Google Meet’s Performance Across Variety of Internet Condition

Austria Vince, La Concepcion College, 2022

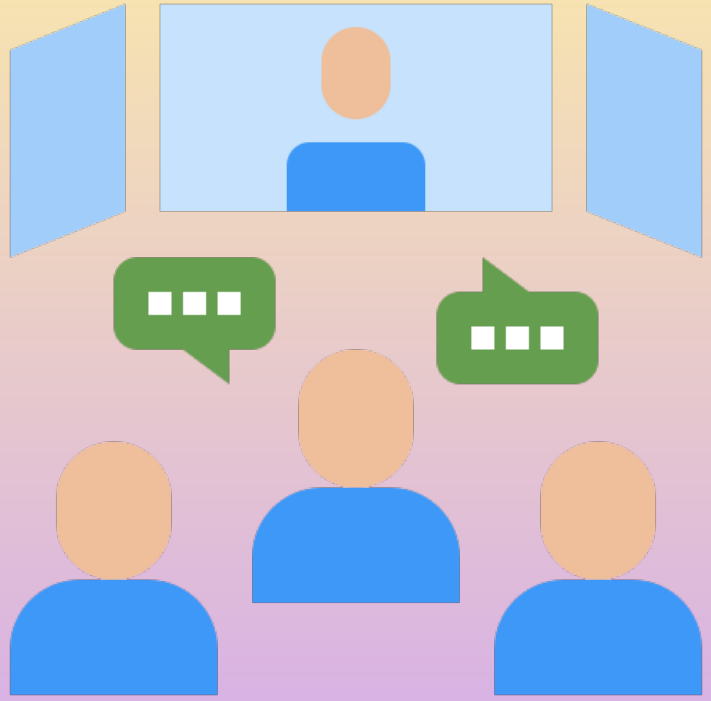
Special thanks to...

- Honorable Panelist
- To Ms. Nelyn (Research adviser)
- My Family <3 (health and funding)
- To my allies (internet and unwinding)
- My classmates :) (peer review)
- TaktusCat
- u/xxEvieEvelyn #reddit
- Dave Warren (statistics and programming support)
- LinusTechTips FB group (technical and network support)
- R statistical software FB group (R programming and data visualization support)

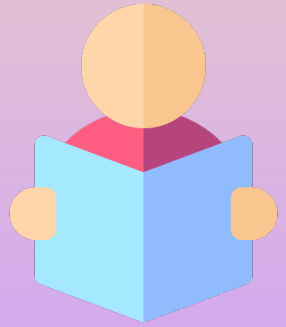
Opening Remarks

Introduction

There’s an ever growing need for reliable video conferencing software than ever before

