



# ActivPal External Presentation #2

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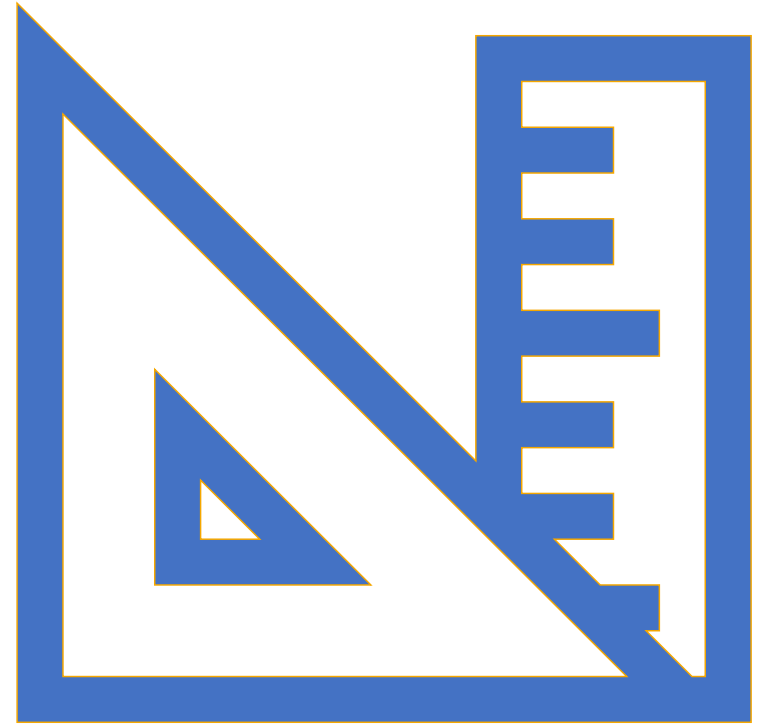
Colin Werkhoven



