

# HUMAN ACTIVITIES PREDICTION

USING DATA MINING TECHNIQUE

# CONTEXT

# PROBLEM SETTING

- The problem is situated in the context of recognition of daily & sports activity.
- User behavior data is collected during their sessions on the website.
- The goal is to understand and predict the purchasing intention of online shoppers based on various features that characterize their interactions with the platform.

# DATA SOURCE & DESCRIPTION

SOURCE: UC Irvine Machine Learning Repository

Citation: Billur Barshan and Kerem Atun

https://archive.ics.uci.edu/dataset/256/daily+and+sports+activities

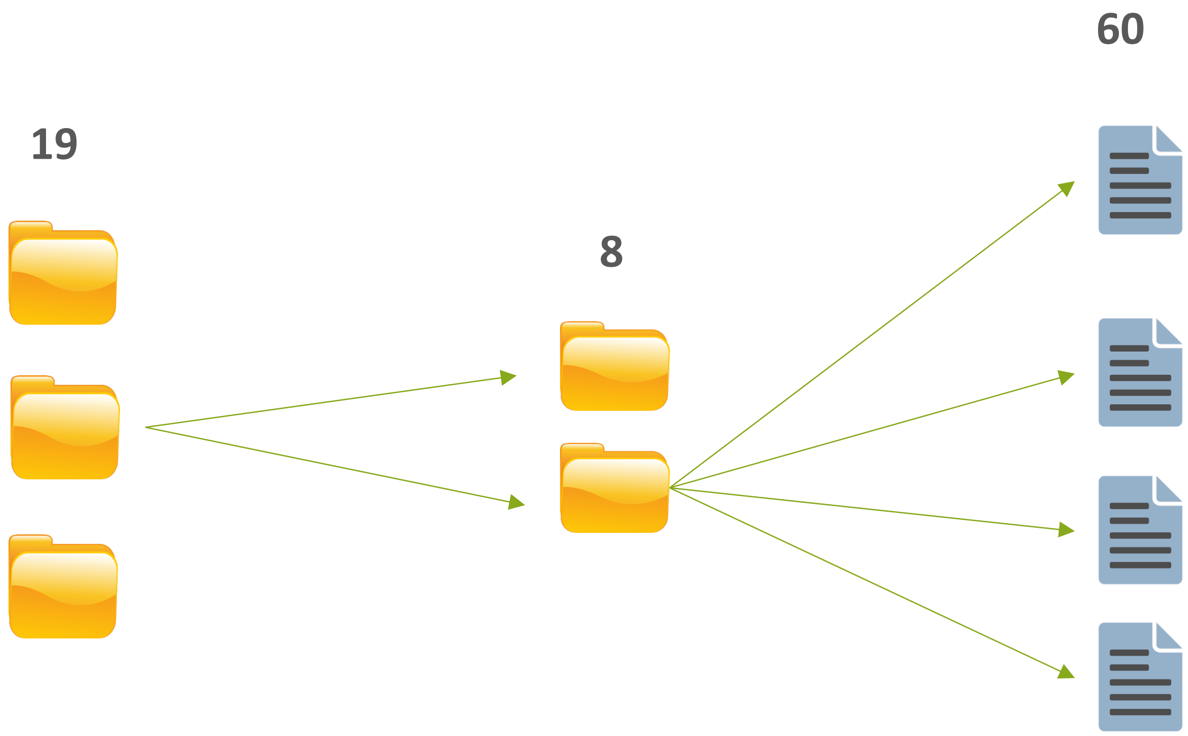
**Target variable:** multinomial variable indicating which activity is performed by the person

**Predictors:** 45 categorial numeric variables

**Dataset shape:** 1140000 rows and 47 columns

# DATA SOURCE & DESCRIPTION

- Each of the 19 activities is performed by eight subjects.
- subjects (4 female, 4 male, between the ages 20 and 30)
- Total signal duration is 5 minutes for each activity of each subject.