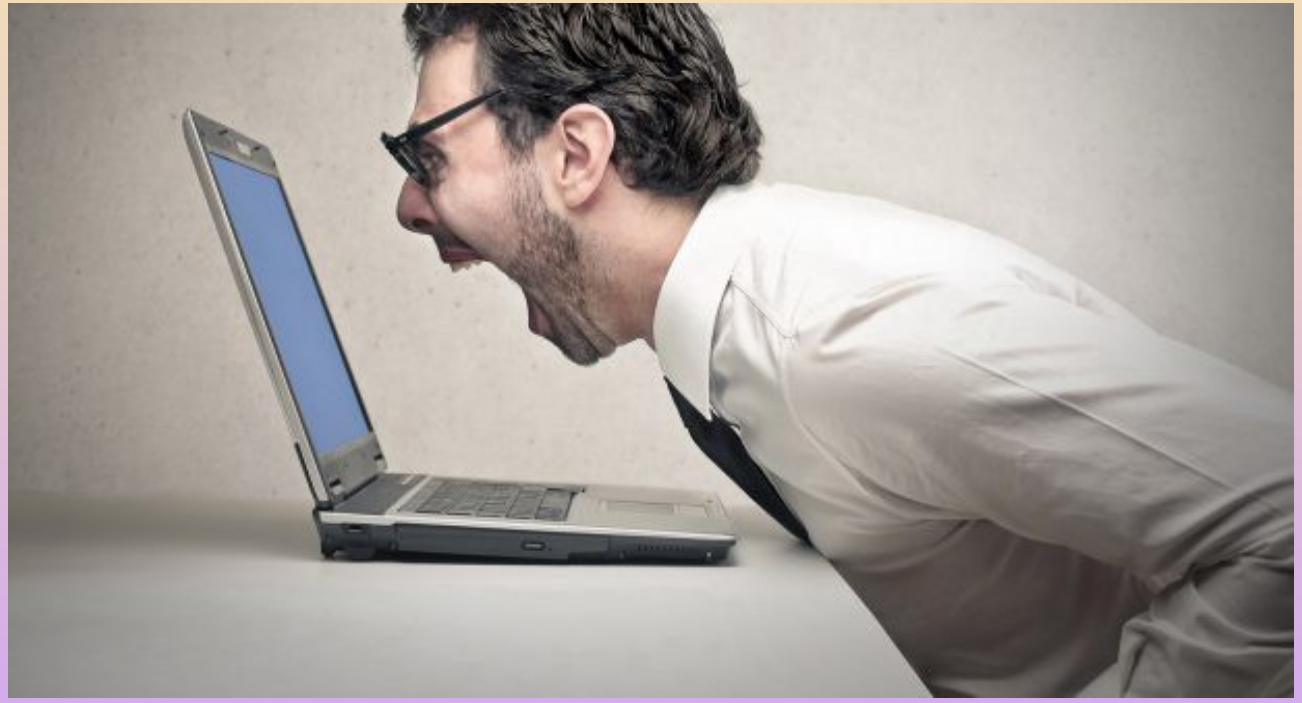


Google Meet position



But our network Infrastructure is Not ready...

