

ST 558 Homework 4

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Task 1 Conceptual Questions

```
# this was one I was trying to make a list for my repsonses
#task_1_QandA <- list("Question 1" = "The purpose of lapply() is to be able to use apply() to
```

Question 1 What is the purpose of lapply()? What is the equivalent purr function?

The purpose of lapply() is to be able to use apply() to lists and lists elements. The equivalent purr function is map().

Question 2 Suppose my_list

```
lapply(my_list, cor, method = "kendall")
```

Question 3 Advantages of using purrr functions

Two advantages to using purrr: 1) more consistency and some helper functions. 2) able to use “shortcut”/ short hand formula code.

Question 4 Side-effect function?

A side effect function is a functions that doesn't try to change the data, but it does try to produce something. Examples seen in the note: print(), or write.csv().

Question 5 sd as a variable and sd function

I can name a variable sd in a function and not cause any issues with the sd function because they are stored in different objects or locations. Like they represent two different things. One is a variable I came up with in my R while the function is one that everyone can use that is not locally stored.

Task 2 - Writing R Functions

###Question 1 Write function getRMSE()

```
options(width = 80)
getRMSE <- function (y, y_hat, ...) { #y=actual responses y_hat=predictions
  diff_sq <- (y-y_hat)^2 #difference and squared
  mean_diff_sq <-mean(diff_sq,...) #the mean of diffs
  rmse <- sqrt(mean_diff_sq)
  return(rmse)
}
```

Question 2 Root Mean Square Error

```
set.seed(10)
n <- 100
x <- runif(n)
resp <- 3 + 10*x + rnorm(n)
pred <- predict(lm(resp ~ x), data.frame(x))
```

```
getRMSE (resp, pred) #without specifying
```

```
[1] 0.9581677
```

```
resp [1] <- NA_real_ #changing to make element 1 NA
resp[2] <-NA_real_ #changing to make element 2 NA
```

```
getRMSE (resp, pred)
```

```
[1] NA
```

```
getRMSE (resp, pred, na.rm = TRUE) #with specifying NA treatment
```

```
[1] 0.9661699
```

Question 3 Mean Absolute Deviation

```
getMAE <- function (y, y_hat, ...) { #y=actual responses y_hat=predictions "... " used to add  
  absolute_diff <- abs(y-y_hat) #difference and abs val  
  MAE <- mean(absolute_diff,...) #the mean of diffs  
  return(MAE)  
}
```

Question 4 Testing MAE

```
set.seed(10)  
n <- 100  
x <- runif(n)  
resp <- 3 + 10*x + rnorm(n)  
pred <- predict(lm(resp ~ x), data.frame(x))
```

```
getMAE(resp, pred) #testing MAE
```

```
[1] 0.8155776
```

```
#replacing two values with NA_real_  
resp[1] <- NA_real_ #hopefully replacing element 1 w/ NA  
resp[2] <- NA_real_ #hopefully replacing element 2 w/ NA
```

```
getMAE(resp, pred) #w/o
```

```
[1] NA
```

```
getMAE(resp, pred, na.rm = TRUE) #w/specifying
```

```
[1] 0.8241201
```

Question 5 Wrapper Function

```
my_wrapper <- function( y, y_hat, metrics = c("RMSE", "MAE"), ...) {  
  if (!is.numeric(y) || !is.numeric(y_hat)) {  
    stop("Error: Both y and y_hat must be numeric vectors.")  
  }  
  if (!is.atomic(y) || !is.atomic(y_hat)) {  
    stop("Error: Both y and y_hat must be atomic vectors.")  
  }  
  if (!is.vector(y) || !is.vector(y_hat)) {  
    stop("Error: Both y and y_hat must be vectors.")  
  }  
  results <- list()  
  if ("RMSE" %in% metrics) {  
    results$RMSE <- getRMSE(y, y_hat)  
  }  
  if ("MAE" %in% metrics) {  
    results$MAE <- getMAE(y, y_hat)  
  }  
  return(results)  
}
```

