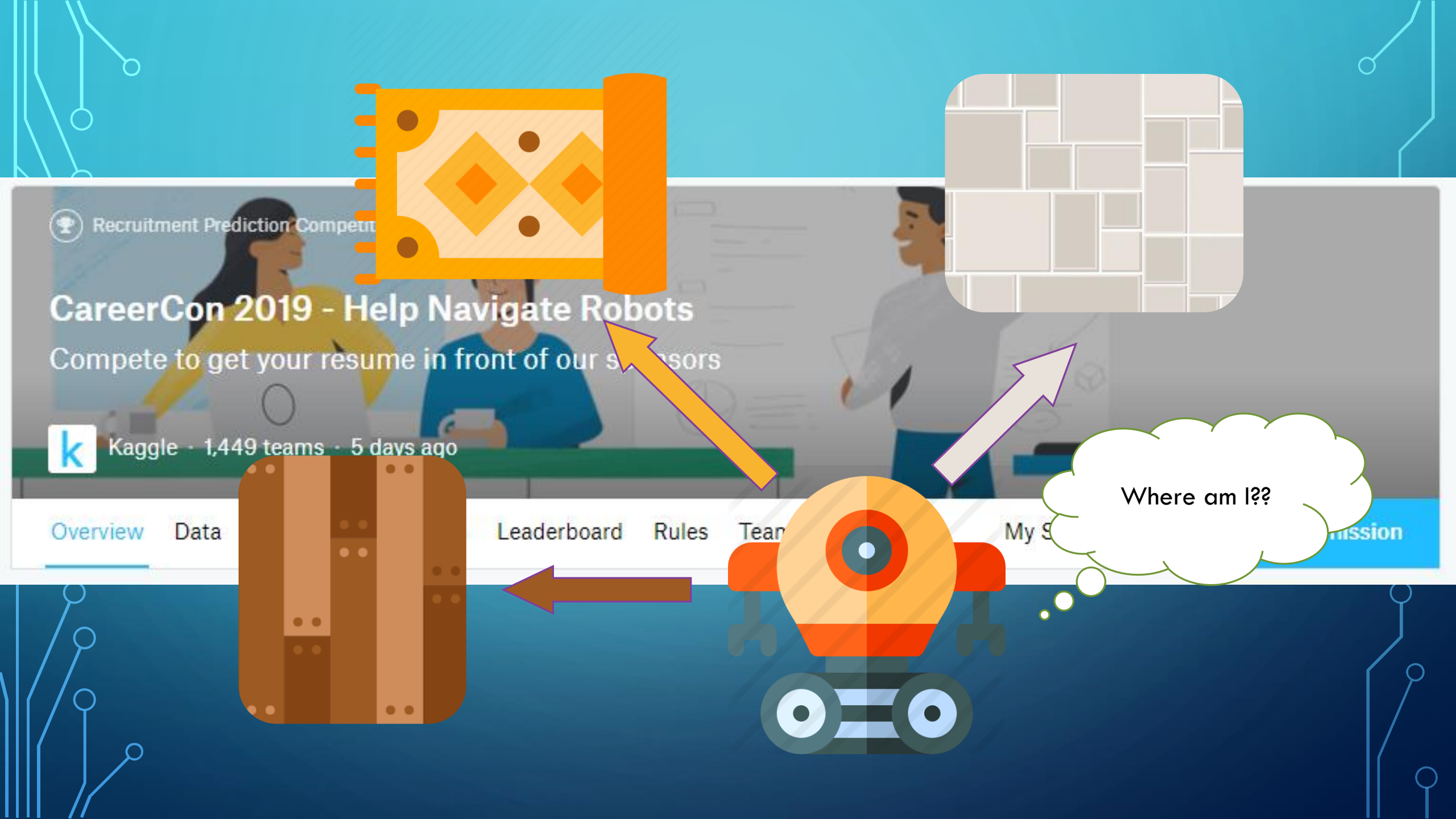
FLOOR SURFACE DETECTION

CE9010 GROUP ASSIGNMENT

TEAM 10

LIM SHU FANG [EDA, PCA, ML MODELS]