# Topics

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



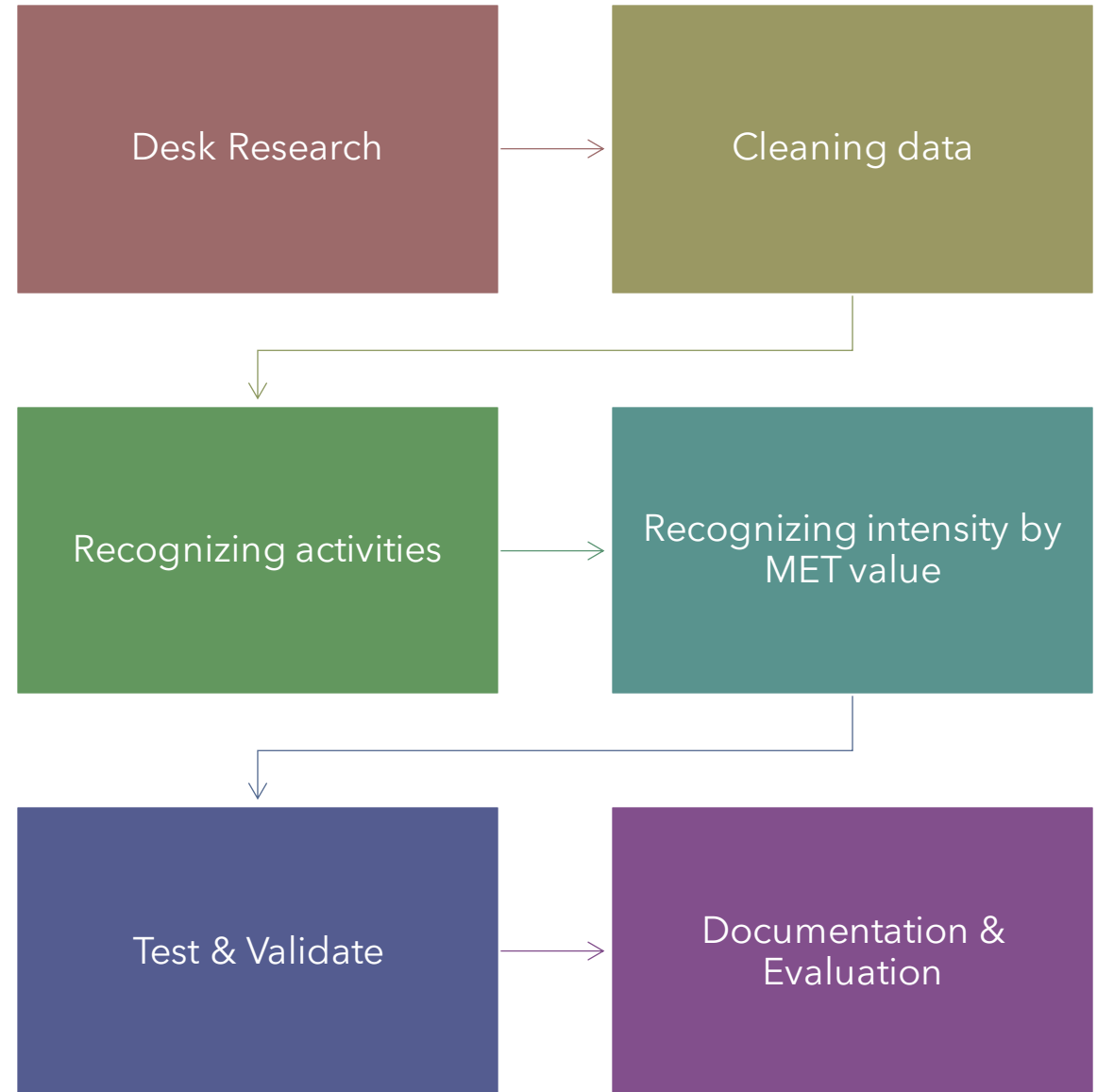


# Introduction

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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

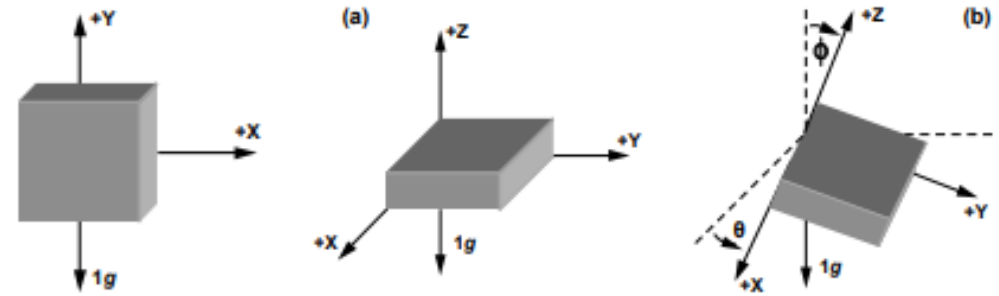