Question 6 Testing Wrapper

```
set.seed(10)  
n <- 100  
x <- runif(n)  
resp <- 3 + 10*x + rnorm(n)  
pred <- predict(lm(resp ~ x), data.frame(x))
```

```
my_wrapper(resp, pred, "RMSE") # 1 result at a time RMSE
```

```
$RMSE  
[1] 0.9581677
```

```
my_wrapper(resp, pred, "MAE") #1 result at a time MAE
```

```
$MAE  
[1] 0.8155776
```

```
my_wrapper(resp, pred) #calling both
```

```
$RMSE  
[1] 0.9581677
```

```
$MAE  
[1] 0.8155776
```

```
#replacing two values with NA_real_  
resp[1] <- NA_real_ #hopefully replacing element 1 w/ NA  
resp[2] <- NA_real_ #hopefully replacing element 2 w/ NA
```

```
my_wrapper(resp, pred, "RMSE") # 1 result at a time RMSE
```

```
$RMSE  
[1] NA
```

```
my_wrapper(resp, pred, "MAE") #1 result at a time MAE
```

```
$MAE  
[1] NA
```

```
my_wrapper(resp, pred) #calling both
```

```
$RMSE  
[1] NA
```

```
$MAE  
[1] NA
```

```
my_wrapper(iris$Sepal.Length, iris$Species) (echo = FALSE) #testing for error
```

```
Error in my_wrapper(iris$Sepal.Length, iris$Species): Error: Both y and y_hat must be numeric
```

Task 3

Question 1 GET()

```
#install.packages("httr")
library(httr)
library(jsonlite)
```

```
URL_ids <- "https://newsapi.org/v2/top-headlines?country=us&category=health&apiKey=6cbf1ccd7a"
id_info <- GET(URL_ids)
str(id_info)
```

List of 10

```
$ url      : chr "https://newsapi.org/v2/top-headlines?country=us&category=health&apiKey=6cbf1ccd7a"
$ status_code: int 200
$ headers   :List of 15
..$ date      : chr "Wed, 25 Jun 2025 02:39:18 GMT"
..$ content-type : chr "application/json; charset=utf-8"
..$ transfer-encoding: chr "chunked"
..$ connection  : chr "keep-alive"
..$ content-encoding : chr "gzip"
..$ cache-control : chr "no-cache"
..$ pragma      : chr "no-cache"
..$ expires     : chr "-1"
..$ x-cached-result : chr "false"
..$ cf-cache-status : chr "DYNAMIC"
..$ report-to    : chr "{\"endpoints\": [{\"url\": \"https://a.nel.cloudflare.com/\"}]"
..$ nel         : chr "{\"success_fraction\": 0, \"report_to\": \"cf-nel\", \"max_age\": 60}"
..$ server      : chr "cloudflare"
..$ cf-ray      : chr "955117f9ba22672f-ATL"
..$ server-timing : chr "cfL4;desc=\\\"?proto=TCP&rtt=35022&min_rtt=35019&rtt_var=13139&..."
..- attr(*, "class")= chr [1:2] "insensitive" "list"
$ all_headers:List of 1
..$ :List of 3
.. ..$ status : int 200
.. ..$ version: chr "HTTP/1.1"
.. ..$ headers:List of 15
.. .. ..$ date      : chr "Wed, 25 Jun 2025 02:39:18 GMT"
.. .. ..$ content-type : chr "application/json; charset=utf-8"
.. .. ..$ transfer-encoding: chr "chunked"
.. .. ..$ connection  : chr "keep-alive"
.. .. ..$ content-encoding : chr "gzip"
.. .. ..$ cache-control : chr "no-cache"
.. .. ..$ pragma      : chr "no-cache"
.. .. ..$ expires     : chr "-1"
```

```

.. .. ..$ x-cached-result : chr "false"
.. .. ..$ cf-cache-status : chr "DYNAMIC"
.. .. ..$ report-to       : chr "{\"endpoints\":[{\"url\":"https://\\a.nel.cloudflare.
.. .. ..$ nel             : chr "{\"success_fraction\":0,\"report_to\":\"cf-nel\", \"max_age\"
.. .. ..$ server          : chr "cloudflare"
.. .. ..$ cf-ray          : chr "955117f9ba22672f-ATL"
.. .. ..$ server-timing   : chr "cfL4;desc=\"?proto=TCP&rtt=35022&min_rtt=35019&rtt_var=1
.. .. ..- attr(*, "class")= chr [1:2] "insensitive" "list"
$ cookies      : 'data.frame':  0 obs. of  7 variables:
..$ domain      : logi(0)
..$ flag        : logi(0)
..$ path        : logi(0)
..$ secure      : logi(0)
..$ expiration: 'POSIXct' num(0)
..$ name        : logi(0)
..$ value       : logi(0)
$ content      : raw [1:13801] 7b 22 73 74 ...
$ date         : POSIXct[1:1], format: "2025-06-25 02:39:18"
$ times        : Named num [1:6] 0 0.228 0.269 0.32 0.521 ...
..- attr(*, "names")= chr [1:6] "redirect" "namelookup" "connect" "pretransfer" ...
$ request      :List of 7
..$ method      : chr "GET"
..$ url         : chr "https://newsapi.org/v2/top-headlines?country=us&category=health&apiKey
..$ headers     : Named chr "application/json, text/xml, application/xml, */*"
.. ..- attr(*, "names")= chr "Accept"
..$ fields      : NULL
..$ options     :List of 2
.. ..$ useragent: chr "libcurl/8.10.1 r-curl/6.2.3 httr/1.4.7"
.. ..$ httpget  : logi TRUE
..$ auth_token  : NULL
..$ output      : list()
.. ..- attr(*, "class")= chr [1:2] "write_memory" "write_function"
..- attr(*, "class")= chr "request"
$ handle       :Class 'curl_handle' <externalptr>
- attr(*, "class")= chr "response"