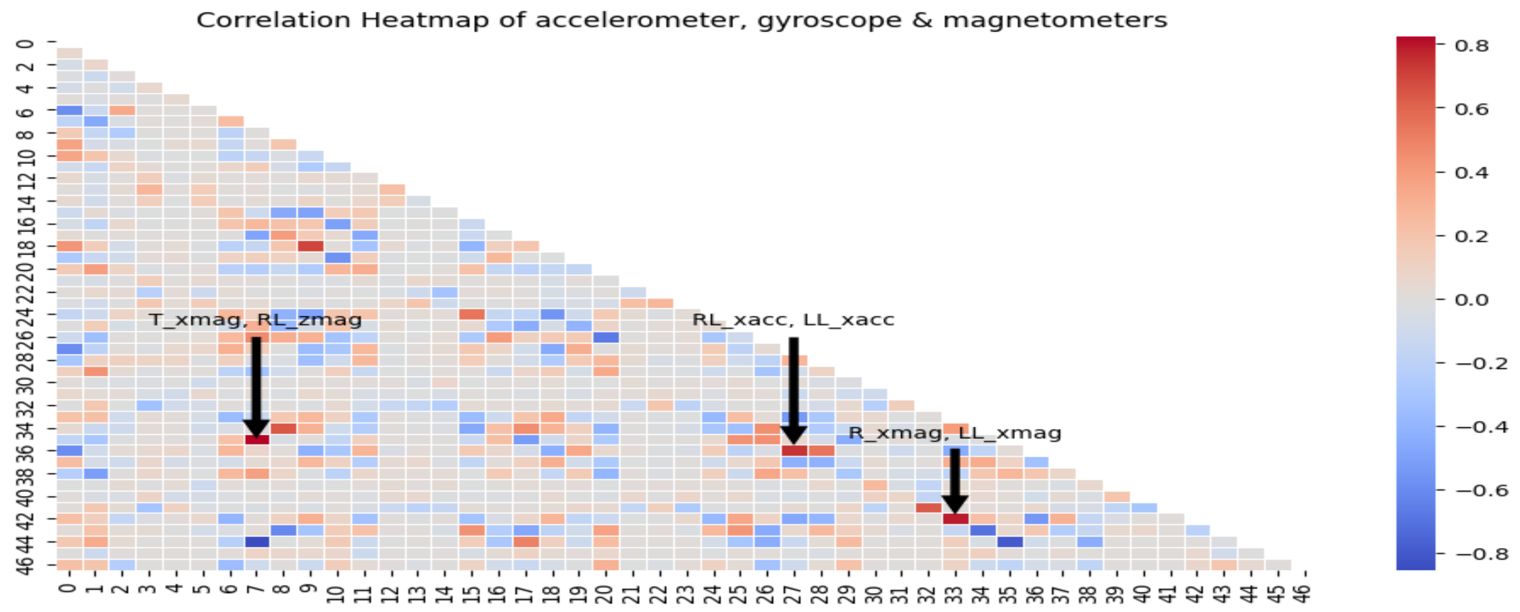

# DATA

# COLLECTION

