



What informs care providers on activity behavior in CP?

Distribution of being active and sedentary during the day

= activity pattern

Aim:

- To convert movement sensor data to detailed time series of activity intensities in patients with chronic pain.
- Present the resulting time series in a way that is intuitively to understand by care providers and patients, so that activity patterns can be assessed and evaluated.

Method: Convert raw movement sensor data to timeseries of activity intensity with machine learning algorithm

Create raw accelerometer data:

- 22 activities, 80sec
- 30 CP patients
- 30 healthy participants



One tri-axial accelerometer, wrist-worn

Label 22 activities



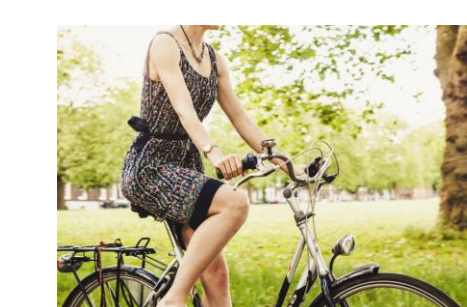
Sedentary



Low intensity



Moderate intensity



Vigorous intensity

Train and test

Machine learning algorithm (CNN+LSTM)



CNN: Convolution Neural Network, that autonomously extracts features from data.
LSTM: Long Short-Term Memory, neural network, suitable for time series.

Apply machine learning algorithm to real-life data:

Participants wear accelerometer for 14 days, algorithm is applied to these time series.

