

SHETH L.U.J AND SIR M.V. COLLEGE

SUBJECT :- DATA ANALYSIS WITH SAS/SPSS/R

MODULE 2 - PRACTICAL – 6

AIM:- Performing paired t-tests using t.test(paired=TRUE) (R).

OUTPUT:-

```
rajji - RStudio
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Go to file/function Addins
Source
Console Terminal Background Jobs
R - R4.1.2 - ~rajji/
[1] The paired t-test compares two related (paired) measurements of the same variable. Since both observations come from the same subjects, the paired t-test is appropriate. The decision is made using the 5% significance level.
> library(dplyr)
>
> # 1. Load Dataset
> df <- read.csv("C:\\Users\\rajji\\Downloads\\games.csv")
> print("Dataset Loaded Successfully")
[1] "Dataset Loaded Successfully"
>
> # 2. Dataset Overview
> head(df)
  x                               Title Release.Date      Team Rating Times.Listed Number.of.Reviews
1 0                      Elden Ring Feb 25, 2022  ['Bandai Namco Entertainment', 'FromSoftware']  4.5      3.9K      3.9K
2 1                      Hades Dec 10, 2019      ['Supergiant Games']  4.3      2.9K      2.9K
3 2 The Legend of Zelda: Breath of the Wild Mar 03, 2017 ['Nintendo', 'Nintendo EPD Production Group No. 3']  4.4      4.3K      4.3K
4 3                      Undertale Sep 15, 2015      ['tobyfox', '8-B']  4.2      3.5K      3.5K
5 4                      Hollow Knight Feb 24, 2017      ['Team Cherry']  4.4      3K      3K
6 5                      Minecraft Nov 18, 2011      ['Mojang Studios']  4.3      2.3K      2.3K
  Genres
1 ['Adventure', 'RPG']
2 ['Adventure', 'Brawler', 'Indie', 'RPG']
3 ['Adventure', 'RPG']
4 ['Adventure', 'Indie', 'RPG', 'Turn based Strategy']
5 ['Adventure', 'Indie', 'Platform']
6 ['Adventure', 'Simulator']
Summary
1 Elden Ring is a fantasy, action and open world game with RPG elements such as stats, weapons and spells. Rise, Tarnished, and be guided by grace to brandish the power of the Elden Ring and become an Elden Lord in the Lands Between.
2 A rogue-lite hack and slash dungeon crawler in which Zagreus, son of Hades the greek god of the dead, attempts to escape his home and his oppressive father by fighting the souls of the dead through the various layers of the ever-shifting underworld, while getting to know and forging relationships with its inhabitants.
3 The Legend of Zelda: Breath of the Wild is the first 3D open-world game in the Zelda series. Link can travel anywhere and be equipped with weapons and armor found throughout the world to grant him various bonuses. Unlike many games in the series, Breath of the Wild does not impose a specific order in which quests or dungeons must be completed, while the game still has environmental obstacles such as weather effects, inhospitable lands, or powerful enemies, many of them can be overcome using the right method. A lot of critics ranked Breath of the Wild as one of the best video games of all time.
4 A small child falls into the underground, where monsters have long been banished by humans and are hunting every human that they find. The player controls the child as they try to make it back to the surface through hostile environments, all the while engaging with a turn-based combat system with puzzle-solving and bullet hell elements, as well as other unconventional game mechanics.
5 A 2D metroidvania with an emphasis on close combat and exploration in which the player enters the once-prosperous now-bleak insect kingdom of Hallownest, travels through its various districts,
```