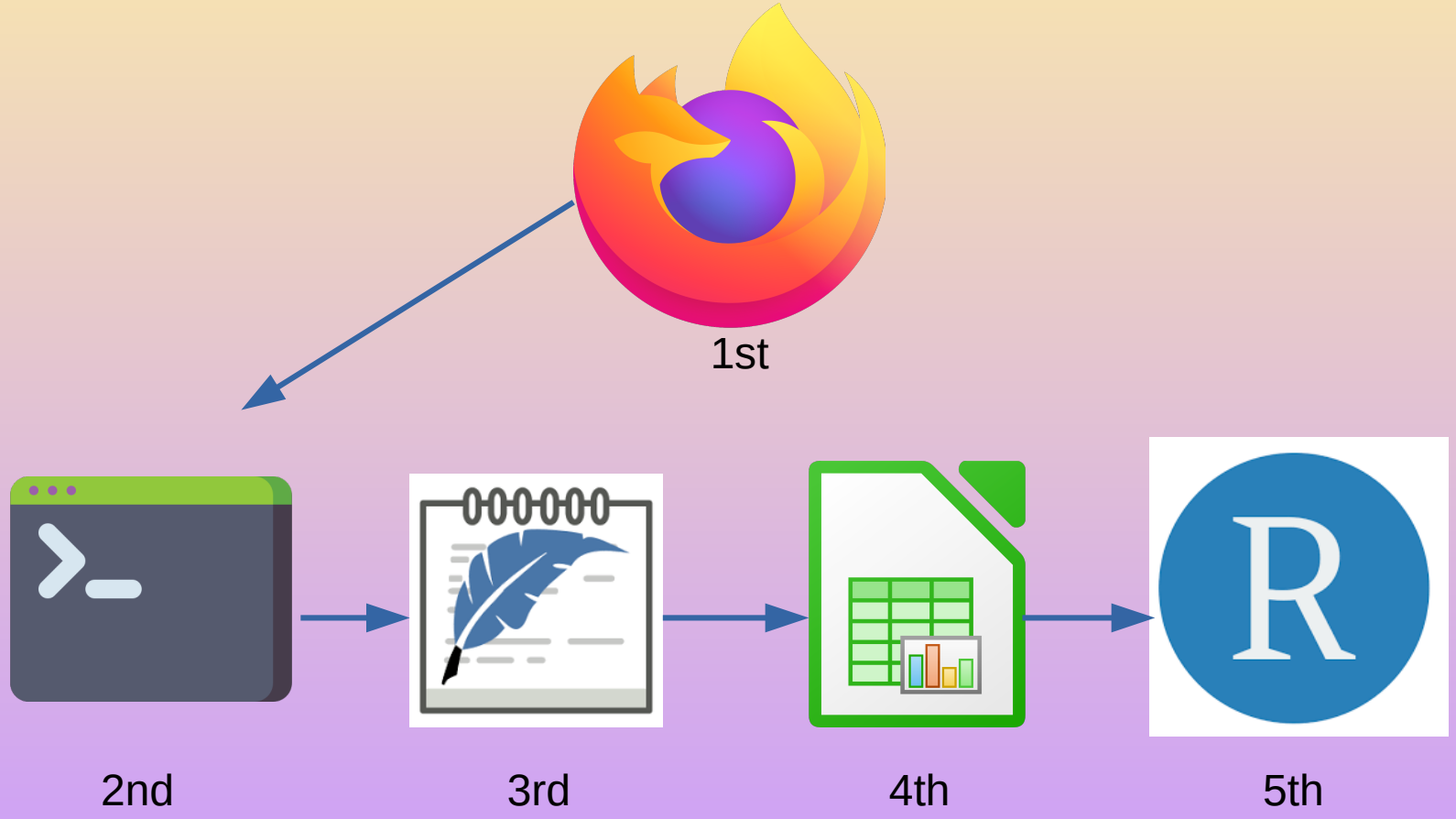
User Frustration



Objectives

- Postulate a testing principle
- Evaluate Google Meet performance
- Determine variables that greatly affect Meet
- Develop a working theory based on this effect
- Establish the adverse impact of slow internet speed and high latency on Meet
- Discussing the positive effect of slow internet speed and latency on Meet

Data Collection



R Statistical Software

RStudio

File Edit Code View Plots Session Build Debug Profile Tools Help

tgroup.3.vcm | analysiscode.R | Untitled1* | Untitled2* | Untitled.8

```
71  tr1 <- c(106,103,120,140,147)
72  tr2 <- c(75,68,71,88,97)
73  tr3 <- c(38,34,34,41,71)
74  tr4 <- c(9,9,15,11,20)
75  lat <- c(80,80,100,250,500,80,80,100,250,500)
76
77  summary(Untitled.8) #calculation
78  ln <- linearregressiontest
79  lin <- lm(Untitled.8$tr1+Untitled.8$tr2+Untitled.8$tr3+Untitled.8$tr4 ~ Untitled.8$lat, data = ln)
80  summary(lin)
81
82  ggplot(Untitled.8,aes(y=lat))+ #visualization
83    labs(x = "Error rate", y = "Latency (ms)")+
84    geom_line(aes(x=tr1, colour = "treatment 1 (50KB/s)"))+
85    geom_line(aes(x=tr2, colour = "treatment 2 (100KB/s)"))+
86    geom_line(aes(x=tr3, colour = "treatment 3 (250KB/s)"))+
87    geom_line(aes(x=tr4, colour = "treatment 4 (500KB/s)"))
88
89
```

82:1 (Top Level) R Script

Console | Terminal | Jobs

R 3.6.3 · /home/elsav/

```
Call:
lm(formula = Untitled.8$tr1 + Untitled.8$tr2 + Untitled.8$tr3 +
    Untitled.8$tr4 ~ Untitled.8$lat, data = ln)

Residuals:
      1       2       3       4       5
  1.001 -12.999   7.690   7.852  -3.544

Coefficients:
              Estimate Std. Error t value Pr(>|t|)
(Intercept)    205.75183    7.18650   28.63 9.36e-05 ***
Untitled.8$lat   0.26559    0.02775    9.57  0.00242 **
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 10.06 on 3 degrees of freedom
Multiple R-squared:  0.9683,    Adjusted R-squared:  0.9577
F-statistic: 91.59 on 1 and 3 DF,  p-value: 0.00242

>
```

