ActivPal External Presentation #2

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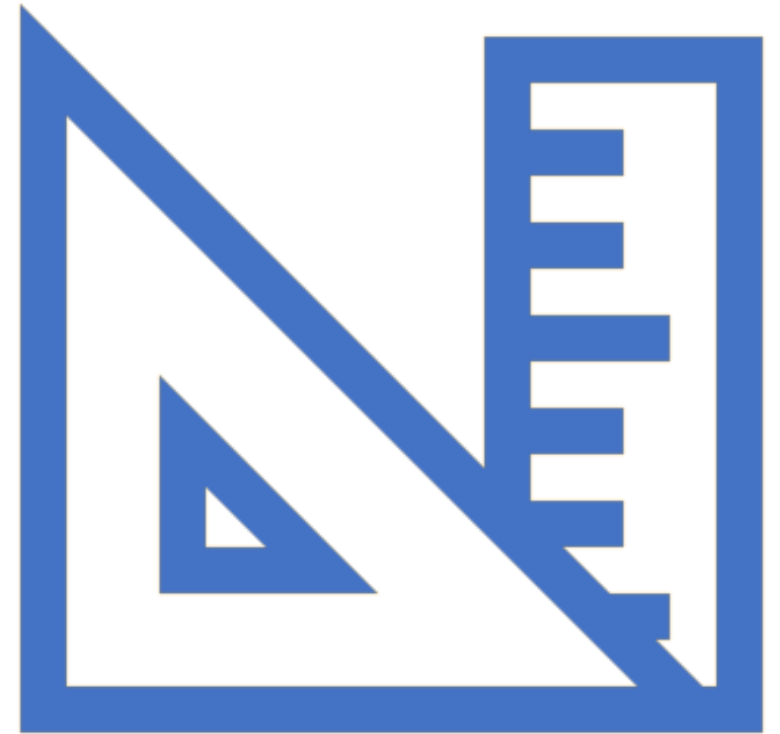Mark Boon