- Progress on dice face issue
- Activity recognition model
- Linear & multivariate regression between MET from lab data and accelerometer data

# Dice face – What is dice face

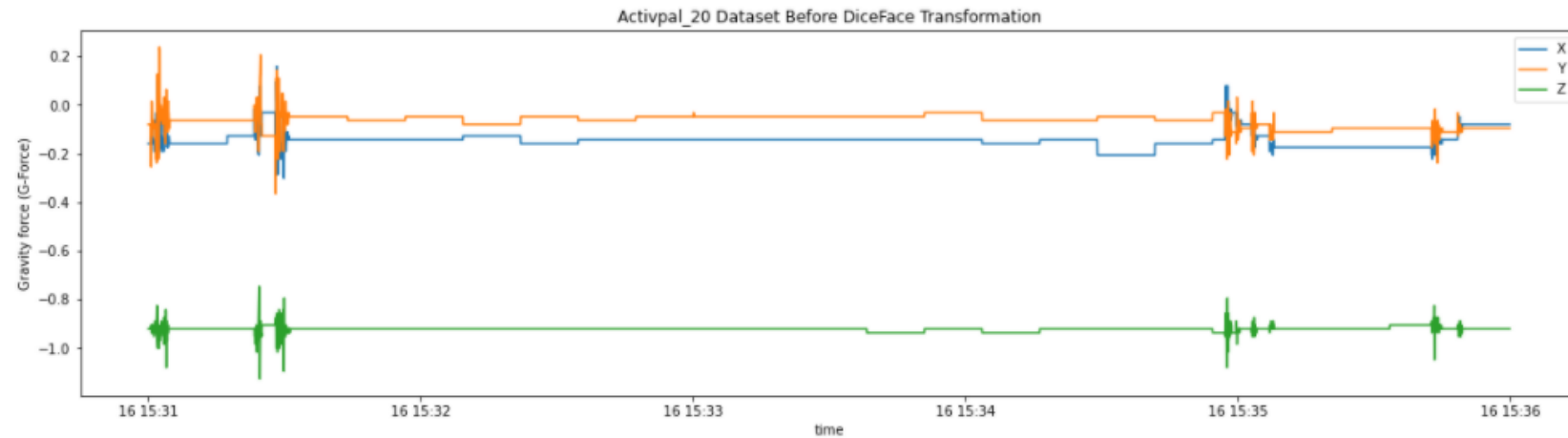
What is dice face?