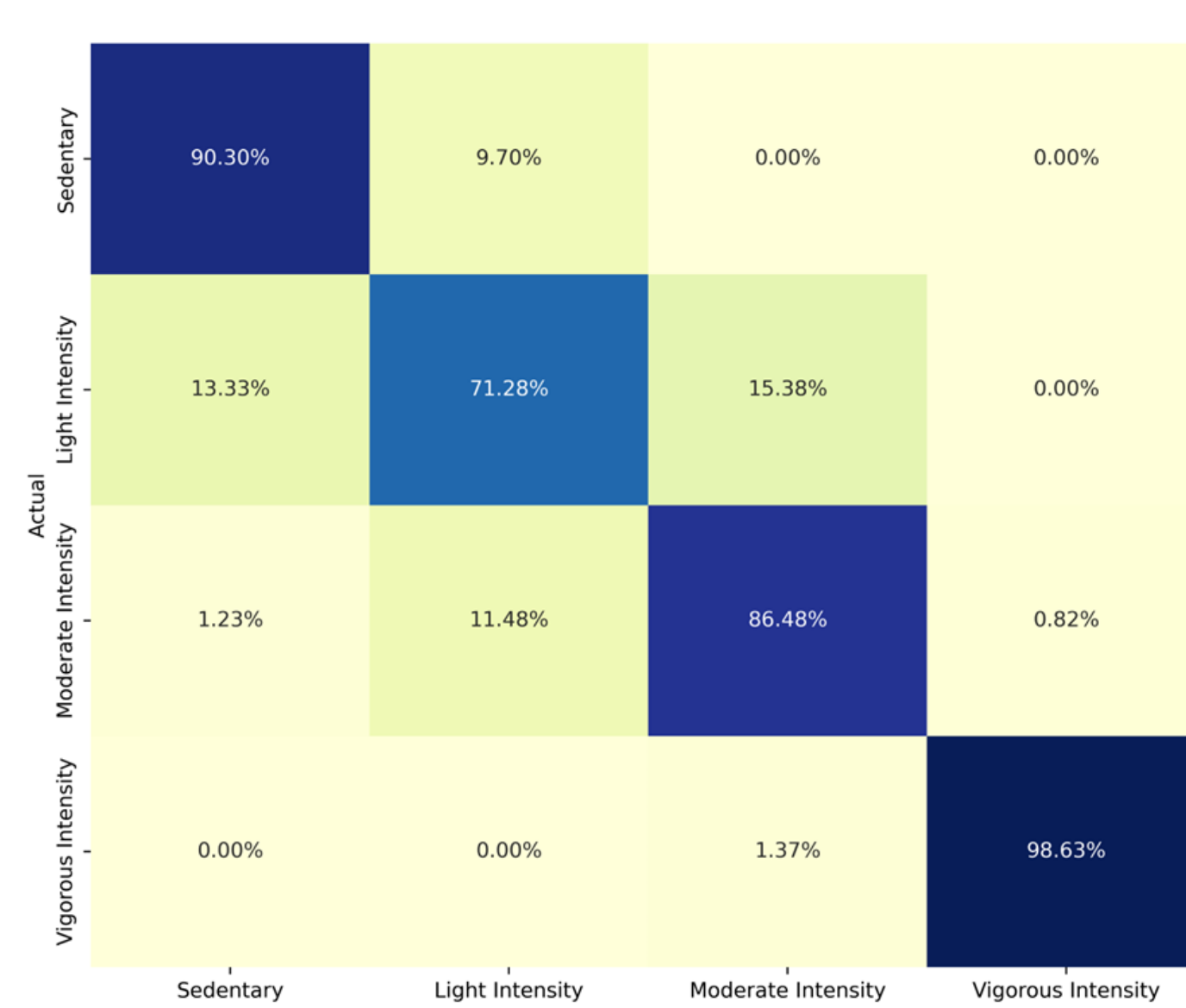


Results: Performance of the machine learning algorithm and face validity

Performance :

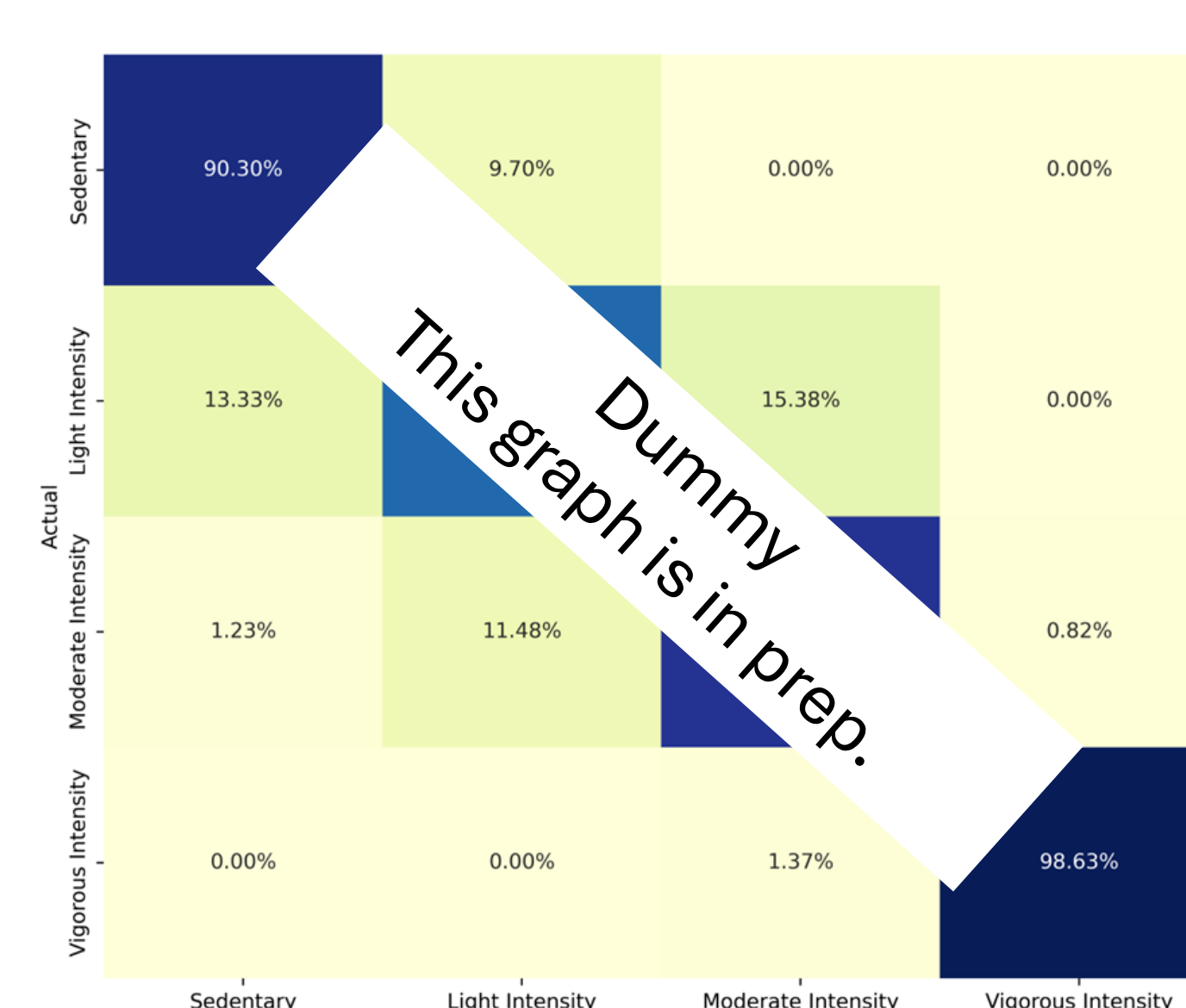
Confusion, accuracy, precision (preliminary)

