



# ActivPal External Presentation #2

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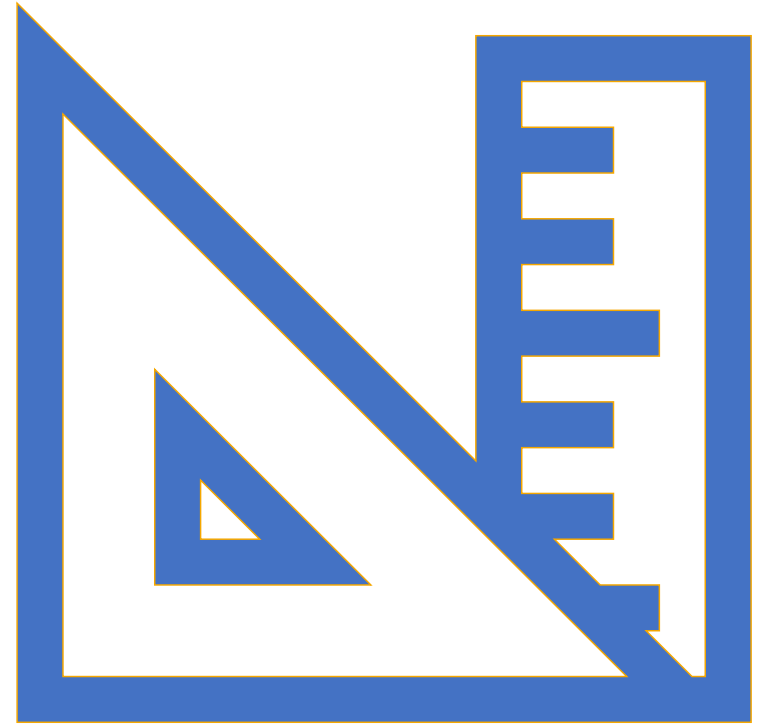
Colin Werkhoven



# Topics

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- Introduction
- Research approach
- Results
- Problems we encountered
- Next steps
- Questions



