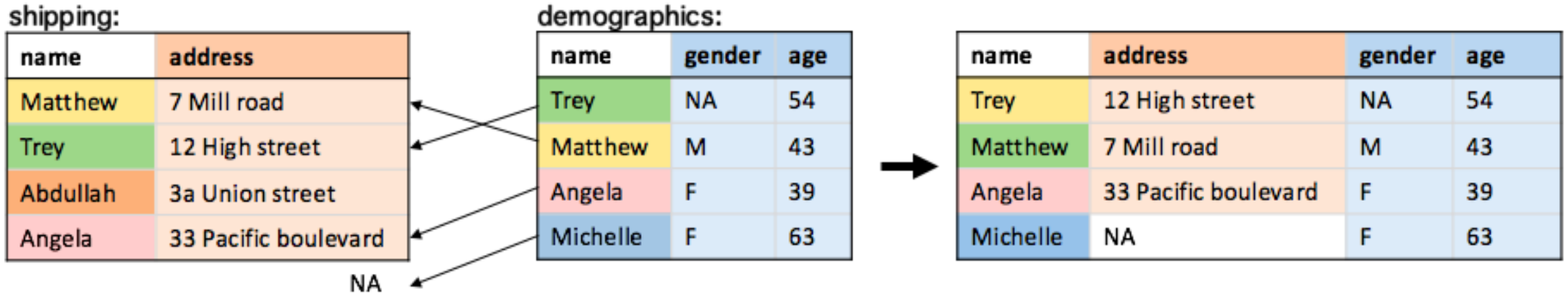
Character vectors can also be used

```
join_key <- c("name")
shipping[demographics, on = join_key]
```

Left joins

Remember, a left join is the same as a right join with the order swapped:

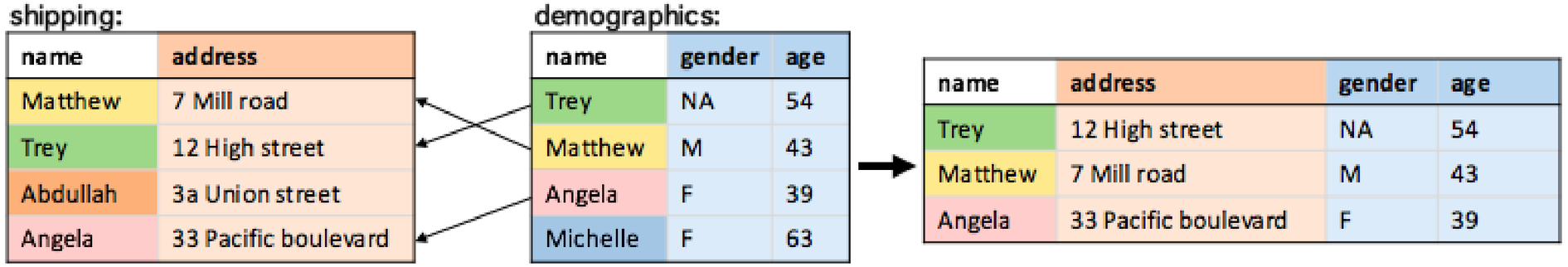
```
shipping[demographics, on = .(name)]
```



Inner joins

Set `nomatch = 0` to perform an inner join:

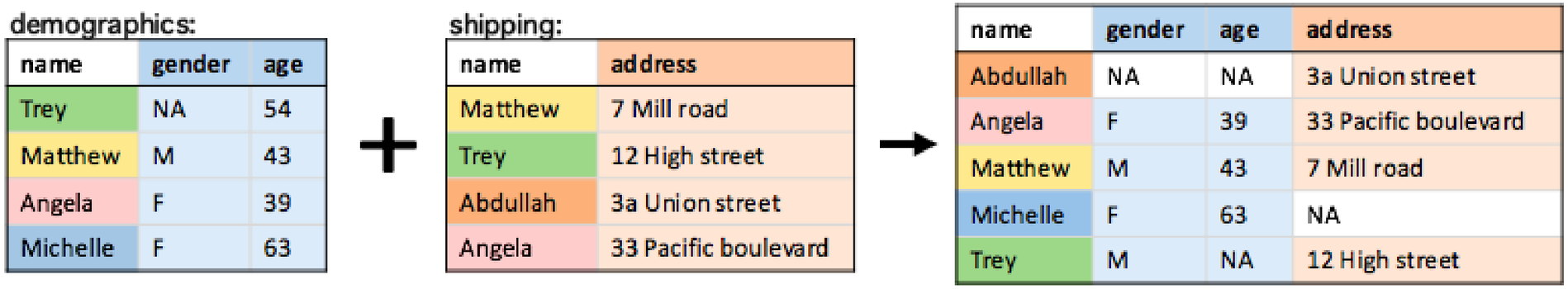
```
shipping[demographics, on = .(name), nomatch = 0]
```