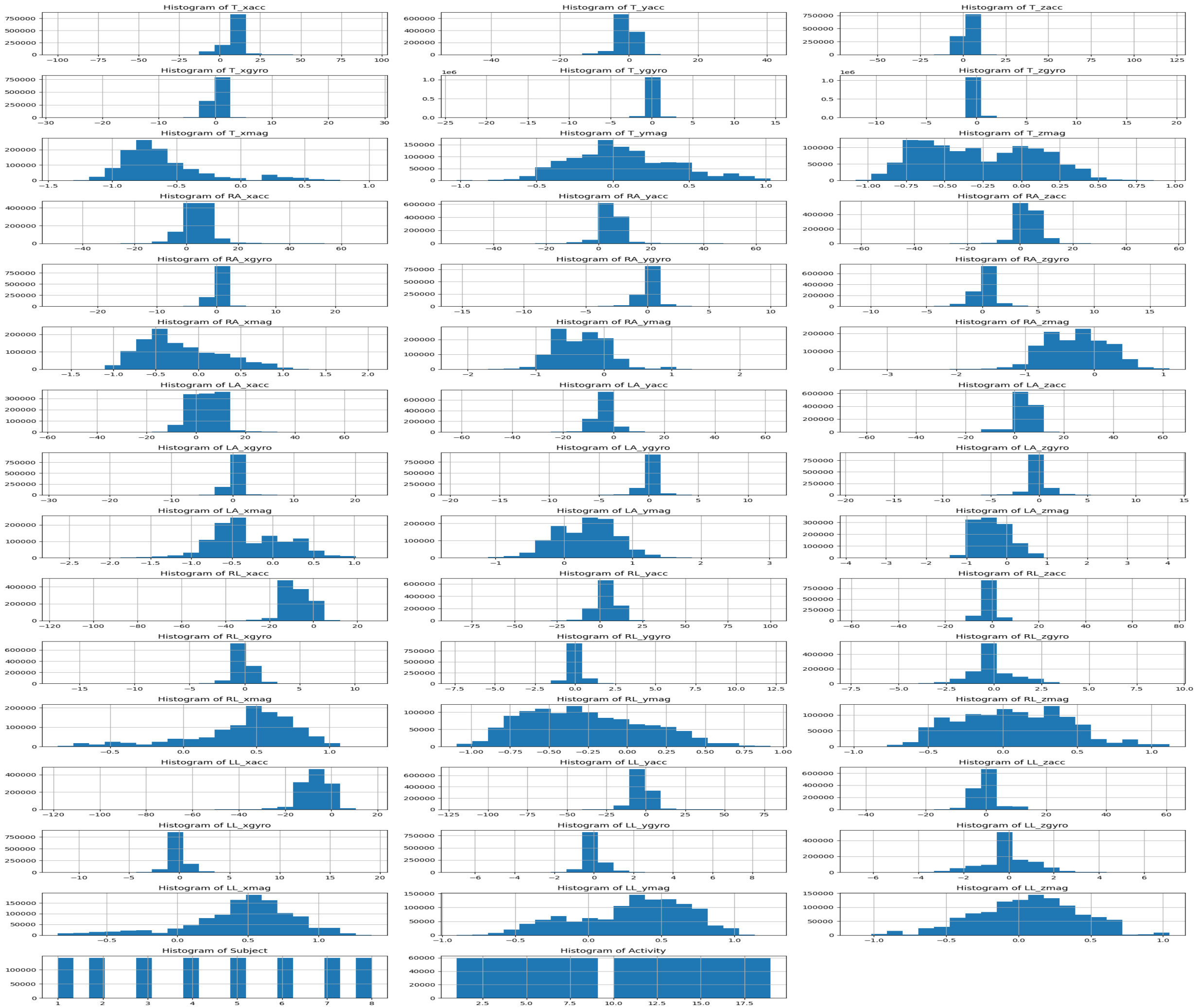
# EXPLORATORY DATA