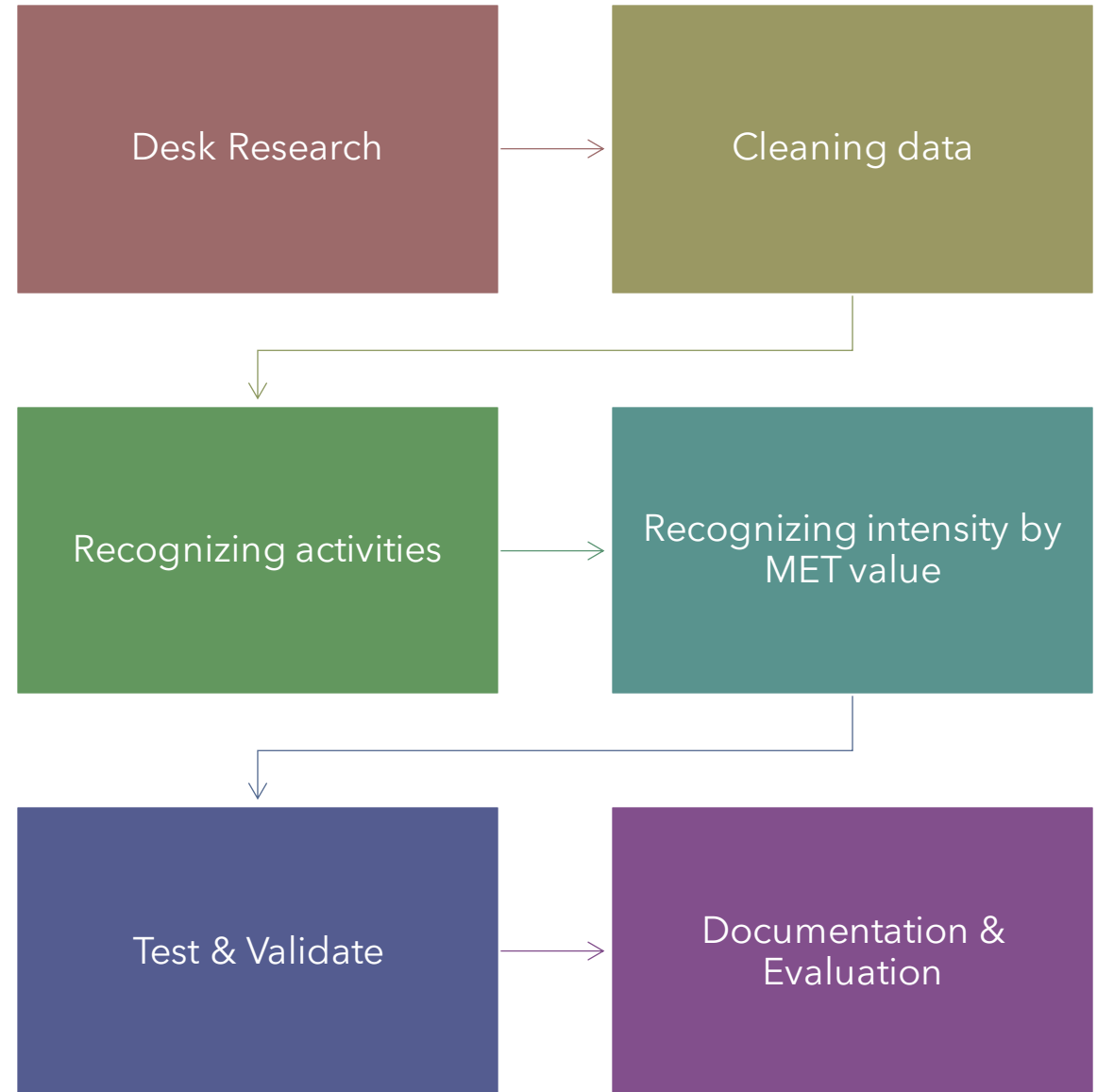


# Introduction

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- Reason Centraal Bureau voor de Statistiek (CBS) came to us
- Research questions:
  - How do we measure the intensity of movement in the ActivPal data
  - Can we use this knowledge to determine if people did their 150 minutes of moderate activity in the week data?
    - Can you recognize the lab activities in the week data?
    - Can you see patterns in the rest of the data that indicate doing sports? What kind of sports?

# Research approach





# Results

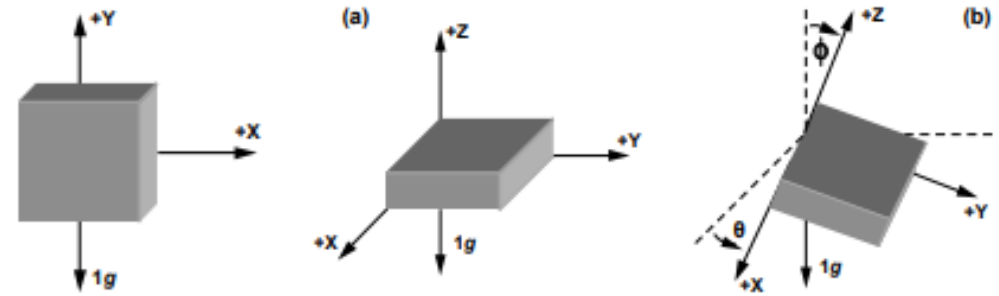
- Progress on dice face issue
- Activity recognition model
- Linear & multivariate regression between MET from lab data and accelerometer data

