

MET regression models (V1 By Colin)

To prepare the features for the MET prediction models we combined data from multiple sources. For the creation and calculation of the features we used the activPAL accelerometer data, Vyntus One data and the 'respondents' file data that was supplied by CBS. This 'respondents' file contains different characteristics from all the respondents that participated in the lab research. The characteristics we used from the 'respondents' file for our features are length, weight, gender, age category, if the respondent meets the balance guidelines, if the respondent meets the bone and muscle guidelines and if the respondent is sporting.

Since most of these characteristics were non-numerical or string values, we converted all features to numerical values. These numerical values differed between simple True/False converted to 1 or 0 and numerical values that represent a category, in our case the age category. The age category '15-19' got a numerical value of 0, '20-24' got a numerical value of 1, etcetera. By converting our features to numerical values our Machine Learning models were able to be trained and evaluated (Brownlee, 2020).

A few other features have more complex computations. Since MET is measured in minutes ([more in this in chapter... Van Mark](#)), the following features were also resampled to 1 minute. The 'sum of magnitude of acceleration', which means the total acceleration within a certain timespan, is resampled to 1 minute after applying the following formula (Measurement of Physical Activity Using Accelerometers, 2016) on the X, Y and Z data from the activPAL accelerometer:

$$\sqrt{x^2 + y^2 + z^2} \quad // \text{ to do equation numbers}$$

The last feature is the speed, which is also resampled to 1 minute for every activity. The following formula (Calculate speed from accelerometer, 2014) was used to calculate the velocity from the acceleration of the X, Y and Z axis. The velocity is needed to calculate the speed.

$$v(t) = v(0) + \sum a \times \delta t$$

The t is the *time interval* of the x, y or z velocity. In this case 0.05 seconds (Why activPAL?, z.d.). The a is the *acceleration* of the X, Y or Z axis. After calculating the velocity for the X, Y and Z axis it is possible to calculate the speed. The following (Calculate speed from accelerometer, 2014) formula has been used. The X, Y and Z inputs are taken from the velocity formula named above.

$$|v| = \sqrt{v_x^2 + v_y^2 + v_z^2}$$
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The MET value, sum of magnitude of acceleration and speed were the only features that were not static and would change its value based on the resampled minute.