ANALYSIS

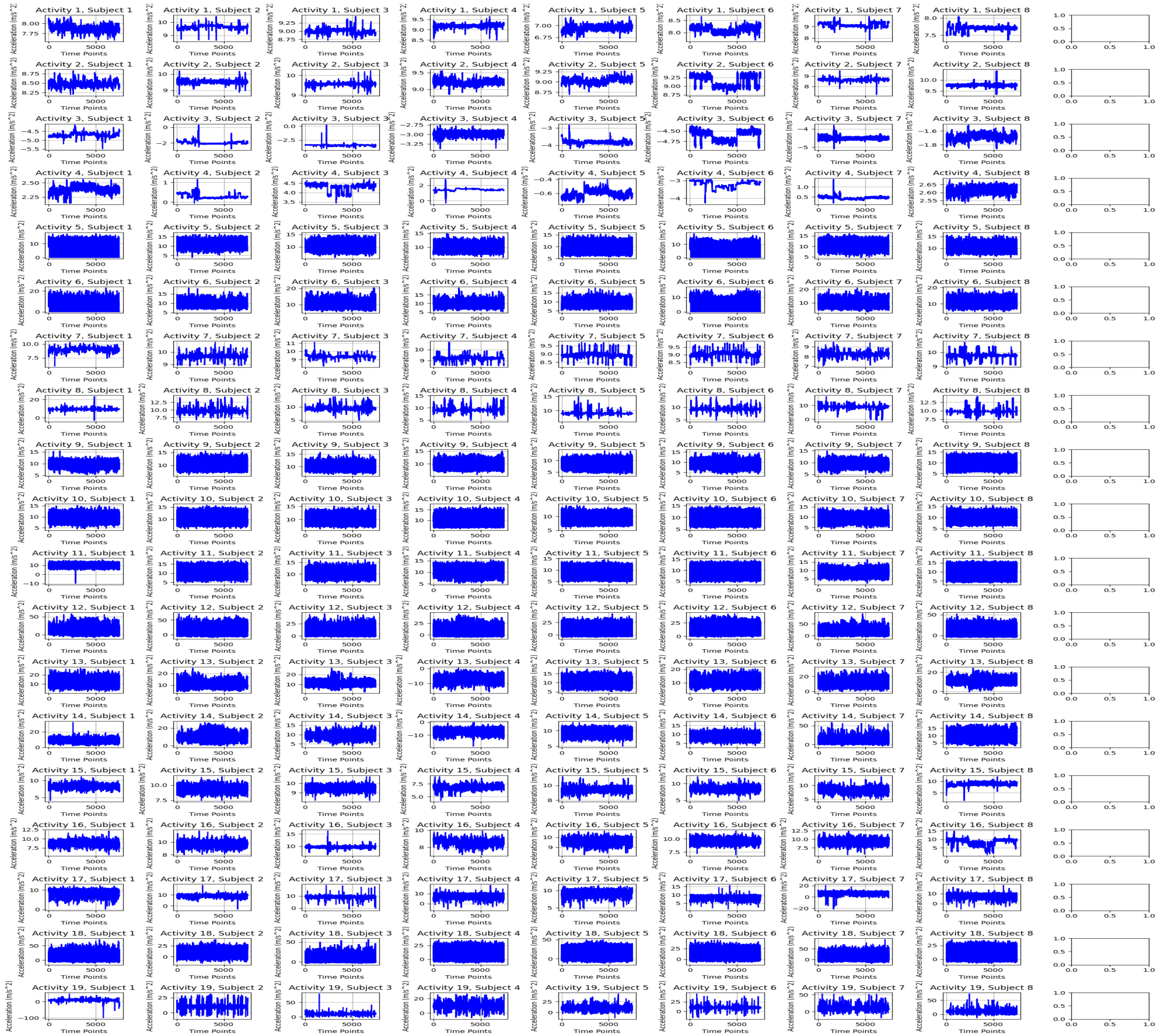
shape: (9, 48)