# Dice face – What is dice face

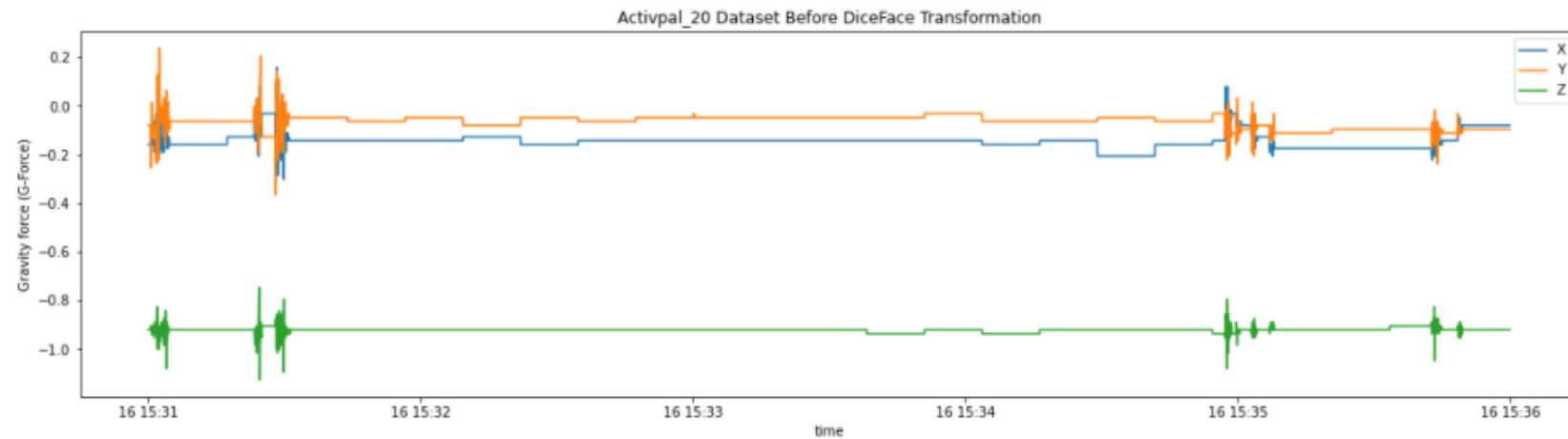
What is dice face?

- The orientation of the Activpal accelerometer itself!