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Topics

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

Introduction

- 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?
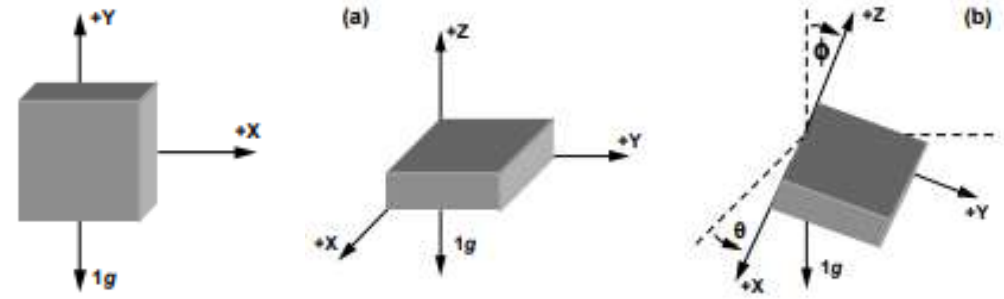
Research approach
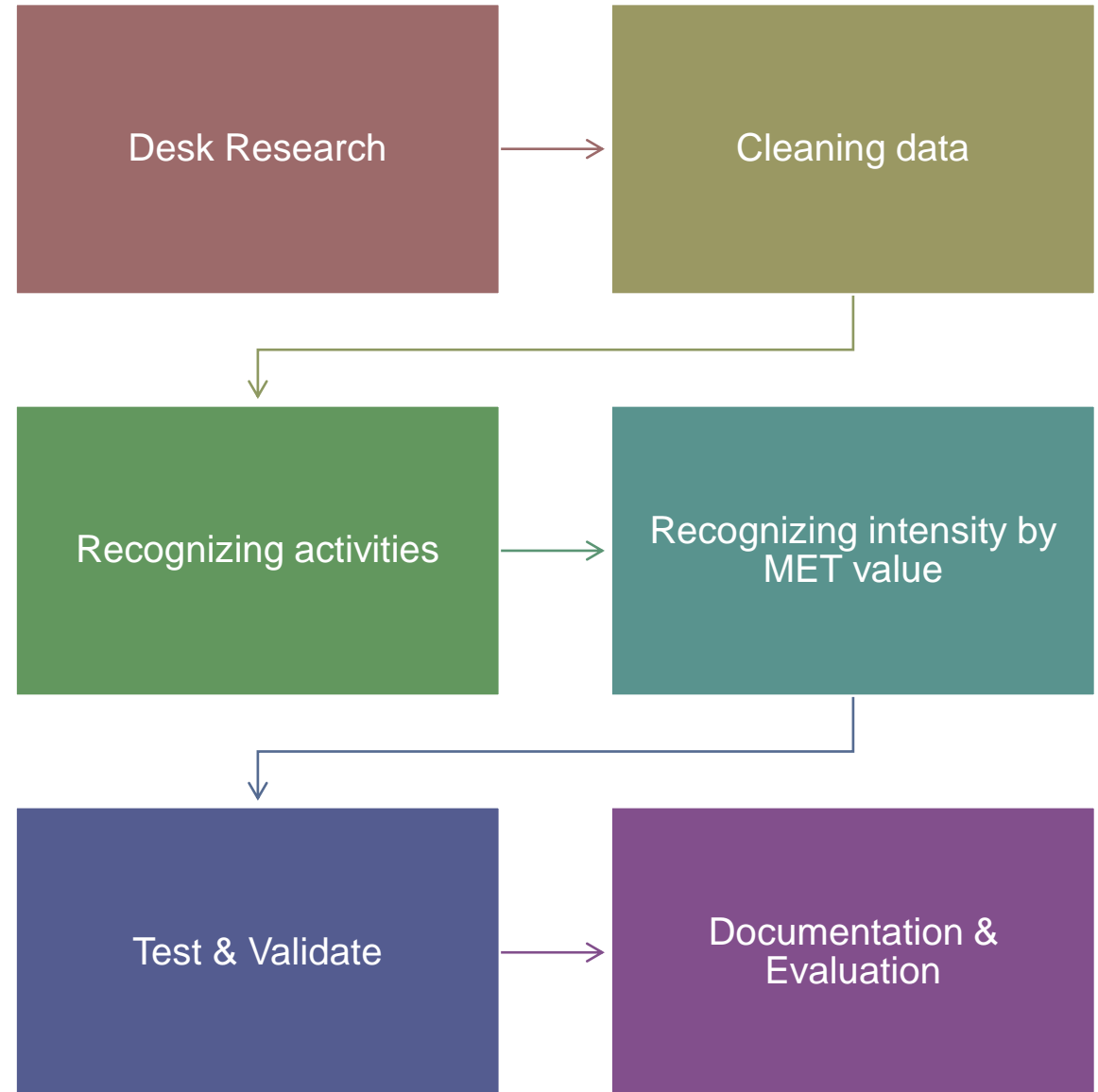
Results

- Progress on dice face issue

- Activity recognition model

- Linear & multivariate regression between MET from lab data and accelerometer data
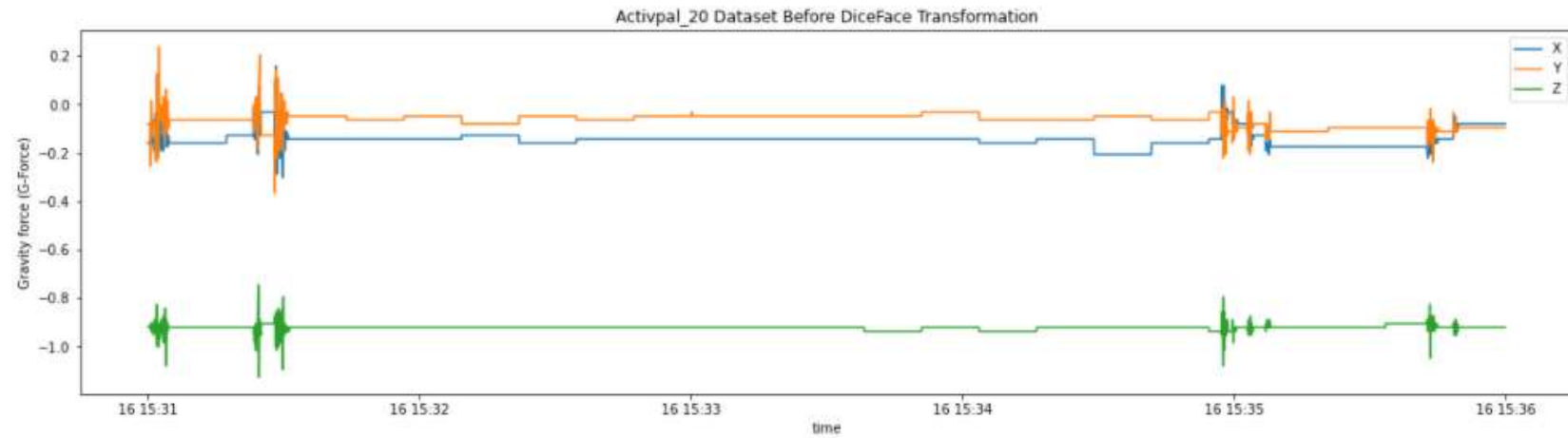
Dice face – What is dice face

