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Creating an API with R

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APIs and Docker

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- Useful for getting data
- Useful for allowing others to run your code and produce something

APIs and Docker

APIs - a defined method for asking for information from a computer

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- Useful for allowing others to run your code and produce something

Docker - a 'container' to easily transport your code to others

- Include all relevant files (R, packages, etc.)

Ideas important for putting work into pipeline!

Implementing a Model in Production

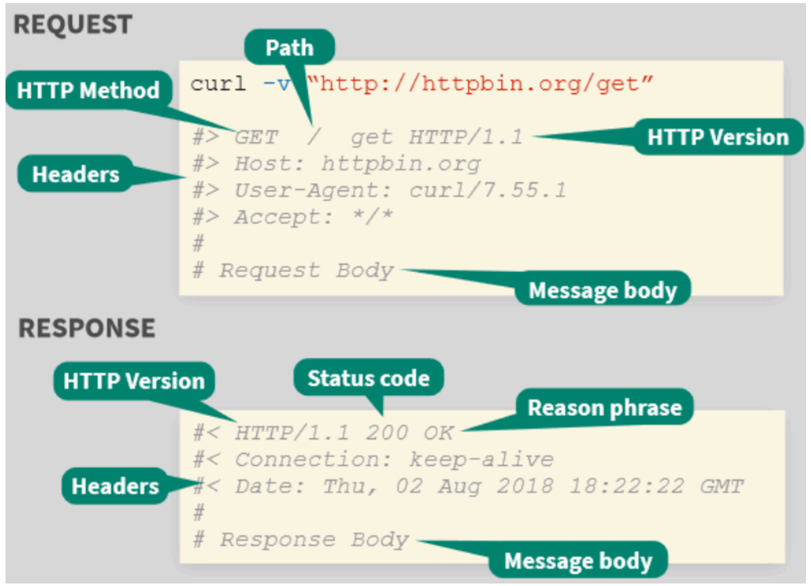
Need a way to make your model available to others

- Can write an API that accesses your model
- Not traditionally done in R!
- Often done in python or lower level language
- Can be done using the `plumber` package

API Basics

`plumber` allows us to build a *REST API*

- Takes in an HTTP request from a client and outputs a response
  - Request and responses are specifically formatted



```
curl -v "http://httpbin.org/get"

#> GET  /  get HTTP/1.1
#> Host: httpbin.org
#> User-Agent: curl/7.55.1
#> Accept: */*
#
# Request Body
```

```
#< HTTP/1.1 200 OK
#< Connection: keep-alive
#< Date: Thu, 02 Aug 2018 18:22:22 GMT
#
# Response Body
```

`plumber` Package

Package creates API by you **decorating** your code with appropriate comments

- `#*`

Ex: Standard R function to paste a message together with comments prior

```
#Send a message
#* @get /readme
function(){
  "This is our basic API"
}

#http://localhost:8000/readme
```

Let's try the template `plumber` file from RStudio!

`plumber` Package

- Endpoints are the logic defining what is returned from a request
- `@get`: a get request, specified by providing something like `/echo`
- Inputs are taken as strings by default

```
#* Find natural log of a number
#* @param num Number to find ln of
#* @get /ln
function(num){
  log(as.numeric(num))
}

#http://localhost:PORT/ln?num=1
```

`plumber` Package

Another example of syntax

```r
#* Find multiple of two numbers
#* @param num1 1st number
#* @param num2 2nd number
#* @get /mult
function(num1, num2){
  as.numeric(num1)*as.numeric(num2)
}

#http://localhost:PORT/mult?num1=10&num2=20
```

`plumber` Package

Output is generally in JSON format

Can alter that:

- for HTML (@serializer html)
- for PNG (@serializer png), for JPEG (@serializer jpeg)
- for htmlwidget (@serializer htmlwidget)

`plumber` Package

Plot output as png

```r
#* Plot of iris data
#* @serializer png
#* @param type base or ggally
#* @param color TRUE or FALSE (only for ggally)
#* @get /plotiris
function(type = "base", color = FALSE){
  if(tolower(type) == "ggally"){
    if(color){
      a <- GGally::ggpairs(iris, aes(color = Species))
      print(a)
    } else {
      a <- GGally::ggpairs(iris)
      print(a)
    }
  } else {
    pairs(iris)
  }
}
#http://localhost:PORT/plotiris?type=base
```

`plumber` Package

- HTML widget as output

```r
#* Plotting widget
#* @serializer htmlwidget
#* @param lat latitude
#* @param lng longitude
#* @get /map
function(lng = 174.768, lat = -36.852){
m <- leaflet::leaflet() |>
  addTiles() |>  # Add default OpenStreetMap map tiles
  addMarkers(as.numeric(lng), as.numeric(lat))
m  # Print the map
}

#http://localhost:PORT/map?lng=174&lat=-36
```

Basic API Process

- Create your R functions
- Load the `plumber` library
- Put them into a file to source with the `plumb` function (or use RStudio's button)
- Code way:

```r
library(plumber)
r <- plumb("API/myAPI.r")
r$run(port = 8000)
#is hosted at http://localhost:8000
```

Recap

- Create our API via `plumber` package
- Decorate code with specific comments
- Many other things can be done we didn't cover!