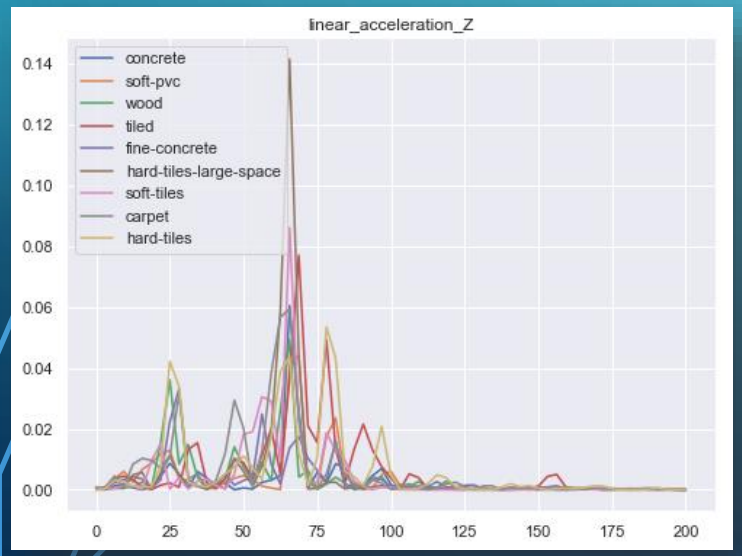
POH YONG KEAT [FEATURES EXTRACTION, NN MODELS]


Recruitment Prediction Competi
CareerCon 2019 - Help Navigate Robots
Compete to get your resume in front of our s sors
Kaggle · 1,449 teams · 5 days ago
Overview
Data
Leaderboard
Rules
Tean
My S
ission
Where am I??

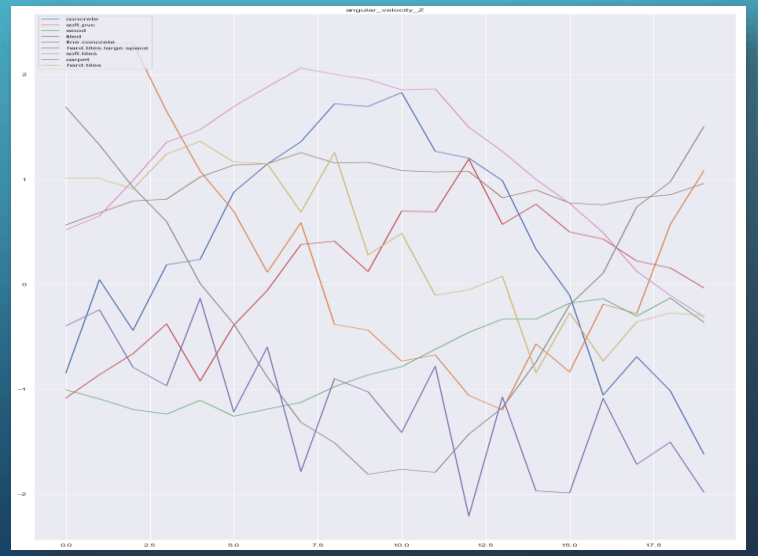
STEP 3: DATA EXPLORATION

- IMU Values: Orientation (convert from quaternion to cartesian form), angular velocity & linear acceleration
- No missing/duplicate data

