

Fall Detection Model



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Overview

01

Business
Challenge

02

Data
Understanding

03

Methods &
Modeling

04

Conclusion

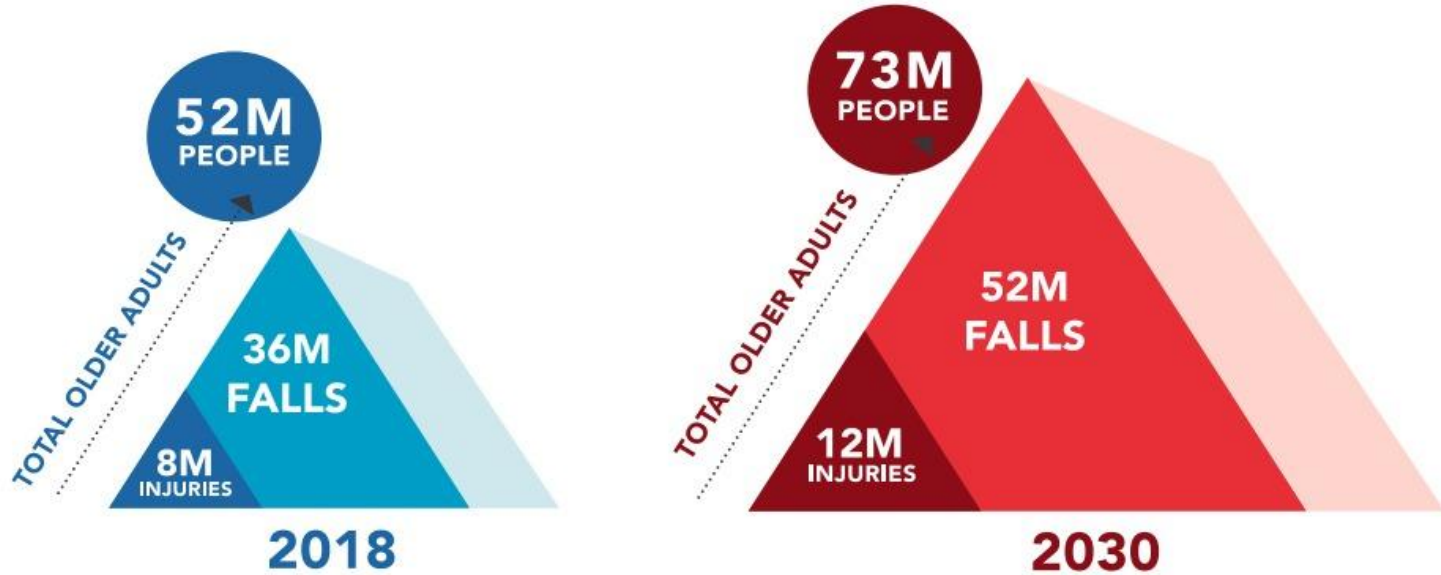




01

Business Challenge

Current & Future Trends



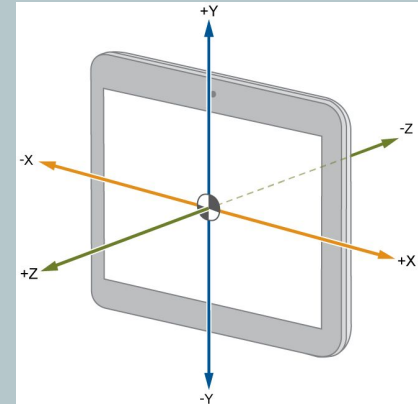
from the CDC



02

Data

- ARCO Research
- 17 subjects
- 45 total tasks (ADLs, Falls)



03

Methods and Modeling



Methods



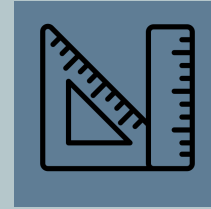
Dataset Selection

- Raw
- Aggregated



Binary Classification

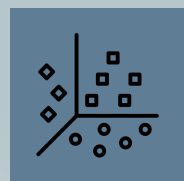
- Target: "Fall"