Environment | History | Connections | Tutorial

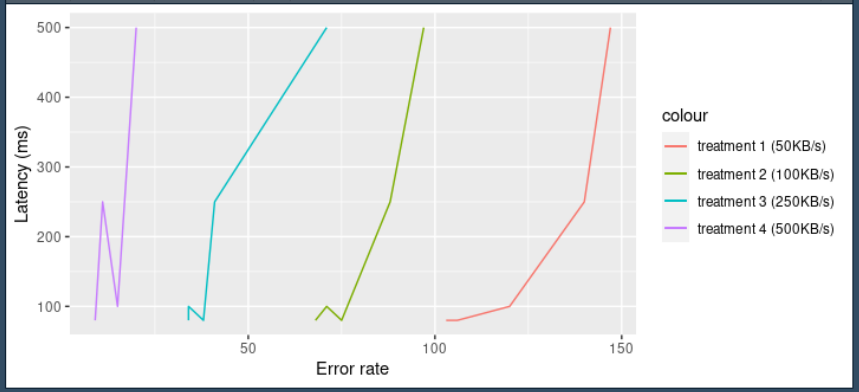
Import Dataset · 296 MiB · List

R · Global Environment

customerData	72637 obs. of 3 variables
df	12 obs. of 12 variables
f	List of 9
fig	List of 8
itr1speed	5372 obs. of 3 variables
itr2speed	5372 obs. of 3 variables
itr3speed	5372 obs. of 3 variables
itr4speed	5372 obs. of 3 variables
lat1speed	5372 obs. of 3 variables
lat2ping	5372 obs. of 2 variables
lat2speed	5372 obs. of 3 variables
lat3speed	5372 obs. of 3 variables
lat4speed	5372 obs. of 3 variables
lin	List of 12
linearregressiontest	6 obs. of 5 variables
ln	6 obs. of 5 variables

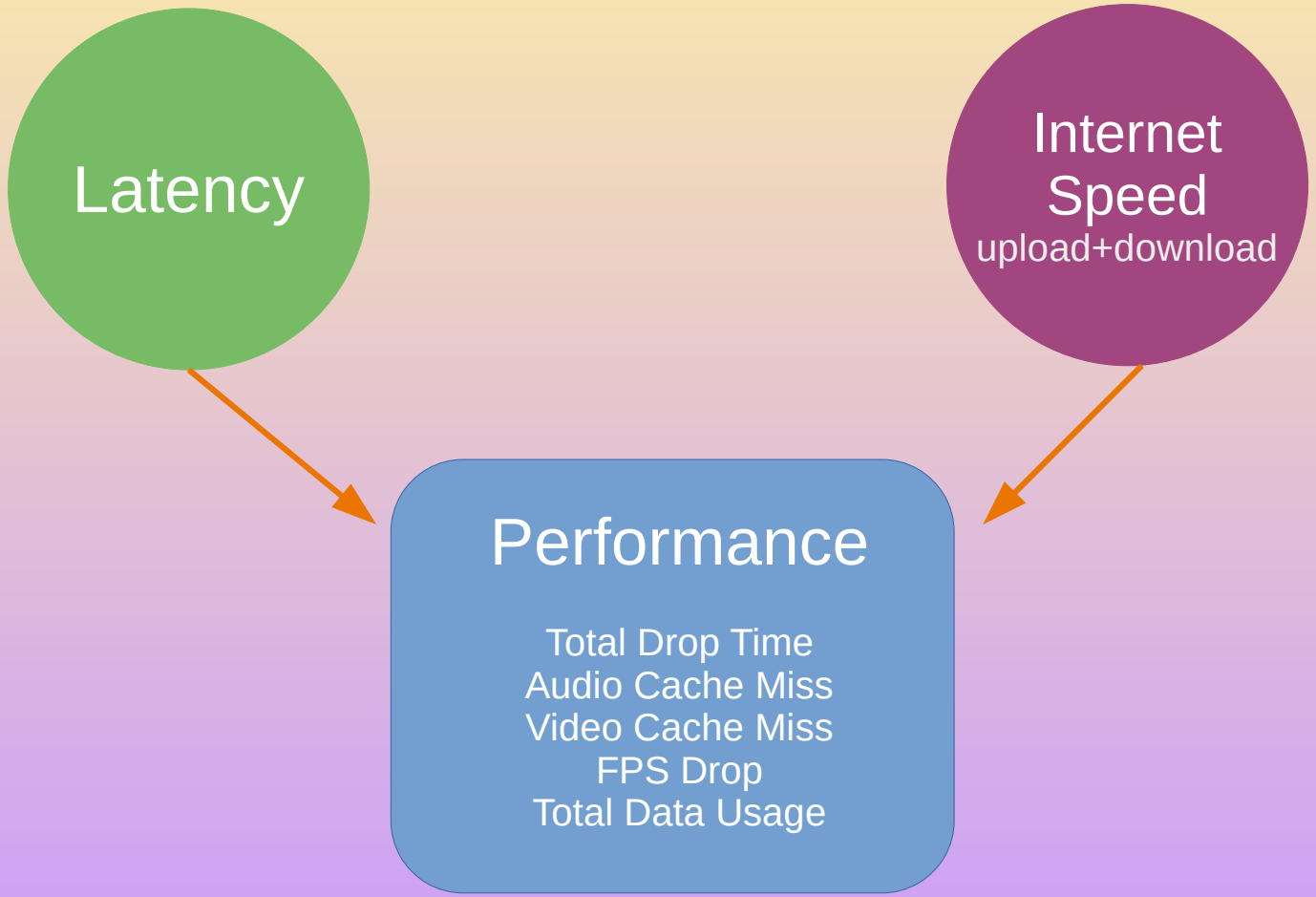
Files | Plots | Packages | Help | Viewer