| describe | T_xacc | T_yacc | T_zacc | T_xgyro | T_ygyro | T_zgyro | T_xmag | T_ymag | T_zmag | RA_xacc | RA_yacc | RA_zacc | RA_xgyro | RA_ygyro | RA_zgyro | RA_xmag |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| str | f64 | f64 | f64 | f64 | f64 | f64 | f64 | f64 | f64 | f64 | f64 | f64 | f64 | f64 | f64 | f64 |
| "count" | 1.14e6 | 1.14e6 | 1.14e6 | 1.14e6 | 1.14e6 | 1.14e6 | 1.14e6 | 1.14e6 | 1.14e6 | 1.14e6 | 1.14e6 | 1.14e6 | 1.14e6 | 1.14e6 | 1.14e6 | 1.14e6 |
| "null_count" | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| "mean" | 7.765766 | -0.811036 | 2.768845 | -0.002796 | 0.013695 | -0.003312 | -0.598436 | 0.061729 | -0.272517 | 4.260595 | 4.938779 | 3.119262 | 0.016302 | -0.021484 | -0.00318 | -0.21123 |
| "std" | 5.637887 | 2.623027 | 3.53826 | 0.794011 | 0.69104 | 0.310766 | 0.3561 | 0.340436 | 0.373412 | 5.821339 | 4.580221 | 3.869474 | 0.869443 | 0.764749 | 1.023147 | 0.46358 |
| "min" | -99.715 | -49.941 | -62.664 | -27.851 | -23.598 | -12.067 | -1.4226 | -1.0228 | -1.0806 | -49.535 | -53.915 | -62.145 | -26.663 | -15.439 | -11.35 | -1.6513 |
| "25%" | 6.907 | -1.5095 | 0.89985 | -0.16289 | -0.10248 | -0.09748 | -0.8247 | -0.17883 | -0.60172 | 0.094976 | 2.5398 | 0.81226 | -0.1356 | -0.16637 | -0.2033 | -0.54955 |
| "50%" | 8.8303 | -0.38953 | 2.7037 | 0.000461 | 0.017438 | -0.002664 | -0.68975 | 0.0225 | -0.30926 | 4.143 | 4.5996 | 2.6645 | 0.007994 | -0.00421 | -0.001273 | -0.33126 |
| "75%" | 9.6905 | 0.41362 | 4.4052 | 0.16482 | 0.13131 | 0.088826 | -0.49252 | 0.28235 | 0.040582 | 8.505 | 7.491 | 5.8893 | 0.16181 | 0.14566 | 0.18436 | 0.1036 |
| "max" | 93.694 | 41.013 | 120.53 | 27.671 | 14.379 | 19.262 | 1.0215 | 1.0309 | 0.96339 | 71.652 | 65.427 | 56.384 | 26.134 | 9.9733 | 16.734 | 2.0433 |



# EXPLORATORY DATA ANALYSIS



# MODEL PERFORMANCE

## KNN

| | precision | recall | f1-score | support |
|---|---|---|---|---|
| 0 | 1.00 | 1.00 | 1.00 | 11913 |
| 1 | 1.00 | 1.00 | 1.00 | 11946 |
| 2 | 1.00 | 1.00 | 1.00 | 12037 |
| 3 | 1.00 | 1.00 | 1.00 | 12142 |
| 4 | 0.91 | 1.00 | 0.95 | 12006 |
| 5 | 0.97 | 0.93 | 0.95 | 11999 |
| 6 | 0.99 | 1.00 | 1.00 | 12299 |
| 7 | 0.96 | 0.97 | 0.96 | 11926 |
| 8 | 0.97 | 1.00 | 0.99 | 11960 |
| 9 | 0.97 | 0.99 | 0.98 | 11999 |
| 10 | 0.98 | 0.98 | 0.98 | 12078 |
| 11 | 0.97 | 0.99 | 0.98 | 11973 |
| 12 | 0.97 | 0.99 | 0.98 | 12081 |
| 13 | 0.98 | 1.00 | 0.99 | 11950 |
| 14 | 1.00 | 1.00 | 1.00 | 11941 |
| 15 | 1.00 | 1.00 | 1.00 | 11962 |
| 16 | 1.00 | 1.00 | 1.00 | 11889 |
| 17 | 0.95 | 0.94 | 0.95 | 12097 |
| 18 | 0.96 | 0.81 | 0.88 | 11802 |
| accuracy | | | 0.98 | 228000 |
| macro avg | 0.98 | 0.98 | 0.98 | 228000 |
| weighted avg | 0.98 | 0.98 | 0.98 | 228000 |