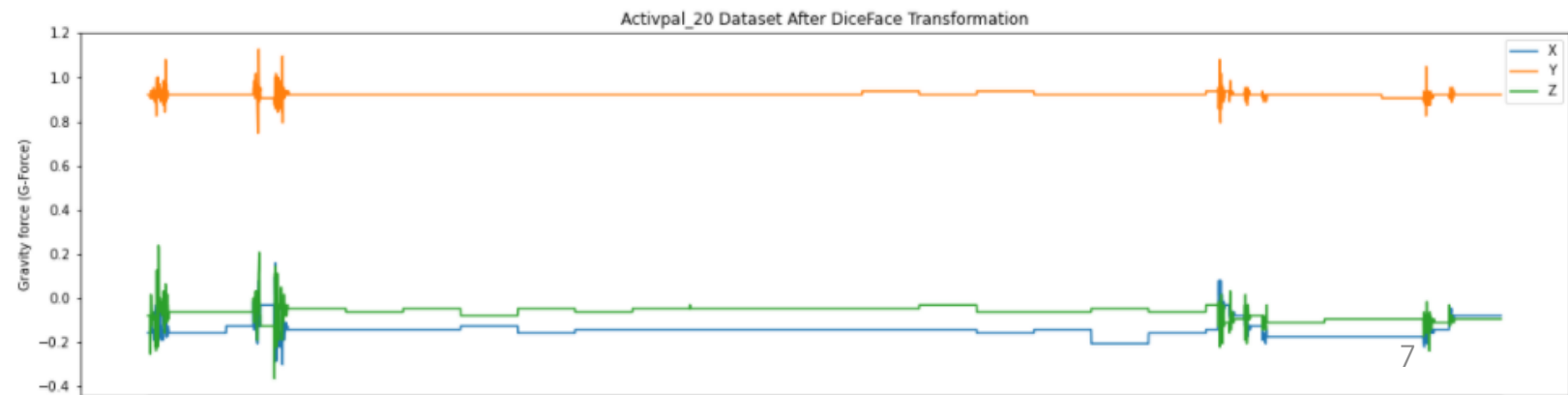




# Dice face

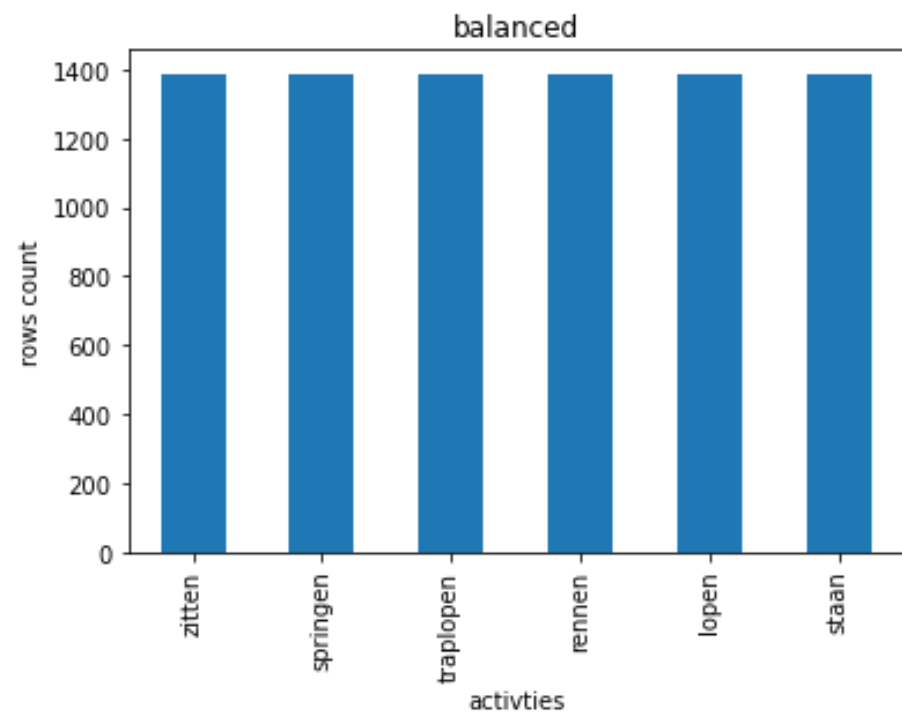
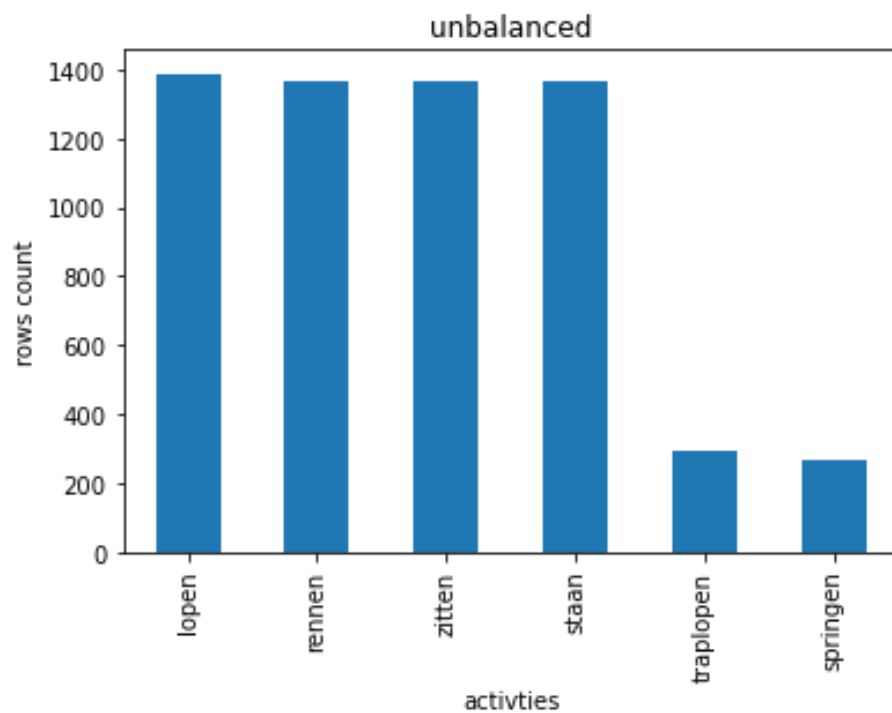


[2.]