Full joins

Not possible with the `data.table` syntax, use the `merge()` function:

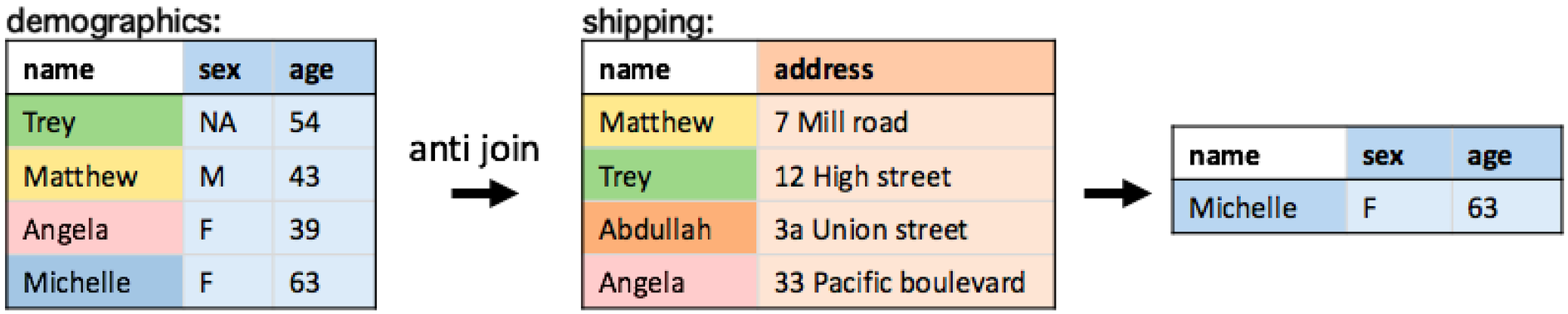
```
merge(demographics, shipping, by = "name", all = TRUE)
```



Anti-joins

Filter a `data.table` to rows that have no match in another `data.table`

```
demographics[!shipping, on = .(name)]
```



JOINING DATA IN R WITH DATA.TABLE

Let's practice!

JOINING DATA IN R WITH DATA.TABLE

Setting and viewing data.table keys

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Setting data.table keys

Setting keys means you don't need the `on` argument when performing a join

- Useful if you need to use a `data.table` in many different joins

Sorts the `data.table` in memory by the key column(s)

- Makes filtering and join operations faster

Multiple columns can be set and used as keys

The setkey() function

Key columns are passed as arguments

```
setkey(DT, ...)
```

```
setkey(DT, key1, key2, key3)

setkey(DT, "key1", "key2", "key3")
```

```
# To set all columns in DT as keys
setkey(DT)
```

The setkey() function

Set the keys of both `data.tables` before a join

```
setkey(dt1, dt1_key)
setkey(dt2, dt2_key)
```

Perform an inner, right, and left join:

```
# Inner join dt1 and dt2
dt1[dt2, nomatch = 0]
```

```
# Right join dt1 and dt2
dt1[dt2]
```

```
# Left join dt1 and dt2
dt2[dt1]
```

Setting keys programmatically

Key columns are provided as a character vector

```
keys <- c("key1", "key2", "key3")
setkeyv(dt, keys)
```

Getting keys

`haskey()` checks whether you have set keys

```
haskey(dt1)
```

```
TRUE
```

`key()` returns the key columns you have set

```
key(dt1)
```

```
"dt1_key"
```

Getting keys

When no keys are set

```
haskey(dt_no_key)

FALSE

key(dt_no_key)

NULL
```

Viewing all data.tables and their keys

```
tables()

     NAME         NROW NCOL MB COLS                          KEY
[1,] dt              3    4  1 key1,key2,key3,value        key1,key2,key3
[2,] dt1         1,000    3  1 dt1_key_column,value,group dt1_key
[3,] dt2         1,000    2  1 dt2_key_column,time         dt2_key
[4,] dt_no_key       5    2  1 id,color
Total: 4MB
```

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Incorporating joins into your data.table workflow