## Decision Tree

Accuracy: 0.94

| | precision | recall | f1-score | support |
|---|---|---|---|---|
| 0 | 1.00 | 1.00 | 1.00 | 11913 |
| 1 | 1.00 | 1.00 | 1.00 | 11946 |
| 2 | 1.00 | 1.00 | 1.00 | 12037 |
| 3 | 1.00 | 1.00 | 1.00 | 12142 |
| 4 | 0.94 | 0.90 | 0.92 | 12006 |
| 5 | 0.88 | 0.94 | 0.91 | 11999 |
| 6 | 0.97 | 0.98 | 0.97 | 12299 |
| 7 | 0.87 | 0.88 | 0.87 | 11926 |
| 8 | 0.94 | 0.95 | 0.95 | 11960 |
| 9 | 0.91 | 0.91 | 0.91 | 11999 |
| 10 | 0.91 | 0.92 | 0.92 | 12078 |
| 11 | 0.94 | 0.93 | 0.94 | 11973 |
| 12 | 0.93 | 0.93 | 0.93 | 12081 |
| 13 | 0.95 | 0.96 | 0.96 | 11950 |
| 14 | 0.99 | 0.99 | 0.99 | 11941 |
| 15 | 0.99 | 0.99 | 0.99 | 11962 |
| 16 | 1.00 | 1.00 | 1.00 | 11889 |
| 17 | 0.88 | 0.87 | 0.87 | 12097 |
| 18 | 0.75 | 0.71 | 0.72 | 11802 |
| accuracy | | | 0.94 | 228000 |
| macro avg | 0.94 | 0.94 | 0.94 | 228000 |
| weighted avg | 0.94 | 0.94 | 0.94 | 228000 |

## Random Forest

| | precision | recall | f1-score | support |
|---|---|---|---|---|
| 1 | 1.00 | 0.00 | 0.00 | 17850 |
| 2 | 0.00 | 0.00 | 0.00 | 17911 |
| 3 | 1.00 | 0.99 | 1.00 | 18019 |
| 4 | 1.00 | 1.00 | 1.00 | 17915 |
| 5 | 0.00 | 0.00 | 0.00 | 18010 |
| 6 | 0.00 | 0.00 | 0.00 | 17948 |
| 7 | 0.00 | 0.00 | 0.00 | 17989 |
| 8 | 0.75 | 0.00 | 0.00 | 18197 |
| 9 | 0.91 | 0.00 | 0.00 | 18064 |
| 10 | 0.29 | 0.83 | 0.43 | 17990 |
| 11 | 0.00 | 0.00 | 0.00 | 18028 |
| 12 | 0.73 | 0.08 | 0.14 | 18008 |
| 13 | 0.17 | 0.93 | 0.28 | 17861 |
| 14 | 0.90 | 0.00 | 0.01 | 17971 |
| 15 | 0.16 | 0.99 | 0.27 | 18171 |
| 16 | 0.82 | 0.95 | 0.88 | 18091 |
| 17 | 1.00 | 0.82 | 0.90 | 17990 |
| 18 | 0.73 | 0.08 | 0.14 | 17978 |
| 19 | 0.59 | 0.01 | 0.02 | 18009 |
| accuracy | | | 0.35 | 342000 |
| macro avg | 0.53 | 0.35 | 0.27 | 342000 |
| weighted avg | 0.53 | 0.35 | 0.27 | 342000 |

# CONCLUSION

- KNN demonstrated superior performance with 98% accuracy in classifying daily and sports activities using motion sensor data.
- Future efforts will focus on refining the KNN model through hyperparameter tuning and feature engineering to optimize its performance further.
- This research highlights the potential of machine learning in health monitoring, sports analytics, and human-computer interaction, showcasing practical applications for automated activity recognition with high accuracy and reliability.

# THANK YOU