# Activity recognition

## - Balancing dataset





# Activity recognition - features dataset

- Segmented our activpal dataset in 6.4S
- Feature engineered:
  - Standard deviation for X, Y, Z
  - Mean for X, Y, Z
  - Based on previous research
- Cleaned dataset and balanced dataset

|   | standard_deviation_x | mean_x    | standard_deviation_y | mean_y   | standard_deviation_z | mean_z   | activity_walking | activity_running | activity_jumping | activity_standing | activity_traplopen | activity_sitten |
|---|----------------------|-----------|----------------------|----------|----------------------|----------|------------------|------------------|------------------|-------------------|--------------------|-----------------|
| 0 | 0.316779             | -1.036914 | 0.241070             | 0.024363 | 0.415354             | 0.180017 | 1                | 0                | 0                | 0                 | 0                  | 0               |
| 1 | 0.471659             | -1.059276 | 0.373105             | 0.032986 | 0.562155             | 0.189236 | 1                | 0                | 0                | 0                 | 0                  | 0               |
| 2 | 0.472722             | -1.036582 | 0.332441             | 0.040551 | 0.586077             | 0.157862 | 1                | 0                | 0                | 0                 | 0                  | 0               |
| 3 | 0.486818             | -1.026290 | 0.328380             | 0.038194 | 0.545233             | 0.147817 | 1                | 0                | 0                | 0                 | 0                  | 0               |
| 4 | 0.516327             | -1.040236 | 0.342754             | 0.030146 | 0.539769             | 0.154424 | 1                | 0                | 0                | 0                 | 0                  | 0               |

# Activity recognition - selected model

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- Random Forest Model
  - Compared to decision tree model it gives best result
- Configurations:
  - number of trees : 20
  - Random seed: 0



# Activity recognition results

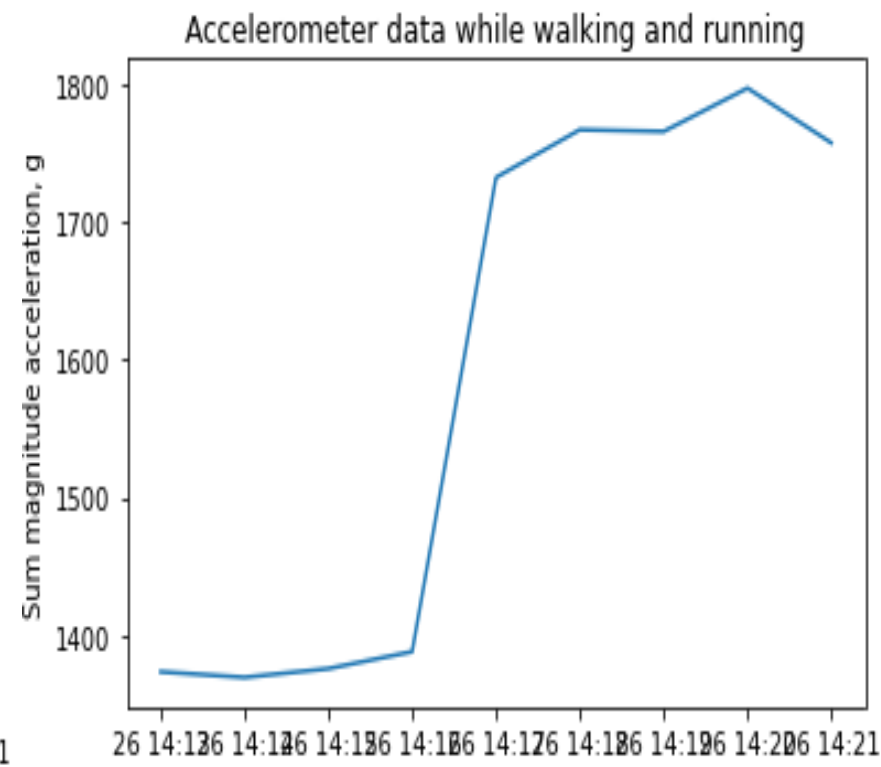
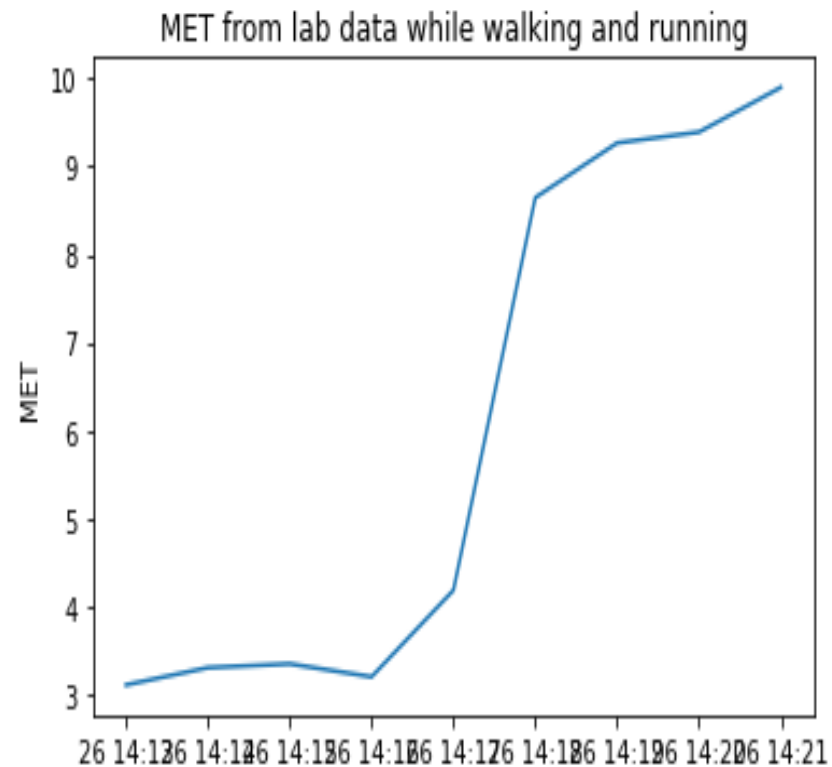
## **Validation test result**