```

Question 2 Parsing

```

library(jsonlite)
library(tidyverse)

```

```
-- Attaching core tidyverse packages ----- tidyverse 2.0.0 --
v dplyr      1.1.4      v readr      2.1.5
v forcats    1.0.0      v stringr    1.5.1
v ggplot2    3.5.2      v tibble     3.2.1
v lubridate  1.9.4      v tidyr      1.3.1
v purrr      1.0.4

-- Conflicts ----- tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x purrr::flatten() masks jsonlite::flatten()
x dplyr::lag()     masks stats::lag()
i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become
```

```
parsed <-fromJSON(rawToChar(id_info$content))
article_info <-as_tibble(parsed$articles)
article_info[[3]]
```

```
[1] "FDA approves HIV drug based on University of Utah biochemist's findings - KSL News"
[2] "The #1 Underrated Food to Increase Your Magnesium Intake, According to Dietitians - Eat"
[3] "Scientists Have Figured Out Exactly How Much Time Drinking Takes Off Your Life - AOL.co"
[4] "Severe bedbug infestation spreads through Coolidge Corner condo building - Brookline.N"
[5] "Fat composition in ketogenic diet may influence outcomes in MS - Multiple Sclerosis Ne"
[6] "Want to know how long you'll live? This 10-second sit-stand test might have the answer"
[7] "The #1 Supplement to Support Gut Health, Recommended by a Gastroenterologist - EatingW"
[8] "Where in Maine are you most likely to get a dangerous tick bite? - The Portland Press H"
[9] "Frequent Nightmares Linked to Faster Aging and Premature Death - Gizmodo"
[10] "6 Things Women over 50 Should Do Every Night Before Bed, According to Dietitians - AOL"
[11] "Column | We asked an oncologist: Should we worry about endocrine disruptors? - The Wash"
[12] "Cat Parasite Can Seriously Disrupt Brain Function, Study Suggests - ScienceAlert"
[13] "Can creatine supplements make you fat? Doctor busts 4 myths, shares tips to use it eff"
[14] "1 Nutrient You're Likely Not Eating Enough of on a High-Protein Diet - TODAY.com"
[15] "Struggling with knee pain? Dr Shriram Nene shares 6 tips that could save your joints -"
[16] "The truth about using cannabis for health problems - The Washington Post"
```