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Chaining data.table expressions

data.table expressions can be chained in sequence:

```
demographics[...][...]
```

General form of chaining a join:

```
DT1[DT2, on][i, j, by]
    |    |   |  |  |
    |    |   |  |   --> grouped by what?
    |    |   |   -----> what to do?
    |    |    --------> on which rows?
    |     ------------> join key columns
     ------------------> join to which data.table?
```

Join then compute

```
customers <- data.table(name   = c("Mark", "Matt", "Angela", "Michelle"),
                        gender = c("M", "M", "F", "F"),
                        age    = c(54, 43, 39, 63))
customers
```

```
       name gender age
1:     Mark      M  54
2:     Matt      M  43
3:   Angela      F  39
4: Michelle      F  63
```

```
purchases <- data.table(name  = c("Mark", "Matt", "Angela", "Michelle"),
                        sales = c(1, 5, 4, 3),
                        spent = c(41.70, 41.78, 50.77, 60.01))
purchases
```

```
       name sales spent
1:     Mark     1 41.70
2:     Matt     5 41.78
3:   Angela     4 50.77
4: Michelle     3 60.01
```

Join then compute

```
customers[purchases,
          on = .(name)][sales > 1,
                        j = .(avg_spent = sum(spent) / sum(sales)),
                        by = .(gender)]

   gender avg_spent
1:      M  13.91333
2:      F  20.00333
```

Computation with joins

Computation with joins:

```
DT1[DT2, on, j]
    |    |   |
    |    |    ----> what to do on the join result?
    |     --------> using which columns as keys?
     -------------> join to which data.table?
```

Efficient for large `data.tables`!

Joining and column creation

Column creation takes place in the main `data.table`:

```
customers[purchases, on = .(name), return_customer := sales > 1]
customers

       name gender age return_customer
1:     Mark      M  54           FALSE
2:     Matt      M  43            TRUE
3:   Angela      F  39            TRUE
4: Michelle      F  63            TRUE
```

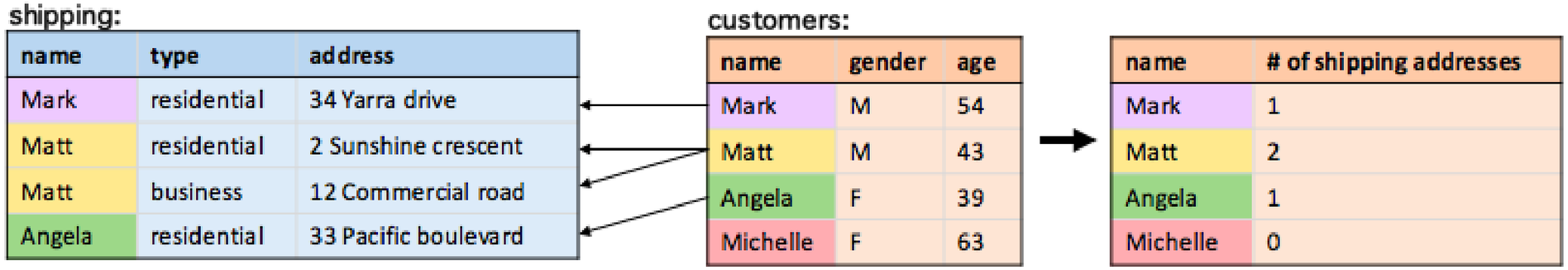
Grouping by matches

`by = .EACHI` groups `j` by each row **from** DT2

```
DT1[DT2, on, j, by = .EACHI]
    |    |   |  |
    |    |   |   --> grouped by each match in DT1.
    |    |    -----> what to do on the join result?
    |     ---------> using which columns as keys?
     --------------> join to which data.table?
```

Grouping by matches

```
shipping[customers, on = .(name),
         j = .("# of shipping addresses" = .N),
         by = .EACHI]
```



Grouping by columns with joins

Grouping by columns in the `by` restricts computation to the main data.table:

```
DT1[DT2, on, j, by]
    |    |   |  |
    |    |   |   --> grouped by what columns in DT1?
    |    |    -----> what to do on columns in DT1?
    |     ---------> using which columns as keys?
     --------------> join to which data.table?
```

Grouping by columns with joins

Join and calculate by group in `customers`:

```
customers[shipping, on = .(name),
          .(avg_age = mean(age)), by = .(gender)]

   gender  avg_age
1:      M 46.66667
2:      F 39.00000
```

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