- Accuracy: 97%
- Precision: 98%
- Recall: 97%

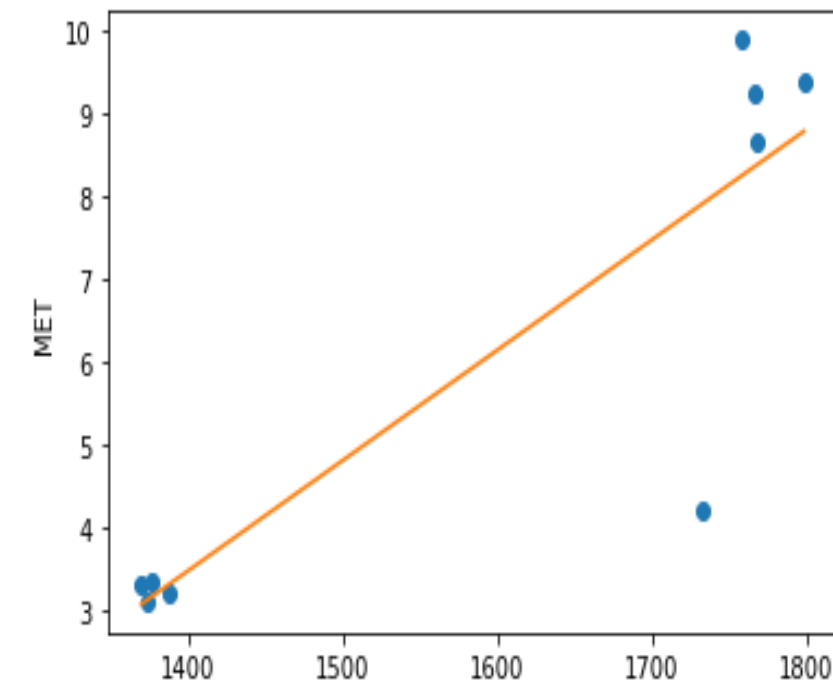
## **Cross-validation results**

- Accuracy: 86% (+/- 17%)
- Precision: 91% (+/- 11%)
- Recall: 86% (+/- 17%)