Metric Selection

- Accuracy, Recall, etc.
- Prediction Time

Model Selection



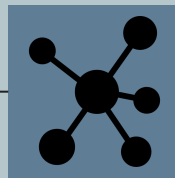
PCA /
KMeans



Baseline

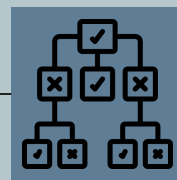


Logistic
Regression



kNN

- With
GridSearch



Tree -
based

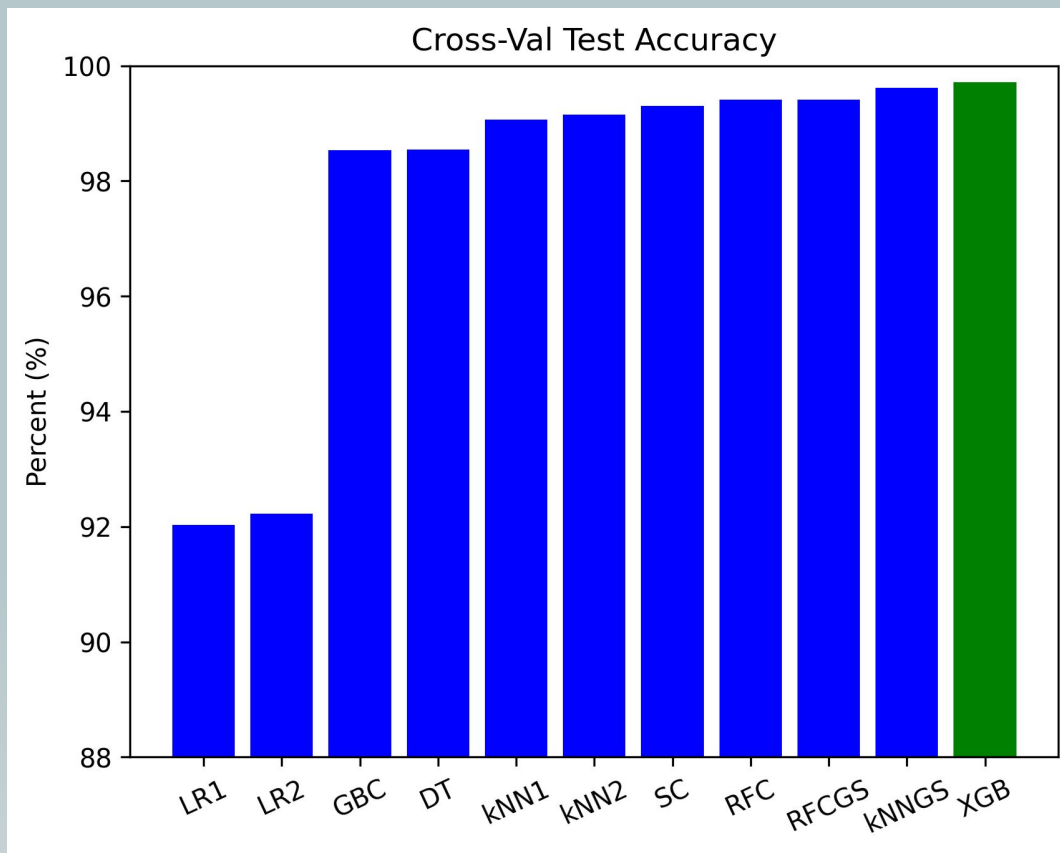