What is dice face?

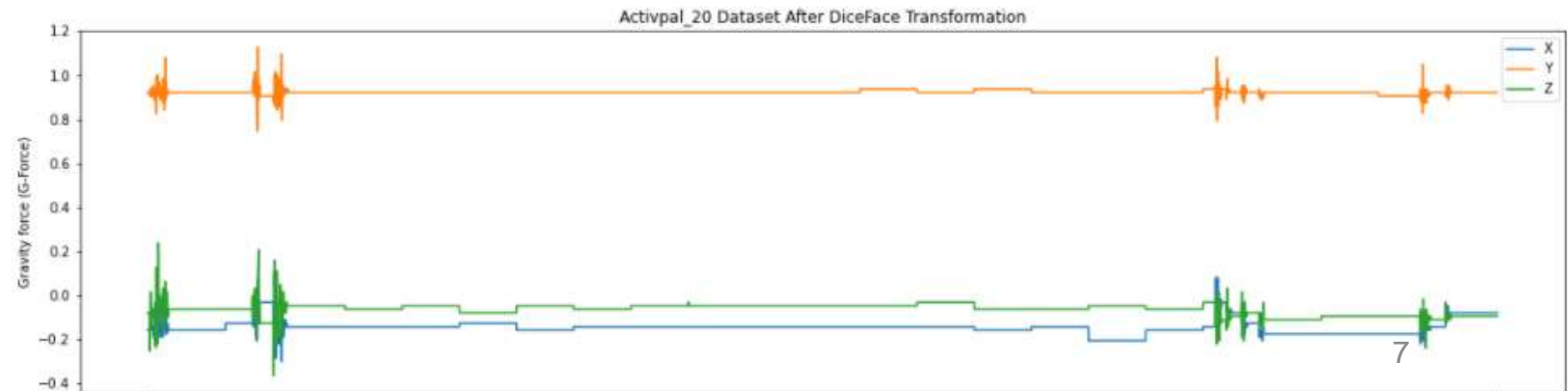- The orientation of the Activpal accelerometer itself!

up   back   right   left   front   down

(a) (b)