- The orientation of the Activpal accelerometer itself!

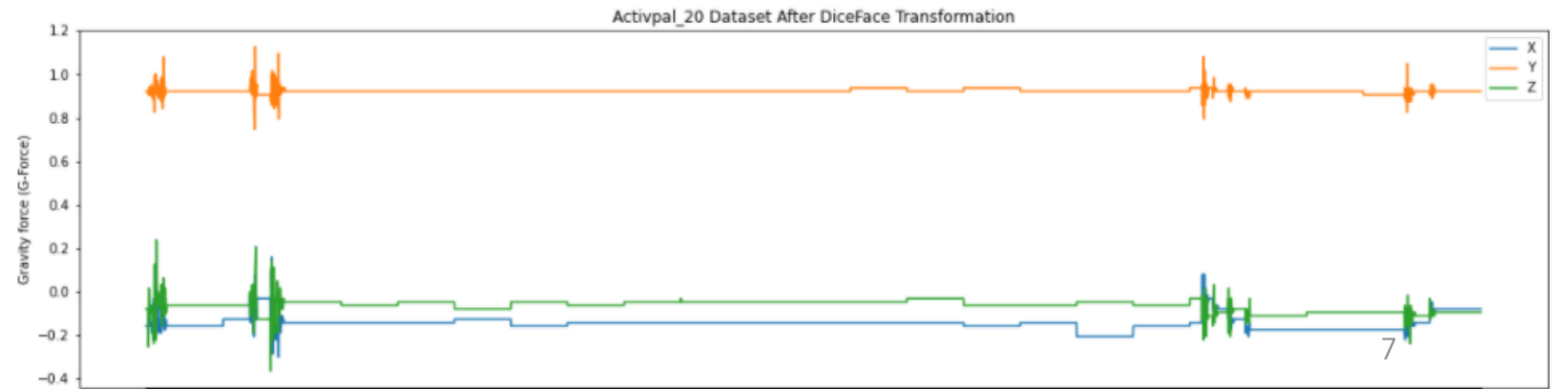




# Dice face

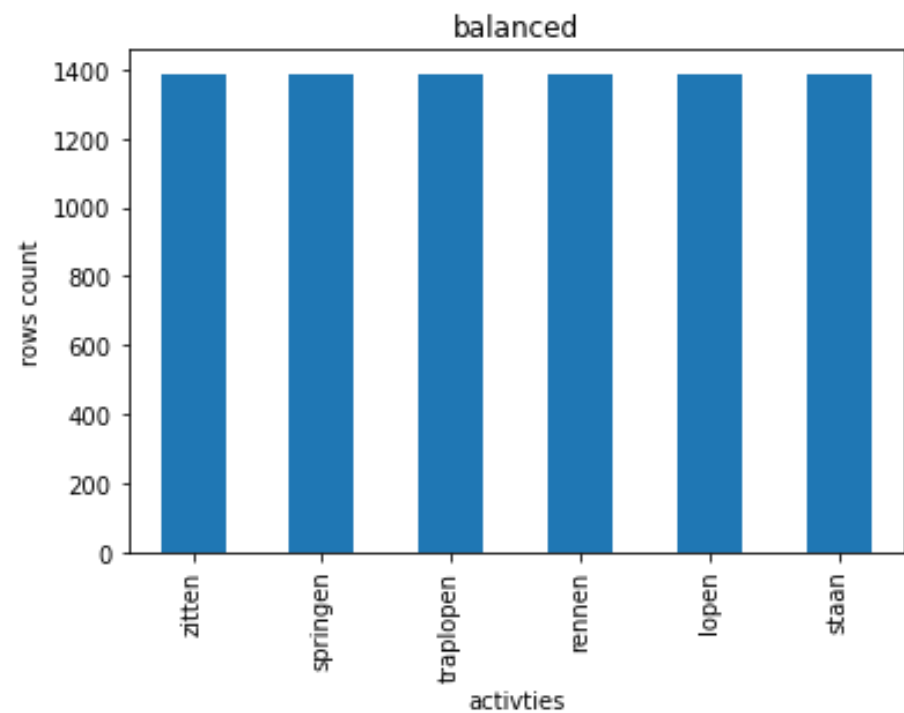
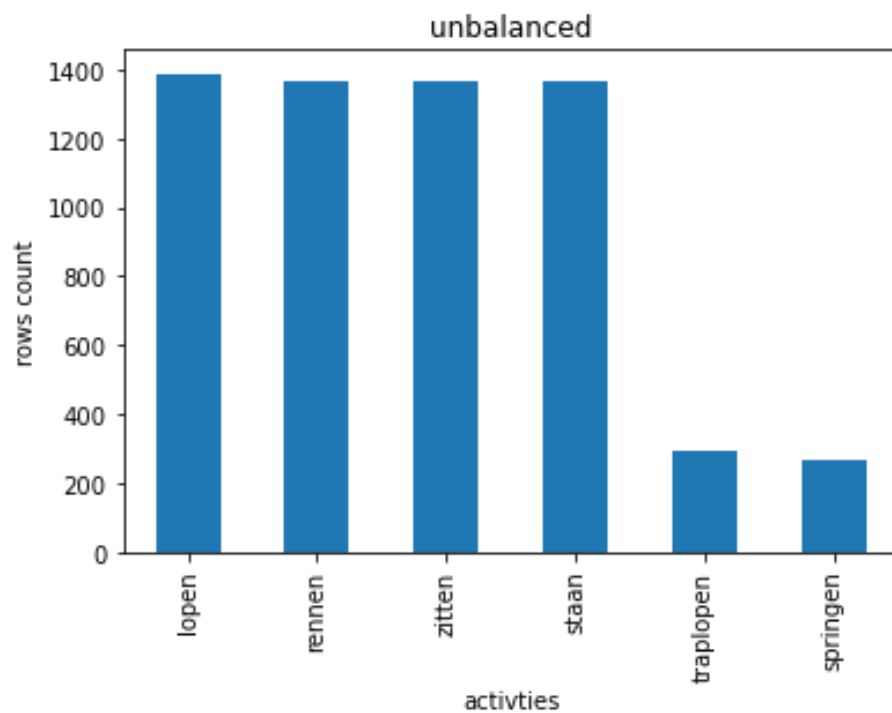


[2.]