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2 A rogue-lite hack and slash dungeon crawler in which Zagreus, son of Hades the greek god of the dead, attempts to escape his home and his oppressive father by fighting the souls of the dead through the various layers of the ever-shifting underworld, while getting to know and forging relationships with its inhabitants.
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5 A 2D metroidvania with an emphasis on close combat and exploration in which the player enters the once-prosperous now-bleak insect kingdom of Hallownest, travels through its various districts, meets friendly inhabitants, fights hostile ones and uncovers the kingdom's history while improving their combat abilities and movement arsenal by fighting bosses and accessing out-of-the-way areas.
6 Minecraft focuses on allowing the player to explore, interact with, and modify a dynamically-generated map made of one-cubic-meter-sized blocks. In addition to blocks, the environment features plants, mobs, and items. Some activities in the game include mining for ore, fighting hostile mobs, and crafting new blocks and tools by gathering various resources found in the game. The game's open-ended model allows players to create structures, creations, and artwork on various multiplayer servers or their single-player maps. Other features include redstone circuits for logic computations and remote actions, minecarts and tracks, and a mysterious underworld called the Nether. A designated but completely optional goal of the game is to travel to a dimension called the End, and defeat the ender dragon.
... <truncated>
1 [The first playthrough of Elden Ring is one of the best experiences gaming can offer you but after you've explored everything in the open world and you've experienced all of the surprises you lose motivation to go exploring on repeat playthroughs which takes a lot away from the replayability which is a very important thing for from games IMO. - "A replay solidified my love for Elden Ring, so easily my favorite game of all time. actually beating Malenia this time was also an amazing feeling. i just love being in this world man its the greatest of all time", "the game is also lutely beautiful, with so much to do. The replayability is crazy. ... <truncated>
2 [convinced this is a roguelike for people who do not like the genre. the art is technically good but the aesthetic does very little for me, too clean or something, idk wish i liked it but i do not", "incredible art, a banger soundtrack a surprisingly charming storyline and a big red dog. Hades has very smooth gameplay but after playing it for a while it just feels like you're doing the same 3 hit combo over and over again, which doesn't get me wrong that combo feels great to do but once i becomes muscle memory you kinda go into autopilot. also i think the boons are cool but i would like to see them change the flow of combat a bit more, there are some cool ones like the grape boon that can change the way you play but most of them are just upgrades that don't really change the gameplay or strategy, other than those 2 small gripes the game is fantastic.", "People tell me this game gets really really good at some point but i've beaten entire games in the amount of time i gave this game.", "Não sou muito de jogo indie, admito que joguei poucos, mas devo dizer que Hades foi um dos melhores jogos que joguei na vida, facilmente no top 15. Toda sua arte, dublagem, gameplay, carisma dos personagens, Aê tudo incr ... <truncated>
3 [This game is the game (that is not CS:GO) that I have played the most ever. I have played this game for 400 hours.", "A really good switch game, however didn't really grip me like Mario Odyssey", "I was very disappointed by the final boss fight, but the rest of the game is so good it makes me not want to even do the final boss fight anyway just so i can play more of the game. i do ...
```

SUMEET JITENDRA YADAV

S124

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dublagem, gameplay, carisma dos personagens, Aê tudo incr ... <truncated>
3
["This game is the game (that is not CS:GO) that I have played the most ever. I have played this game for 400 hours.", "A really good switch game, however didn't really grip me like mario odyssey", "I was very disappointed by the final boss fight, but the rest of the game is so good it makes me not want to even do the final boss fight anyway just so i can play more of the game. I do wish that there were more unique mechanics in combat besides just parrying and link's flurry rush, but the world is really pretty and actually incentivizes exploring it. characters are great, s
tory is great and makes you work for it, and there's tons of hidden secrets and details.", "em 105 horas de jogo não houve um segundo que eu não tava me divertindo e eu acho que isso diz muit
o", "sencillamente el mejor juego que he tenido el placer de disfrutar, esperô 5 años para poder jugarlo y puedo decir que valió cada segundo la espera. No estoy ni cerca de conseguir el 10