# Regression between MET and accelerometer data - Single linear regression one respondent

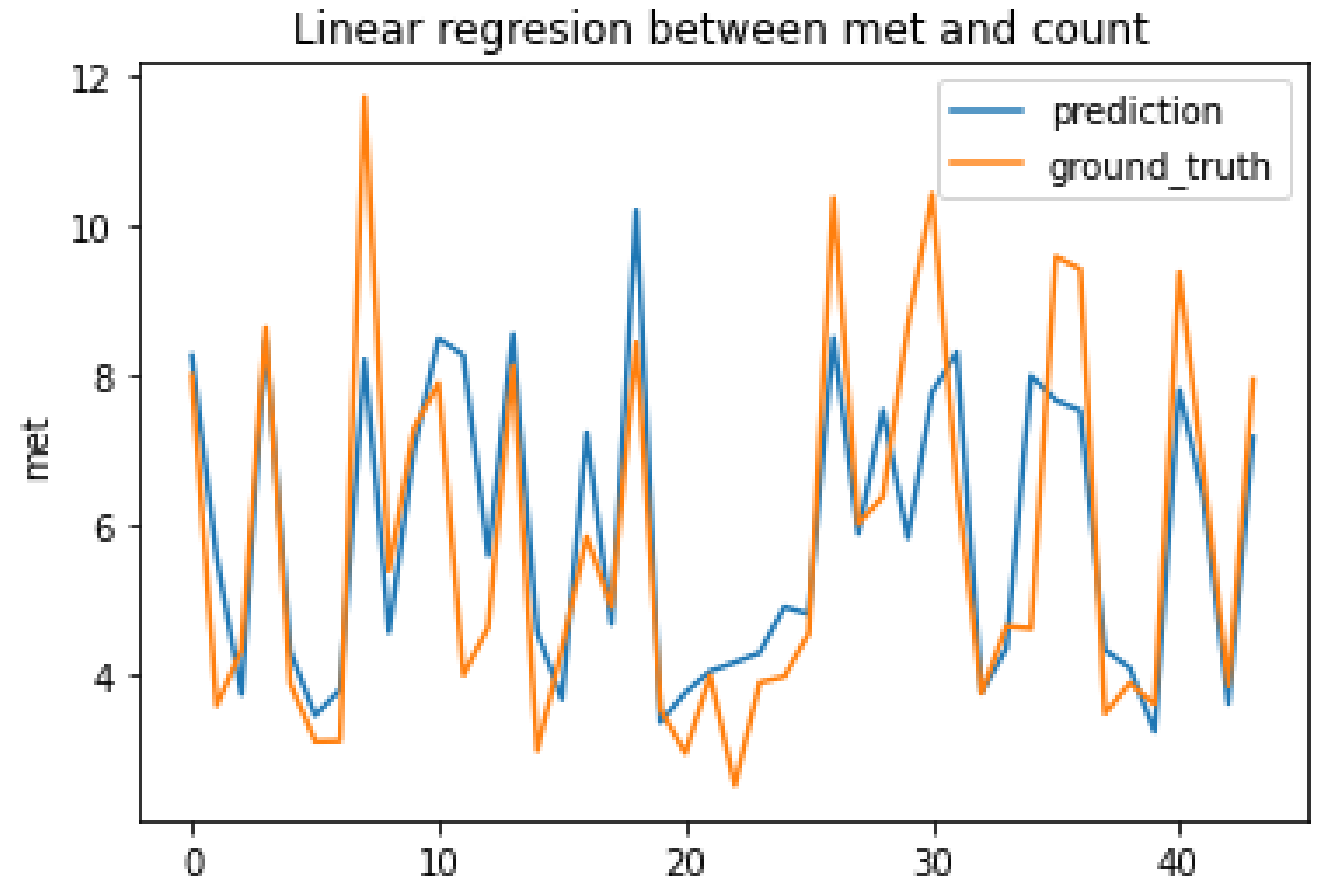


$r = 0.8772657125077458$



Regression  
between MET and  
accelerometer data  
- linear regression  
all respondents