# 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

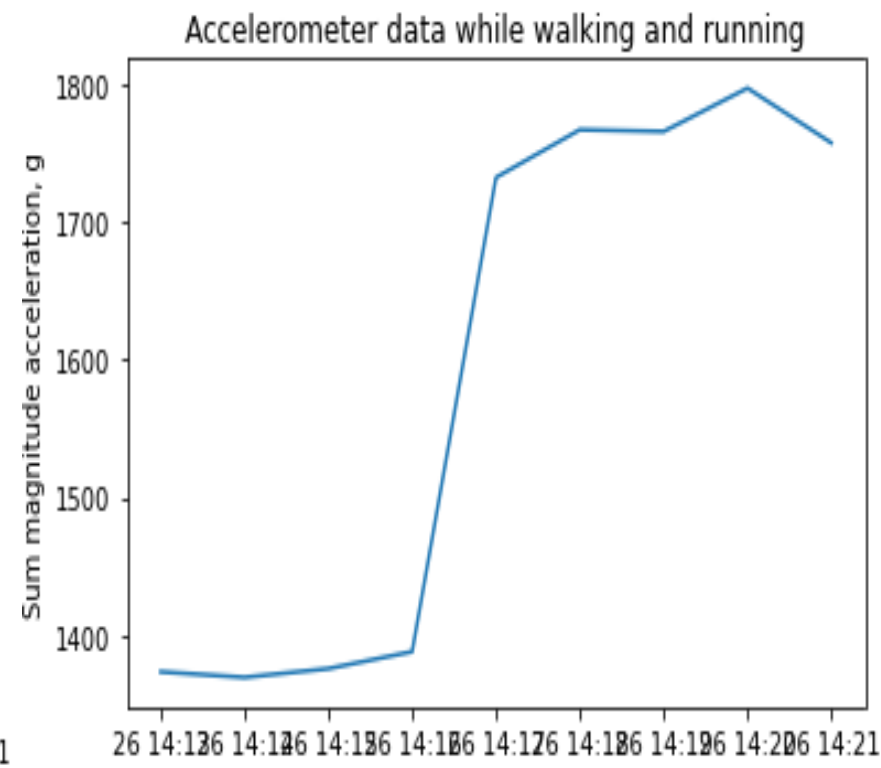
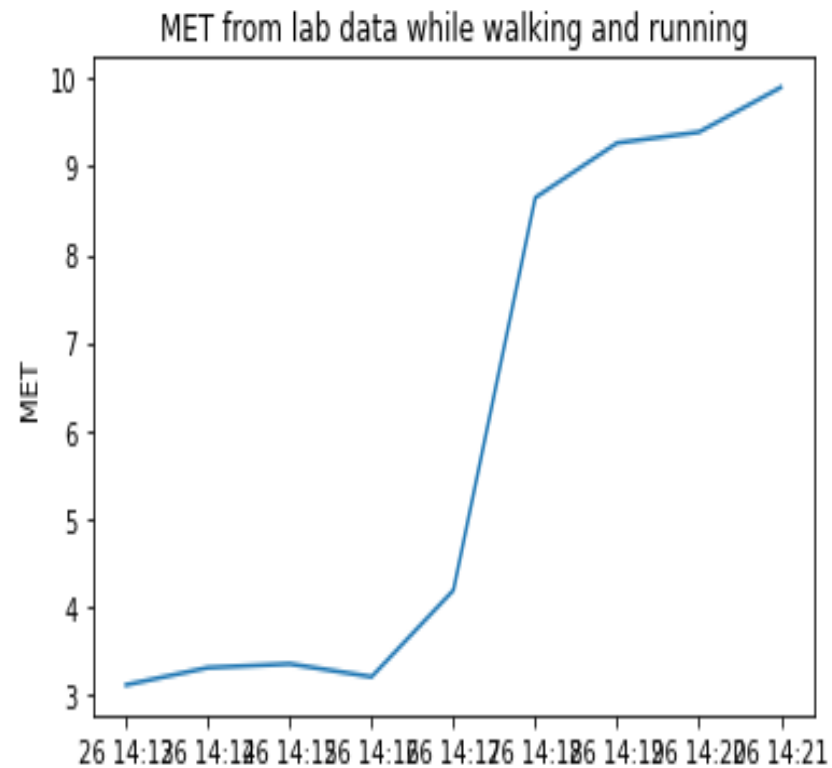
## **Validation test result**