Dice face

Activpal_20 Dataset Before DiceFace Transformation

[2.]
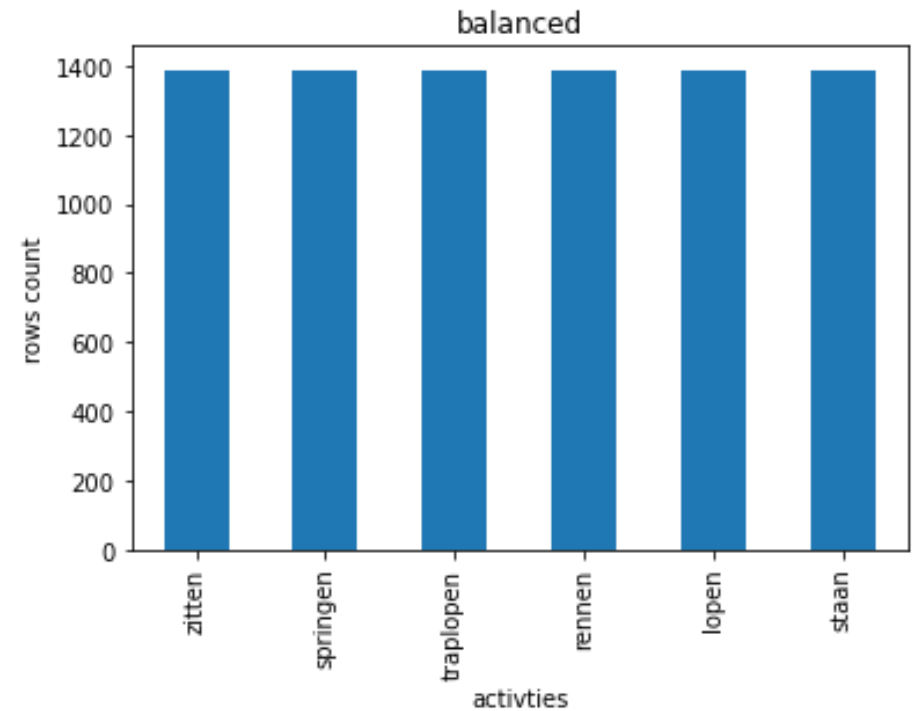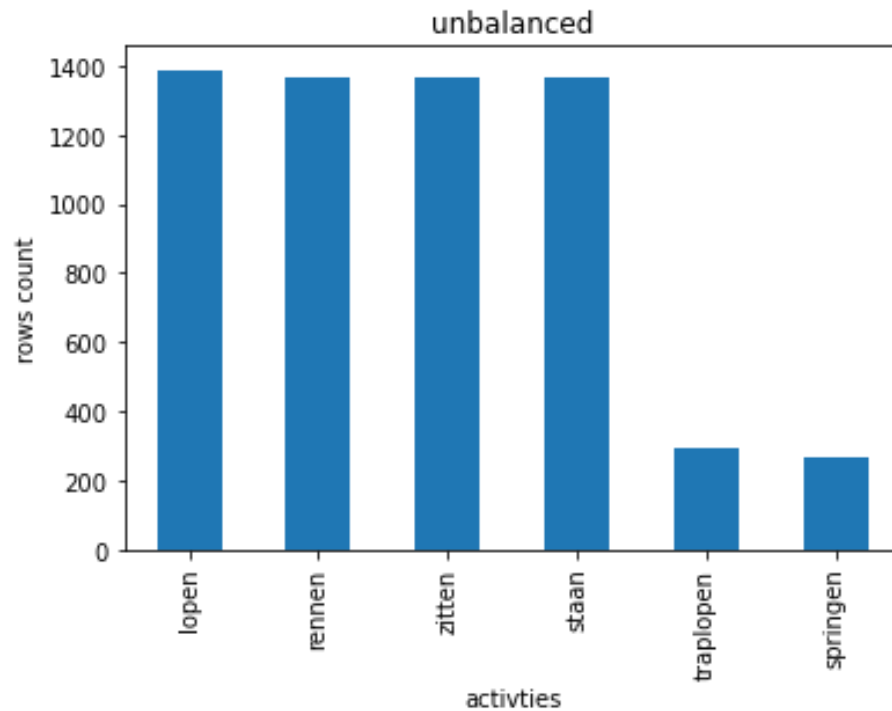