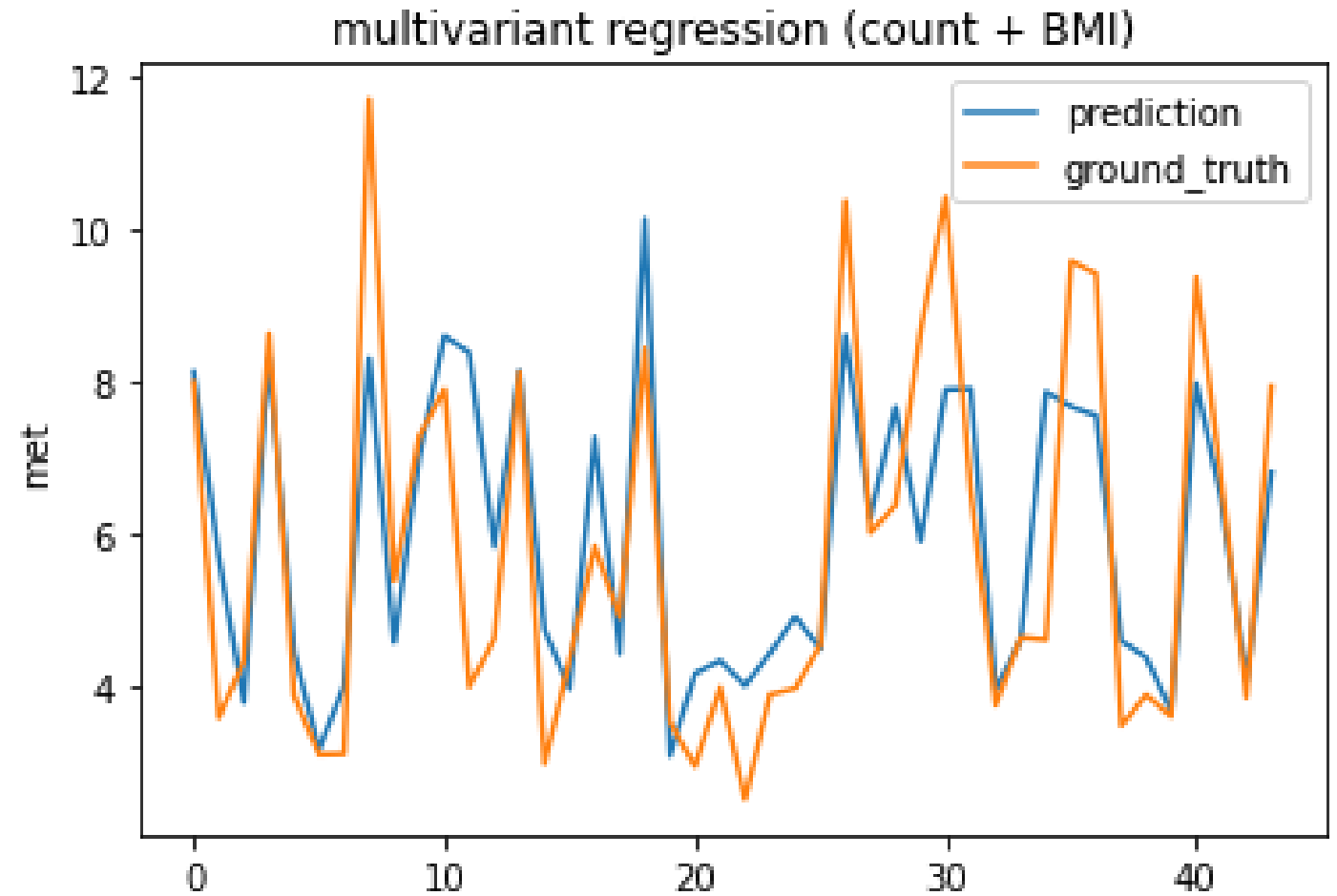
`r_squared = 0.5060251771104591`



Regression between MET  
and accelerometer data -  
multivariate  
regression all  
respondents

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`r_squared = 0.5237108907536834`



# Problems we encountered



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- Accelerometer X, Y, Z axes orientations may have been misinterpreted
- The gyroscope data is only available in data file with a sampling rate of 15 seconds
- How to synchronize the gyroscope data with the raw data (with much lower sampling rate of 50ms)

# Next steps

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01

Data analysing raw data & dice face data set

02

Improving the activity recognition model

03

Improving the linear regression model between the MET value & magnitude of acceleration





# Questions?

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