Question 3 Query Function

```
library(httr)
my_api_query <- function (title, date, api_key){
  starting_url <- "https://newsapi.org/v2/everything"
  responses <-GET(url = starting_url, query= list( q = title,
    from = date, apiKey=api_key))
```



```

  parsed_my_query <- fromJSON(rawToChar(responses$content))
  article_title <- as_tibble(parsed_my_query$articles)
  return(article_title)
}

```

```
my_api_res1 <- my_api_query("measles", "2025-06-16", "6cbf1ccd7a26414fb634a04a7fef4f91") #th
```

```
my_api_res1
```

```
# A tibble: 92 x 8
```

	source\$id	\$name	author	title	description	url	urlToImage	publishedAt	content
	<chr>	<chr>	<chr>	<chr>	<chr>	<chr>	<chr>	<chr>	<chr>
1	the-verge	The ~	Laure~	RFK ~	"Last Nove~	http~	https://p~	2025-06-18~	"RFK J~
2	<NA>	Yaho~	<NA>	Map ~	<NA>	http~	<NA>	2025-06-20~	"If yo~
3	<NA>	Tech~	Dark ~	In T~	"The secon~	http~	https://w~	2025-06-16~	"from ~
4	abc-news	ABC ~	ABC N~	WATC~	"There is ~	http~	https://i~	2025-06-16~	"<~
5	abc-news	ABC ~	ABC N~	WATC~	"A group o~	http~	https://i~	2025-06-16~	"<~
6	abc-news	ABC ~	ABC N~	WATC~	"President~	http~	https://i~	2025-06-22~	"<~
7	abc-news	ABC ~	ABC N~	WATC~	"In 2015, ~	http~	https://i~	2025-06-16~	"<~
8	abc-news	ABC ~	ABC N~	WATC~	"British a~	http~	https://i~	2025-06-16~	"<~
9	abc-news	ABC ~	ABC N~	WATC~	"Mei Zhu, ~	http~	https://i~	2025-06-21~	"<~
10	abc-news	ABC ~	ABC N~	WATC~	"Kilauea, ~	http~	https://i~	2025-06-21~	"<~

```
# i 82 more rows
```

```
my_api_res2 <- my_api_query("gamestop", "2025-06-16", "6cbf1ccd7a26414fb634a04a7fef4f91") #tl
```

```
my_api_res2 #everything
```

```
# A tibble: 99 x 8
```

	source\$id	\$name	author	title	description	url	urlToImage	publishedAt	content
	<chr>	<chr>	<chr>	<chr>	<chr>	<chr>	<chr>	<chr>	<chr>
1	the-verge	The ~	Brand~	The ~	"Amazon's ~	http~	https://p~	2025-06-20~	"Amazo~
2	<NA>	Gizm~	James~	Some~	"There's o~	http~	https://g~	2025-06-18~	"The S~
3	<NA>	Yaho~	<NA>	\$1.4~	<NA>	http~	<NA>	2025-06-18~	"If yo~
4	<NA>	Andr~	Adamy~	Some~	"In a high~	http~	https://w~	2025-06-19~	"<~
5	<NA>	Xata~	John ~	Cuan~	"El robo m~	http~	https://i~	2025-06-20~	"El ro~
6	<NA>	Kota~	Ethan~	It's~	"Hot off t~	http~	https://i~	2025-06-23~	"Hot o~
7	<NA>	Game~	Steve~	Both~	"Pokemon L~	http~	https://w~	2025-06-23~	"Pokem~
8	<NA>	Kota~	Justi~	Six ~	"You wake ~	http~	https://i~	2025-06-20~	"You w~
9	<NA>	Gizm~	Kyle ~	Nint~	"The Switc~	http~	https://g~	2025-06-20~	"After~