Activpal_20 Dataset After DiceFace Transformation

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

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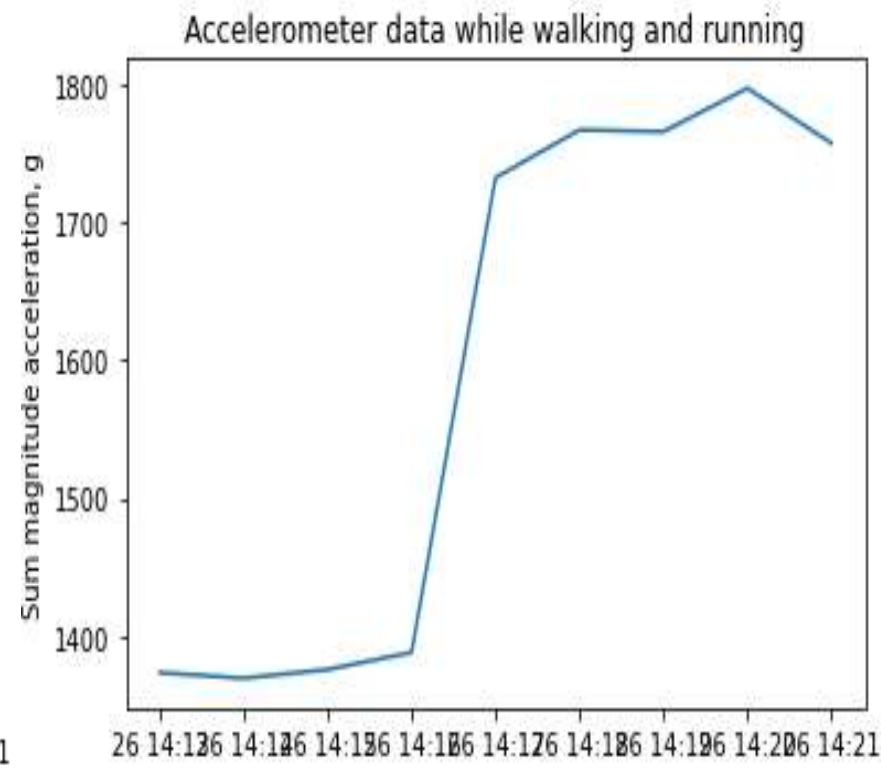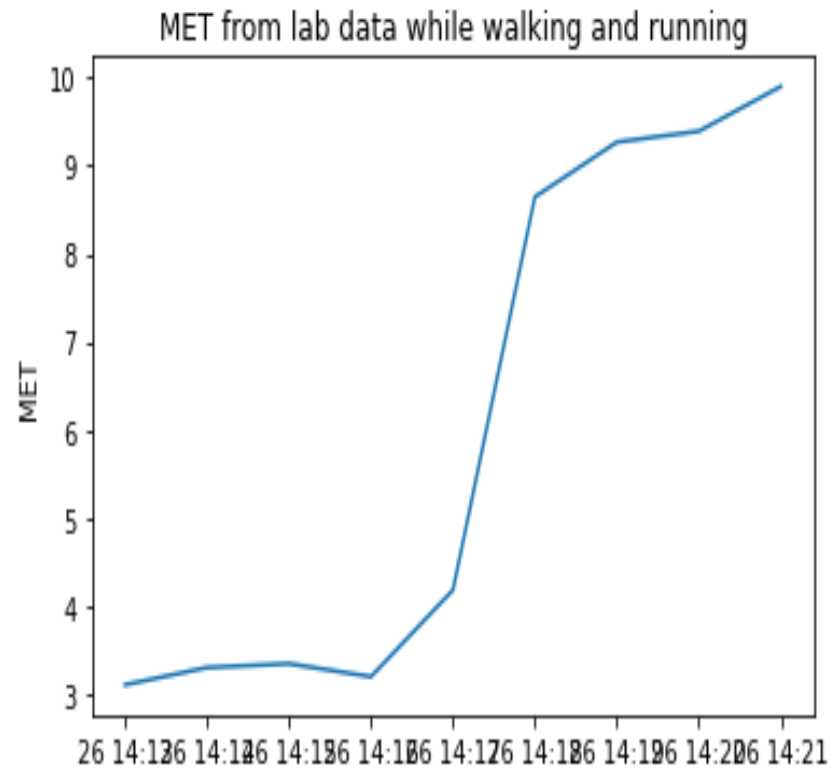 - Random seed: 0