Zoom · Export · Publish

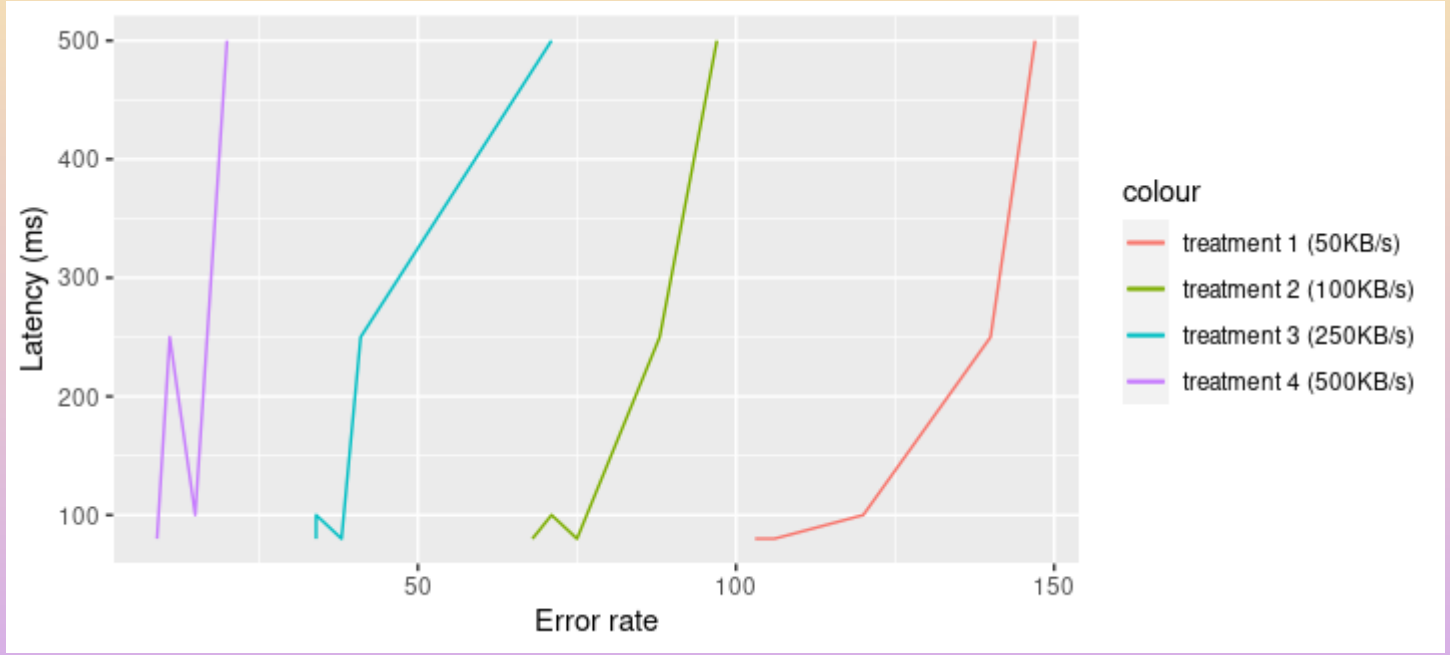


1 2 3 4 Untitled 1 ...fice Writer | pr_pres.od...ce Impress | elsav@elsa-cute-pc: ~ | RStudio | ytls.com -... Audacious 11:54

Variables


Latency
Internet Speed
upload+download
Performance
Total Drop Time
Audio Cache Miss
Video Cache Miss
FPS Drop
Total Data Usage

Overall Results



Positive trend in error rate as latency increased combined with internet speed dropping

R = 0.9683, p = 0.0024; (327,753 data points)