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

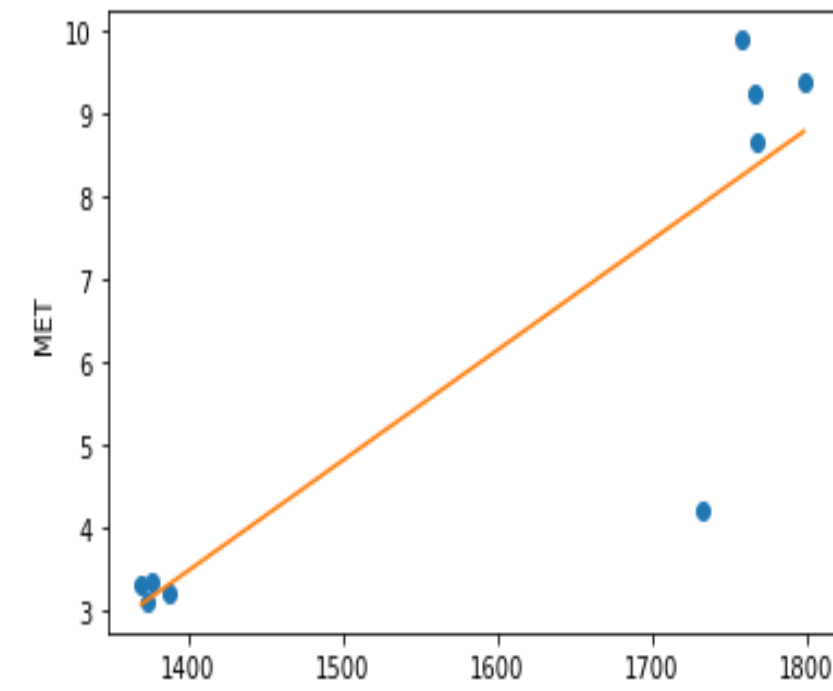
## **Cross-validation results**

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

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

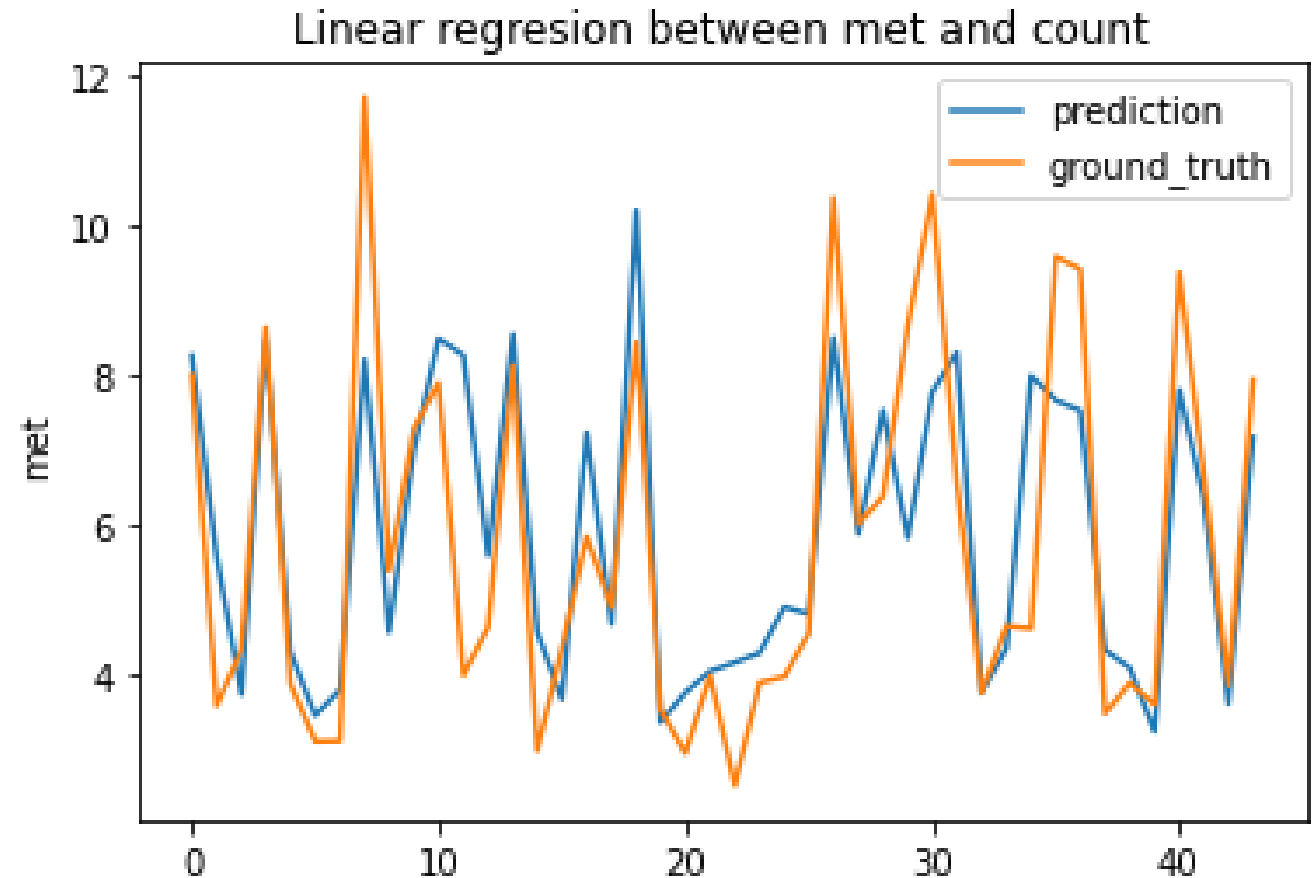


$r = 0.8772657125077458$



Regression  
between MET and  
accelerometer data  
- linear regression  
all respondents