10 <NA> Bizt~ barch~ Anal~ "" http~ https://b~ 2025-06-16~ "{ win~
i 89 more rows

```
my_api_res2[[4]] #titles
```

```
[1] "Amazon's mega sale is nearly upon us. This year, Prime Day will kick off on July 8th and  
well, aside from Amazon's so-called "..."  
[2] "There's only one villain who's greedy enough to pull off a heist of this caliber."  
[3] NA  
[4] "In a high-stakes heist, thieves stole 2,810 units of the newly released Nintendo Switch 2  
[5] "El robo más espectacular en lo que llevamos de junio ha tenido una víctima poco habitua  
[6] "Hot off the conclusion of Andor's incredible Rebel Alliance origin story, fans have bee  
[7] "Pokemon Legends: Z-A for Switch \r\n $60 | Releases October 16 \r\nPreorder at Amazon I  
[8] "You wake up at 1 am to score a pre-order. You put yourself in manageable debt to financ  
[9] "The Switch 2 \"1-Ups\" the groundbreaking original in every single way."  
[10] ""  
[11] "Se dice que, cada uno hace con su dinero lo que quiere, pero en el futuro está la preg  
[12] "Authorities say that the 2,810 Nintendo Switch 2 consoles were stolen from the back of  
[13] " Switch 2 2810 Switch 2 140 HK$1,092 \nThe pos  
[14] "A $1.4-million Nintendo Switch 2 shipment has been stolen off the back of a semi-truck  
[15] NA  
[16] "Probabilmente finiranno sul dark web"  
[17] " 3,000 Switch 2 140 ( 4,100 )  
[18] "A user on the Chinese online marketplace Goofish is offering what appears to be the Ni  
[19] NA  
[20] "To tak dziwne, że aż niewiarygodne. W Stanach Zjednoczonych doszło do spektakularnej k  
[21] "Samsung 1TB Pro Plus microSD Card (180MB/s) \r\n $70 (was $120) | Best price to date \r  
[22] " 12 ."  
[23] "Ein LKW voller Switch-2-Konsolen ist spurlos verschwunden - irgendwo zwischen Nintendo  
[24] "Nos EUA, um roubo de \"brinquedos\" envolvendo 2.800 consoles Switch 2 resultou em um p  
[25] " "  
[26] "Fans in den USA erleben Frust: Nagelneue Switch 2 mit Löchern im Display. GameStop taci  
[27] "Un furto clamoroso ha colpito la filiera distributiva della Nintendo Switch 2, e non in  
[28] "Gearbox and 2K today opened Borderlands 4 pre-orders, with the rather unexpected $69.99  
[29] "Borderlands 4 is up for pre-order, including the Collector's Edition. However, there is  
[30] "Gearbox and 2K today opened Borderlands 4 pre-orders, with the rather unexpected $69.99  
[31] NA  
[32] " - Borderlands 4, "  
[33] "I negozi gamelife e GameStop accettano ora anche il ritiro di retrogaming per PlayStat  
[34] "Borderlands 4 Standard Edition \r\n $70 \r\nPreorder at Best Buy (PS5) Preorder at Bes  
[35] "Nasdaq-listed Genius Group grows Bitcoin treasury by 52% in a month, after a favorable  
[36] " , "
```

[37] " 3 Nintendo Switch 2. -

[38] " Switch 2 [...] \n The post Switch 2 140 appeared

[39] "The Nintendo Switch 2 is a hot commodity, so much so that the theft of the console in

[40] "IT 6 18 Switch 2 500 IT 3594 6 8 8

[41] "A fresh Nintendo Switch 2 restock has finally made the console available to buy again

[42] "Rune Factory: Guardians of Azuma - Earth Dancer Edition (Switch) \r\n \$100 | Restocked

[43] "A delivery truck driver had a nasty surprise earlier today in Colorado when he discover

[44] "Un vol spectaculaire a eu lieu aux États-Unis : 2 810 consoles Nintendo Switch 2, d'un

[45] "As the price of bitcoin rallies above \$100,000, a host of companies are harnessing publ