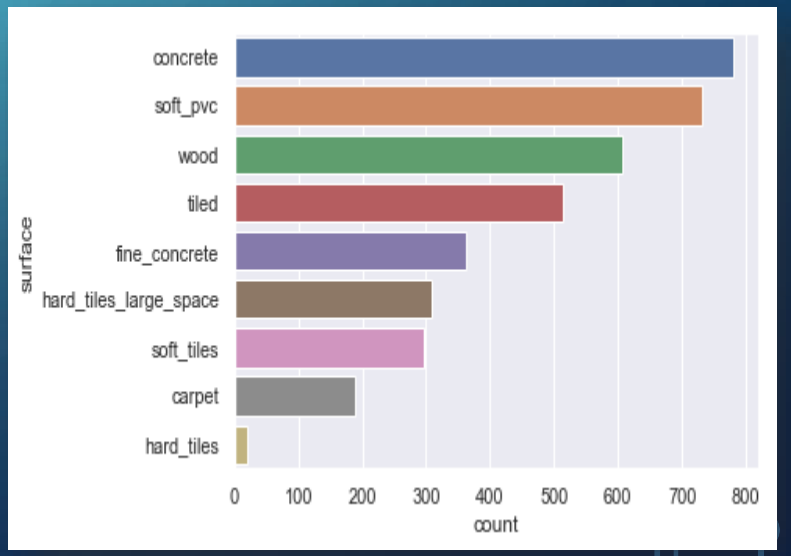
Frequency plot



Time-domain plot

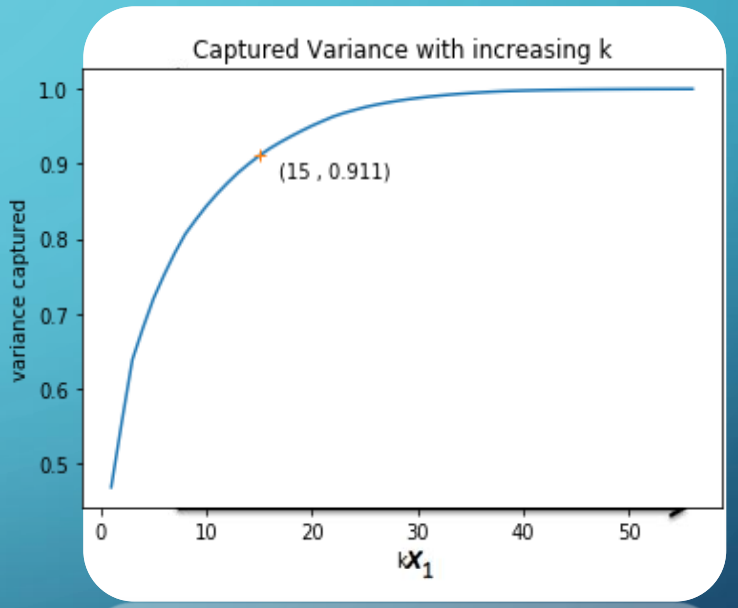


Class distribution



STEP 4: PREPROCESSING & FEATURE EXTRACTION

9 new features per each old feature



81 → 15 features
>90% variance captured

STEP 5: DATA ANALYSIS

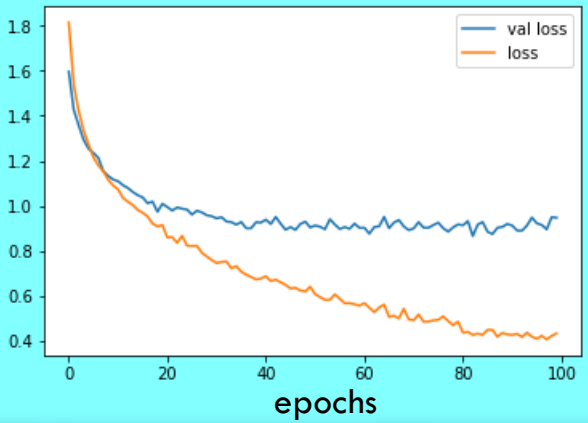
TRADITIONAL ML CLASSIFIERS

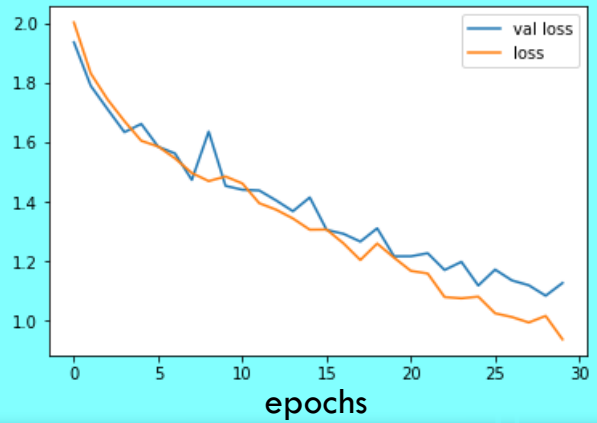
- Logistic Regression = 43%
  - Regularisation constant = 0.01
- SVM (rbf & poly kernels) = 48%
  - Regularisation constant = 10, type of kernel = polynomial

NEURAL NETWORKS

- Shallow MLP = 75%
  - Hidden Layer Neurons = 300, Dropout = 0.5, Epochs = 100
- LSTM Model = 60%
  - # LSTM Layers = 1, Dropout = 0.1

- Neural Networks perform better
- SVM has higher accuracy than LR
- LSTM limited by training epochs





STEP 6: SUMMARY OF RESULTS & CONCLUSION

- Relationships between statistical features and type of surface are non-linear.
- Neural Networks have high learning capacity, yielding good results.
- Handcrafting important features may improve performance.
- More potential for LSTM model.

REFERENCES

- External libraries used:
  - Tabulate [https://pypi.org/project/tabulate/]
  - Seaborn [https://pypi.org/project/seaborn/]
  - Scipy [https://pypi.org/project/scipy/]
  - Sklearn [https://pypi.org/project/scikit-learn/]
  - Keras [https://pypi.org/project/Keras/]
  - Plotly [https://pypi.org/project/plotly/

THANK YOU
FOR YOUR KIND ATTENTION ☺

https://github.com/pohyk123/CE9010-SurfaceML