0%, tengo mas de 100 horas y aún estoy descubriendo cosas nuevas. va más allá de un simple juego, es una experiencia que lamentablemente solo se puede vivir ... <truncated>
4
["soundtrack is tied for #1 with nier automata. a super charming story and characters which have become iconic. and all that made by 1 man. thats it, thats t ... <truncated>
5
["this games worldbuilding is incredible, with its amazing soundtrack and gorgeous art direction it really makes you feel like you're spiderman. one of the best value in gaming tbh, this gam
e is packed full of content and none of it feels like filler. even the boss rush manages to feel fresh by introducing some surprise bosses/boss variants as rewards for beating tough pantheons.
cant wait to play silksong when i turn 80!", "This isn't just a game, this is an entire experience.", "I was not too much into Metroidvania games and
then I tried this without any expectation, it became one of my favorite games of all time and brought me into the genre, now I'm seeking for similar adventures and I can't wait for Silksong.", "
I've done all 112k in my first run and now I'm beating the game again, then I'll aim to master the game on steam, and this is the first time a game instigated me to do t
hat. Masterpiece.", "raz uns 2/3 anos que eu zeroi esse jogo, mesmo assim nunca saiu da minha memória.", "você jogou para fazer uma análise mais a
profundada", "i like how you can bounce on spikes with your nail. a good casual game that offers additional challenges for people that are socially challenged", "A rivetting action/adventure ga
me with a stunning design. Extremely rewarding but also gruesomely difficult at times.", "I'd give this game a 4 for each individual aspect (platforming, exploration, combat) but the integrati
on and packaging of the content are so good, it's slightly better than the sum of its parts. Most of the combat and traversal abilities feel useful, and many evoke that Super Metroidry, glee
ul feeling that you'll finally be able to access that new area, grab that item, or beat that boss. The end-game challenges, reminiscent of wiley's Fortress and boss rushes after Meganan has
fully self-actualized, were the highlight. Boss ... <truncated>
6
["Winecraft is what you make of it. unfortunately theres no reason to do anything.", "muito bom, vc pode construir, usar sua imaginação, mods, sobreviver, jogar multiplayer e até zerar o jog
o! minecraft Aê um jogo incrável e ... <truncated>
Plays Playing Backlogs wishlist
1 17K 3.8K 4.6K 4.8K
2 21K 3.2K 6.3K 3.6K
3 30K 2.5K 5K 2.6K
4 28K 679 4.9K 1.8K
5 21K 2.4K 8.3K 2.3K
6 33K 1.8K 1.1K 230
> str(df)
'data.frame': 1512 obs. of 14 variables:
 $ X : int 0 1 2 3 4 5 6 7 8 9 ...
 $ title : chr "Elden Ring" "Hades" "The Legend of Zelda: Breath of the wild" "Undertale" ...
 $ Release.Date : chr "Feb 25, 2022" "Dec 10, 2019" "Mar 03, 2017" "Sep 15, 2015" ...
 $ Team : chr "['Bandai Namco Entertainment', 'FromSoftware']" "['Supergiant Games']" "['Nintendo', 'Nintendo EPD Production Group No. 3']" "['tobyfox', '8-4']" ...
 $ Rating : num 4.5 4.3 4.4 4.2 4.4 4.3 4.2 4.3 3 4.3 ...
 $ Times.Listed : chr "3.9K" "2.9K" "4.3K" "3.5K" ...
 $ Number.of.Reviews : chr "3.9K" "2.9K" "4.3K" "3.5K" ...
 $ Genres : chr "['Adventure', 'RPG']" "['Adventure', 'Brawler', 'Indie', 'RPG']" "['Adventure', 'RPG']" "['Adventure', 'Indie', 'RPG', 'Turn Based Strategy']" ...
 $ Summary : chr "Elden Ring is a fantasy, action and open world game with RPG elements such as stats, weapons and spells. Rise, ..." "A rogue-lite hack and slash dungeon
crawler in which zagreus, son of Hades the Greek god of the dead, attempts ..." "The Legend of Zelda: Breath of the wild is the first 3D open-world game in the Zelda series. Link ca
n travel an ..." "A small child falls into the underground, where monsters have long been banished by humans and are hunting ever ..."
 $ reviews : chr "['The first playthrough of elden ring is one of the best experiences gaming can offer you but after youve explo' ..." "I convinced this is a roguelike for
people who do not like the genre. The art is technically good but the aesth ..." "This game is the game (that is not CS:GO) that i have played the most ever. I have played this gam
e for 400 h ..." "soundtrack is tied for #1 with nier automata. a super charming story and characters which have become iconic" ... <truncated> ...
 $ Plays : chr "17K" "21K" "30K" "28K" ...
 $ Playing : chr "3.8K" "3.2K" "2.5K" "679" ...
 $ Backlogs : chr "4.6K" "6.3K" "5K" "4.9K" ...
 $ wishlist : chr "4.8K" "3.6K" "2.6K" "1.8K" ...
> dim(df)
[1] 1512 14
>
> # 3. create Paired variables
> set.seed(123) # For reproducibility
> df$Rating_Before <- df$Rating
> df$Rating_After <- df$Rating + runif(nrow(df), -0.2, 0.2)
>
> print("Summary of Rating Before:")
[1] "Summary of Rating Before:"
> summary(df$Rating_Before)
 Min. 1st Qu. Median Mean 3rd Qu. Max. NA's
0.700 3.400 3.800 3.719 4.100 4.800 13
>
> print("Summary of Rating After:")
[1] "Summary of Rating After:"
> summary(df$Rating_After)
 Min. 1st Qu. Median Mean 3rd Qu. Max. NA's
0.8352 3.4193 3.7806 3.7179 4.1178 4.8271 13
>
> # 4. Prepare Paired Data
```