Activity recognition results

Validation test result

- Accuracy: 97%

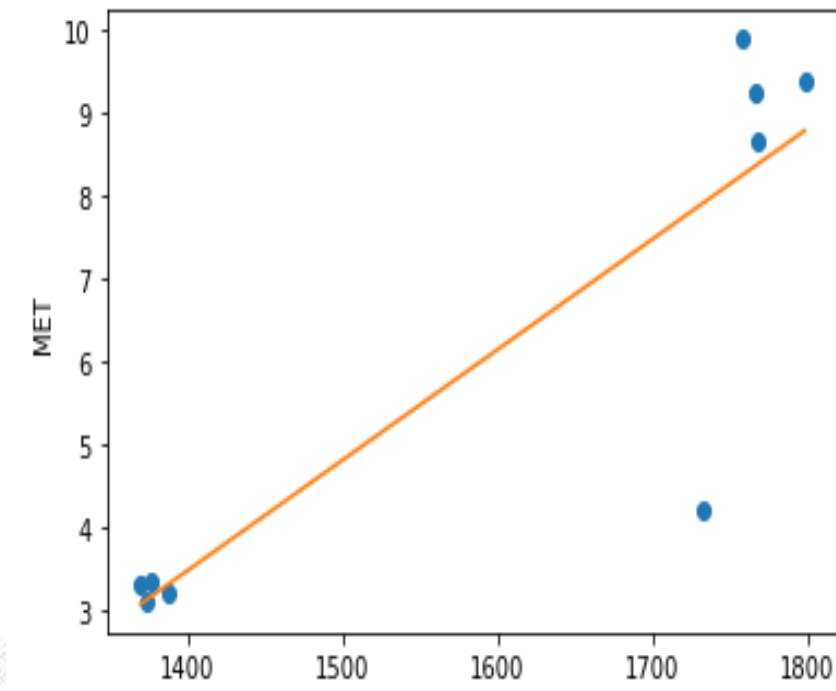- Precision: 98%

- 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
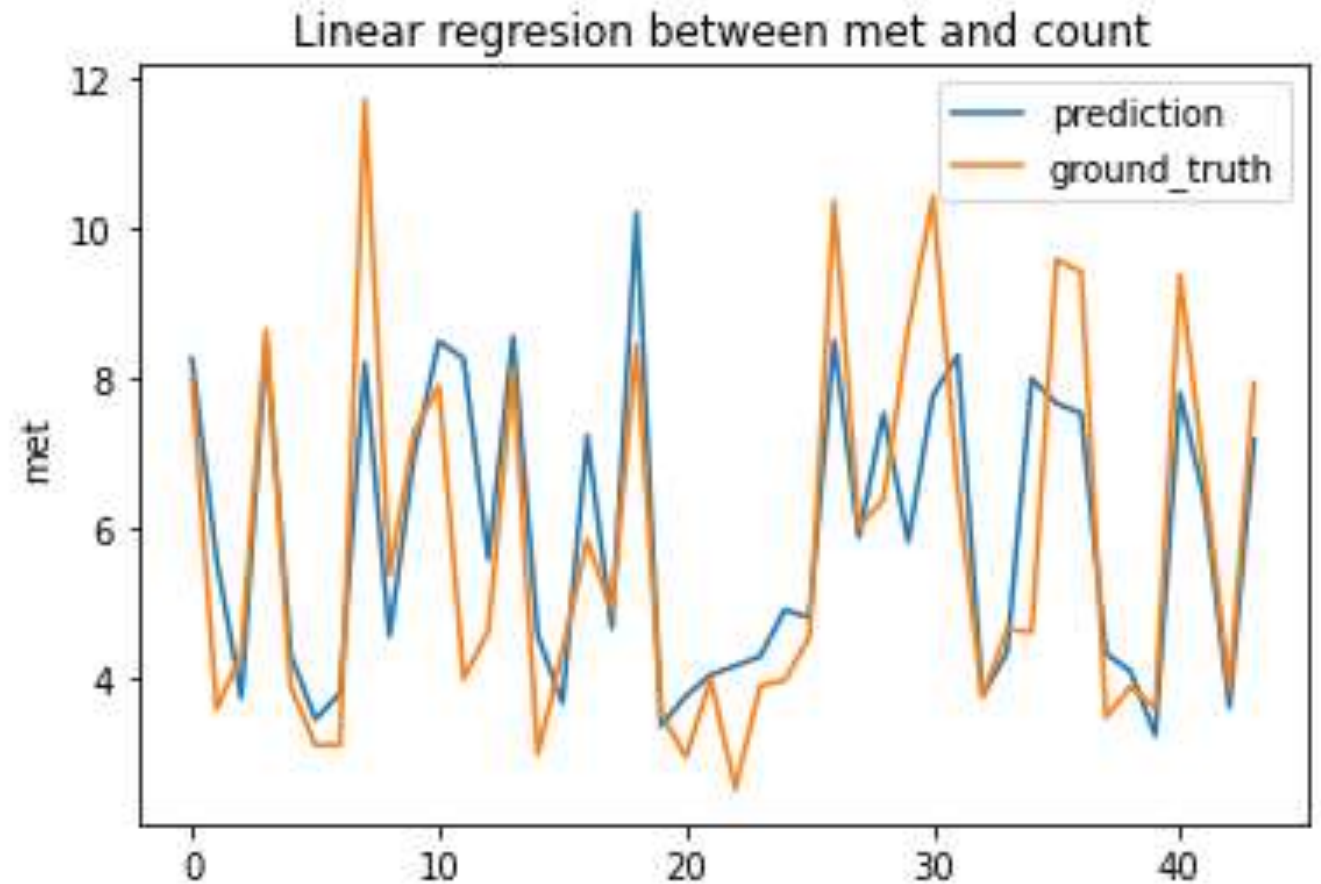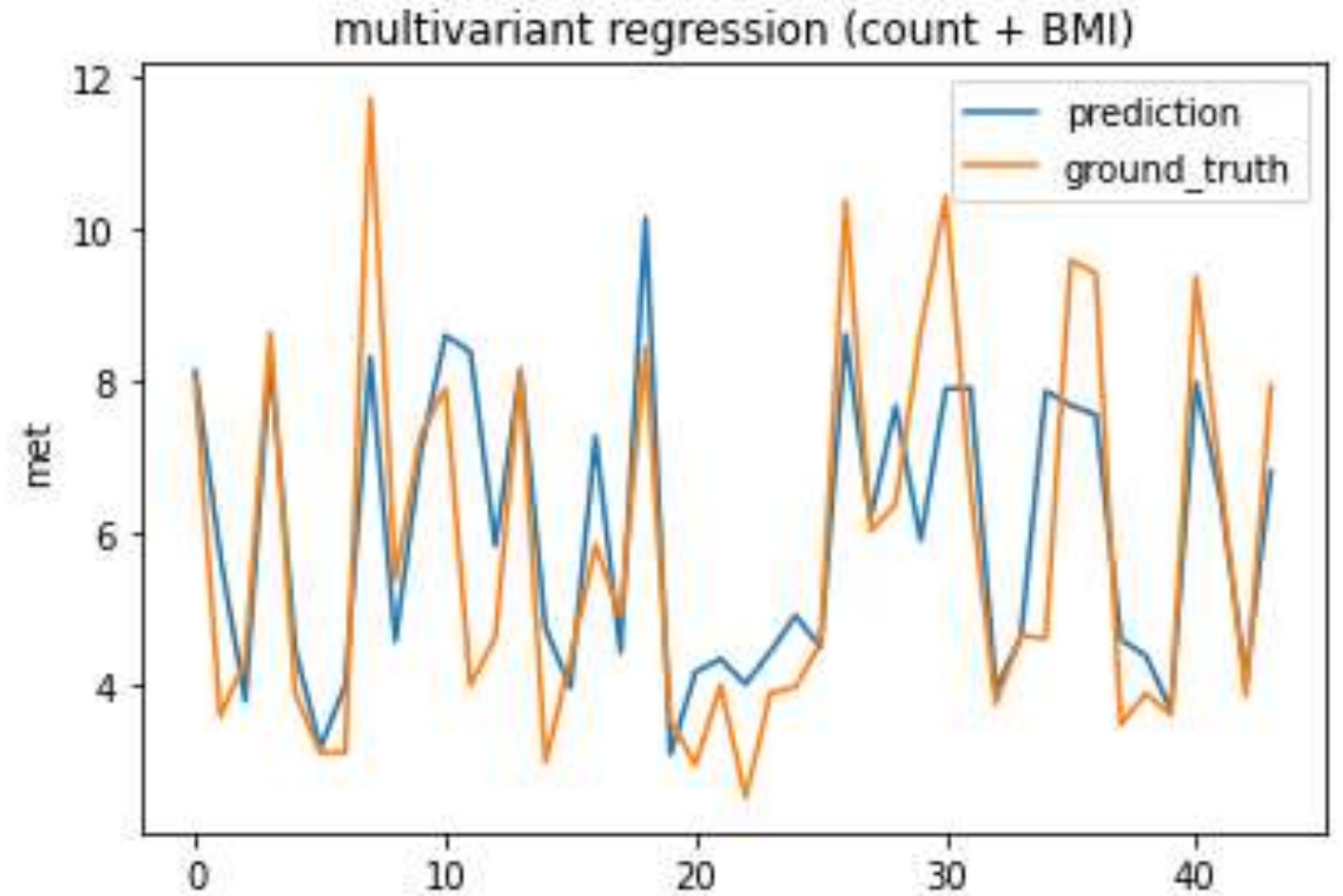
Regression between MET and accelerometer data – linear regression all respondents

r squared = 0.5060251771104591

Linear regresion between met and count

Regression between MET and accelerometer data – multivariate regression all respondents

r squared = 0.5237108907536834

multivariant regression (count + BMI)

Problems we encountered

- 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

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?