Confusion matrix, healthy participants



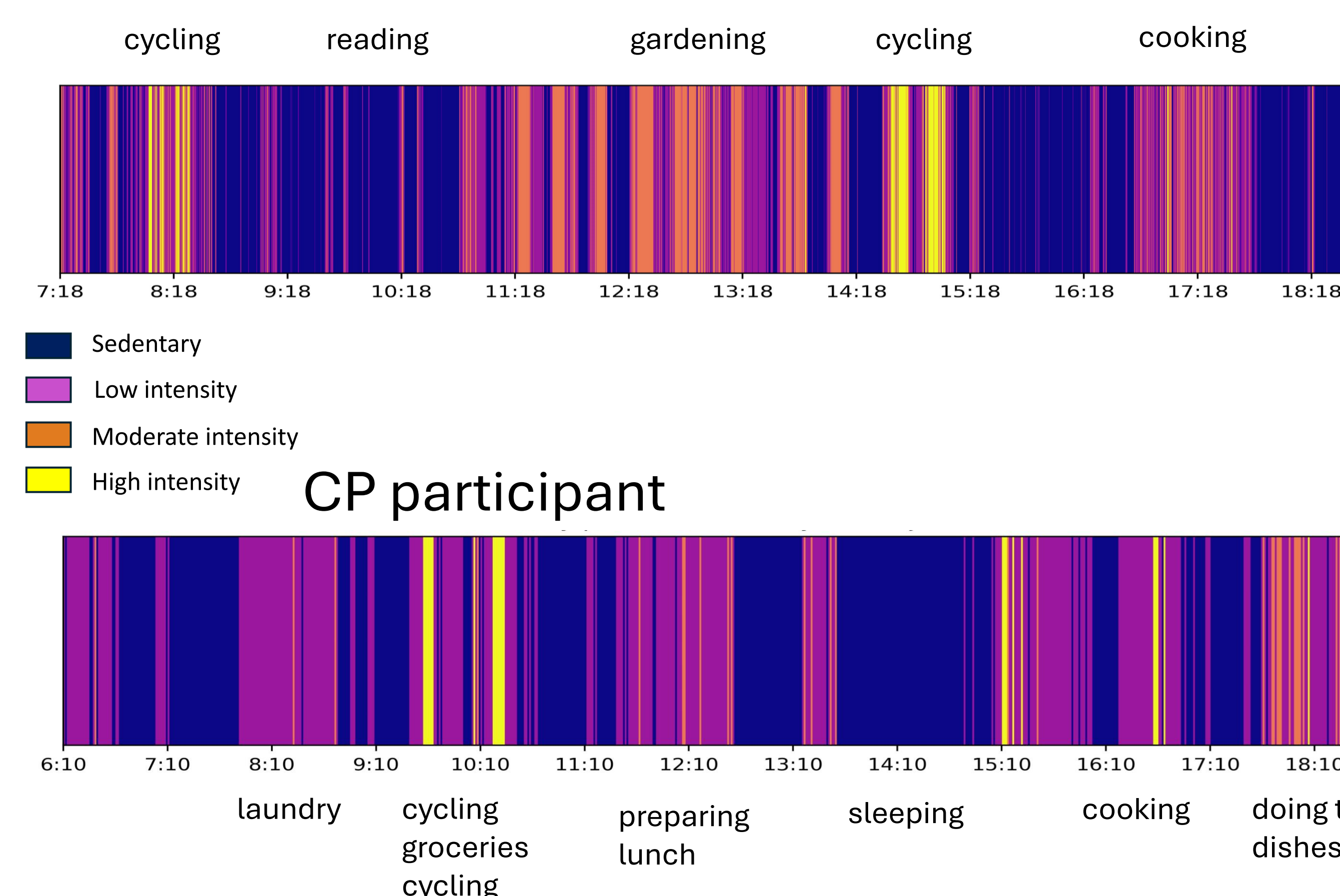
Overall accuracy: 0.86
Precision: 0.68 – 0.93
F1: 0.74-0.94

Confusion matrix, CP patients



Overall accuracy:
Precision: ...
F1: ...

Face validity (compare time series with diary):
Healthy participant



Conclusions

A CNN+LSTM Machine Learning Model accurately and precisely classifies data from a single wrist-worn tri-axial accelerometer in four classes of activity intensity (preliminary results).

When comparing timeseries of classified activity intensities with diaries it can be concluded that the machine learning model might have external validity.

Next steps:

- Criterion validity (observations)
- Data-driven investigation of activity patterns with unsupervised learning
- Code and algorithm will be published