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e for 400 h | ____truncated____ | soundtrack is tied for #1 with mter automata. a super charming story and characters which have become iconic | ____truncated____ ...
$ Plays : chr "17K" "21K" "30K" "28K" ...
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[1] "Summary of Rating After:"
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   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.   NA's
0.8352  3.4193  3.7806  3.7179  4.1178  4.8271    13
>
> # 4. Prepare Paired Data
> paired_df <- df %>%
+   select(Rating_Before, Rating_After) %>%
+   na.omit()
>
> print("Number of paired observations:")
[1] "Number of paired observations:"
> nrow(paired_df)
[1] 1499
>
> # 5. Descriptive Statistics
> mean_before <- mean(paired_df$Rating_Before)
> mean_after <- mean(paired_df$Rating_After)
>
> print(paste("Mean Rating Before:", round(mean_before, 2)))
[1] "Mean Rating Before: 3.72"
> print(paste("Mean Rating After:", round(mean_after, 2)))
```

```
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> mean_after <- mean(paired_df$Rating_After)
>
> print(paste("Mean Rating Before:", round(mean_before, 2)))
[1] "Mean Rating Before: 3.72"
> print(paste("Mean Rating After:", round(mean_after, 2)))
[1] "Mean Rating After: 3.72"
>
> # 6. Paired t-test
> # H0: Mean difference between ratings is zero
> # H1: Mean difference between ratings is not zero
>
> print("Paired t-test Result:")
[1] "Paired t-test Result:"
>
> t_test_result <- t.test(
+   paired_df$Rating_Before,
+   paired_df$Rating_After,
+   paired = TRUE
+ )
>
> print(t_test_result)

    Paired t-test

data: paired_df$Rating_Before and paired_df$Rating_After
t = 0.5012, df = 1498, p-value = 0.6163
alternative hypothesis: true difference in means is not equal to 0
95 percent confidence interval:
 -0.004319808  0.007284937
sample estimates:
mean of the differences
      0.001482564

>
> # 7. Decision Based on p-value
> if (t_test_result$p.value < 0.05) {
+   print("Reject the null hypothesis")
+ } else {
+   print("Fail to reject the null hypothesis")
+ }
[1] "Fail to reject the null hypothesis"
> print(head(retail_Product))
```