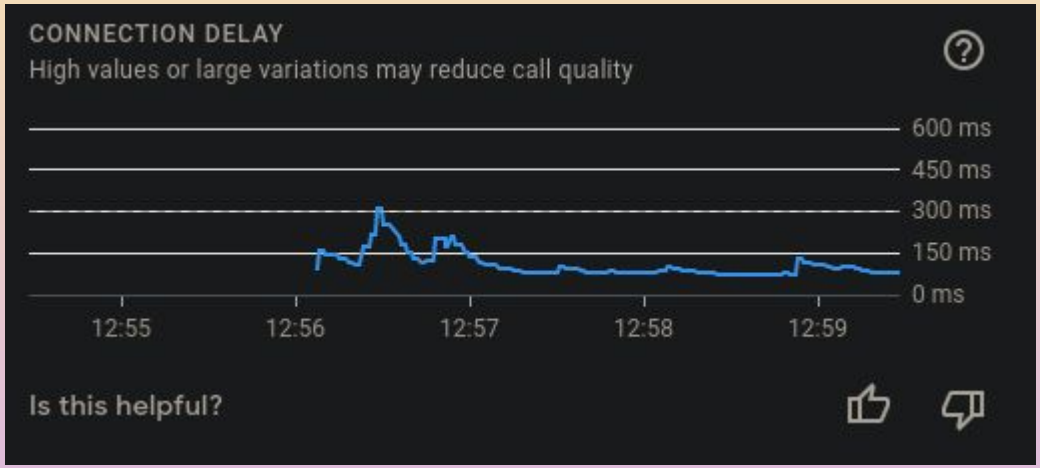
Study’s Limitation

- Single point sampling (limiting the scope to individual performance)
- Non linear behaviour of the dependent variable pass the performance of plateau (refer to theoretical framework)
- Hardware limitation (1 Million datapoints and beyond requires a better computer)

Conclusion

1. Google Meet Resiliency

2. Synthetically slowing down internet speed might lead to data and electrical savings...

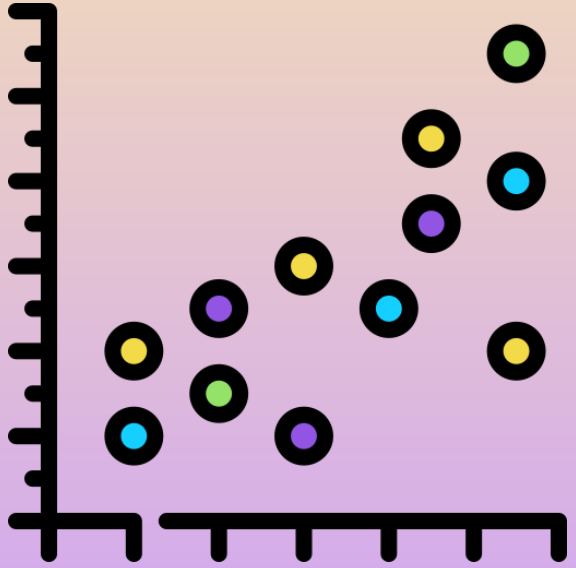


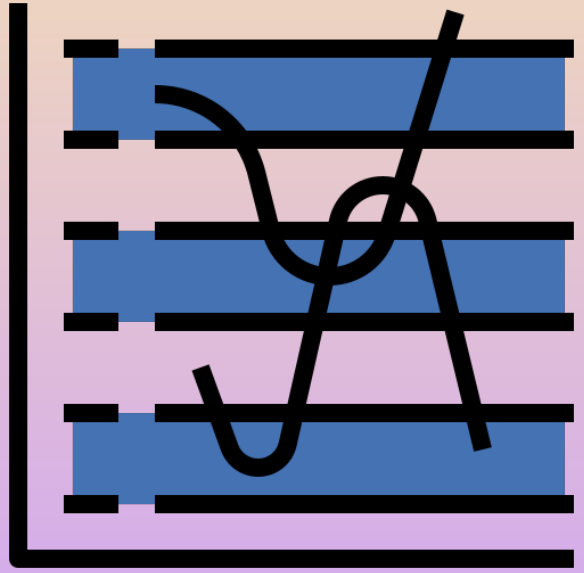
Induced delay will result in smoother graph

And Lower CPU usage

*feature only available on Chrome

3. Google Meet performance is influenced by the independent variables in a non linear way (curve)





The END :)