[46] "Nintendo Switch 2 har nyligen lanserats. Men för invånare i Grapevine, Texas, kan det

[47] "Amazon is now offering the officially-licensed HORI Compact Carry All Travel Bag for N

[48] "Nintendo Switch 2 stock is back in action this week, with planned drops across both the

[49] "Or you can wait until January when you will probably be able to pick it up for \$40"

[50] "While US debt soared to \$37 trillion, BTC quietly rose from zero to a trillion-dollar a

[51] "A brand new co-op game known as Peak is topping the sales charts on Steam after going v

[52] "Some of the holiday's best discounts are already live. Browse the 65 best 4th of July s

[53] "Retirement Systems of Alabama increased its position in GameStop Corp. (NYSE:GME -

Free Report) by 0.2% in the 1st quarter, HoldingsChannel reports. The institutional investor

[54] "GameStop (NYSE:GME) has outperformed the market over the past 5 years by 67.1% on an an

[55] " NS2 \r\n GameStop --

ns2 . GameStop ..."

[56] "Parataxis is launching a Bitcoin treasury platform for South Korean institutional inve

[57] "\nPolicisté v americkém Coloradu vyšetřují kuriózní loupež, při které se z kam

[58] "GameStop Corp (NYSE:GME) shares were trading up approximately 2.7% at \$23.61 Wednesday

[59] "Nakamoto and KindlyMD plan to merge for a bitcoin treasury strategy, joining a BTC bal

[60] "Most of the time, a new Pokemon TCG release finds fans strategizing about which store

[61] "The company will spend up to \$1 billion to establish a Bitcoin treasury."

[62] "Dozens of single-stock ETFs using leverage have recently been filed with the Securities

[63] "so i've got a chronic pain condition that makes office chairs hurt, but that is never

[64] "Walmart, GameStop, and Colgate-Palmolive are the three Ecommerce stocks to watch today

[65] "Walmart, GameStop, and Colgate-Palmolive are the three Ecommerce stocks to watch today

[66] "GameStop, Alibaba Group, and Roblox are the three Entertainment stocks to watch today,

[67] "Earlier this month, fans began to speculate that big news about the next game in the C

[68] "Best Buy has restocked the Nintendo Switch 2, giving you yet another opportunity to buy

[69] "Today, 2K and Gearbox Software opened up pre-orders for the next installment of the Bo

[70] "Costco Wholesale, Walmart, GameStop, Target, Take-Two Interactive Software, Kroger, and

often micr..."

[71] "Meta Platforms, GameStop, Best Buy, Unity Software, EPAM Systems, Ambarella, and Everb

[72] "Walmart, GameStop, Colgate-Palmolive, BellRing Brands, and W.W. Grainger are the five

[73] "Walt Disney, Alibaba Group, GameStop, Roblox, and SEA are the five Entertainment stocks

[74] "Meta Platforms, GameStop, and Best Buy are the three Virtual Reality stocks to watch t

[75] "Walmart, GameStop, Colgate-Palmolive, W.W. Grainger, BellRing Brands, Post, and Regal

[76] "Meta Platforms, GameStop, Best Buy, Unity Software, and EPAM Systems are the five Virt

[77] "Direxion Daily TSLA Bull 2X Shares, Oklo, GameStop, RH, and Archer Aviation are the fi
[78] "Meta Platforms, GameStop, and Unity Software are the three Virtual Reality stocks to w
[79] "Meta Platforms, GameStop, Best Buy, Unity Software, EPAM Systems, Ambarella, and POET
[80] "Elden Ring Nightreign è protagonista di un nuovo contest grafico organizzato da gameli
[81] "Donkey Kong Bananza \r\n \$70 | Releases July 17 \r\nPreorder at Amazon Preorder at Wal
[82] ""
[83] ""
[84] ""
[85] ""
[86] ""
[87] ""
[88] ""
[89] ""
[90] ""
[91] ""
[92] ""
[93] ""
[94] ""
[95] ""
[96] ""
[97] "More to come....."
[98] ""
[99] ""