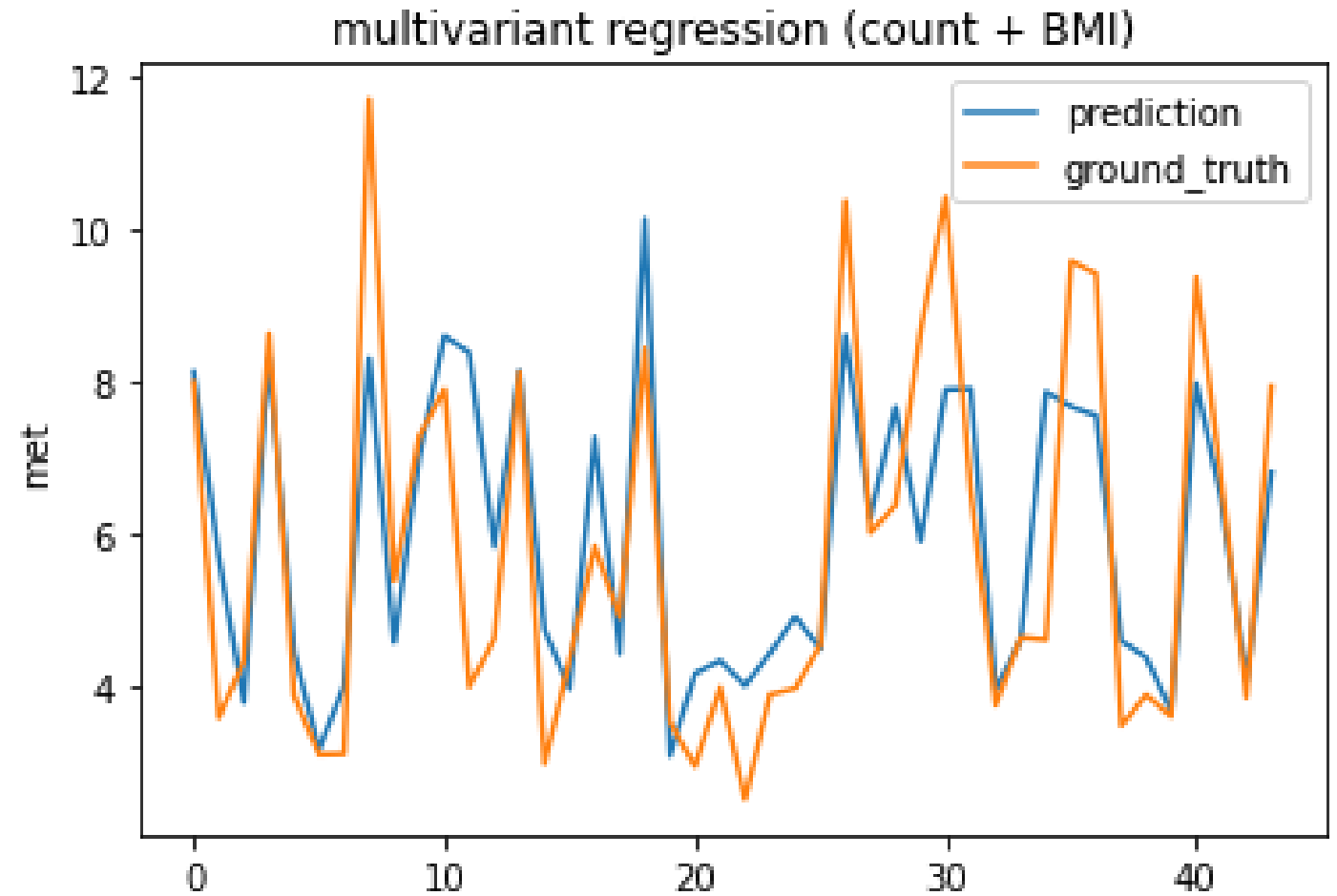
`r_squared = 0.5060251771104591`



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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