- RFC with
GridSearch



Ensemble
Methods

- Stacking
Classifier
- Gradient
Boosting
- XG Boost

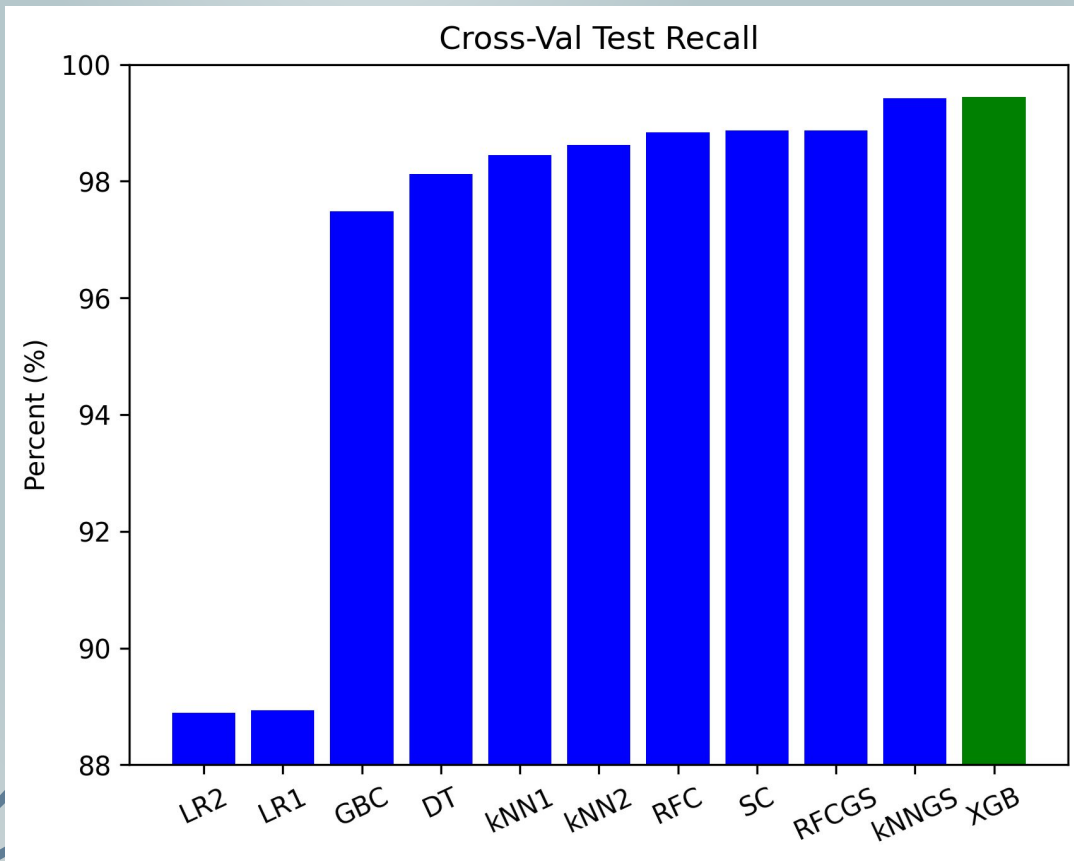
XG Boost Results: Accuracy



XG Boost = **99.71%**

kNN GS = **99.62%**

XG Boost Results: Recall

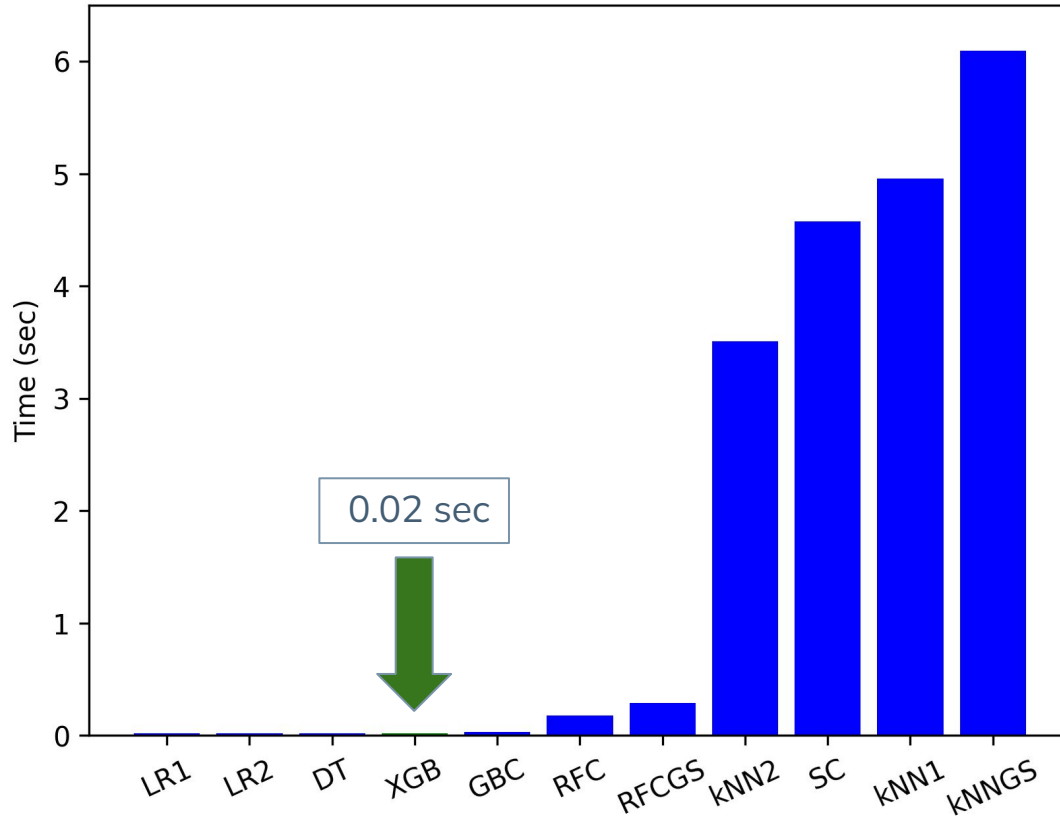


XG Boost = **99.44%**

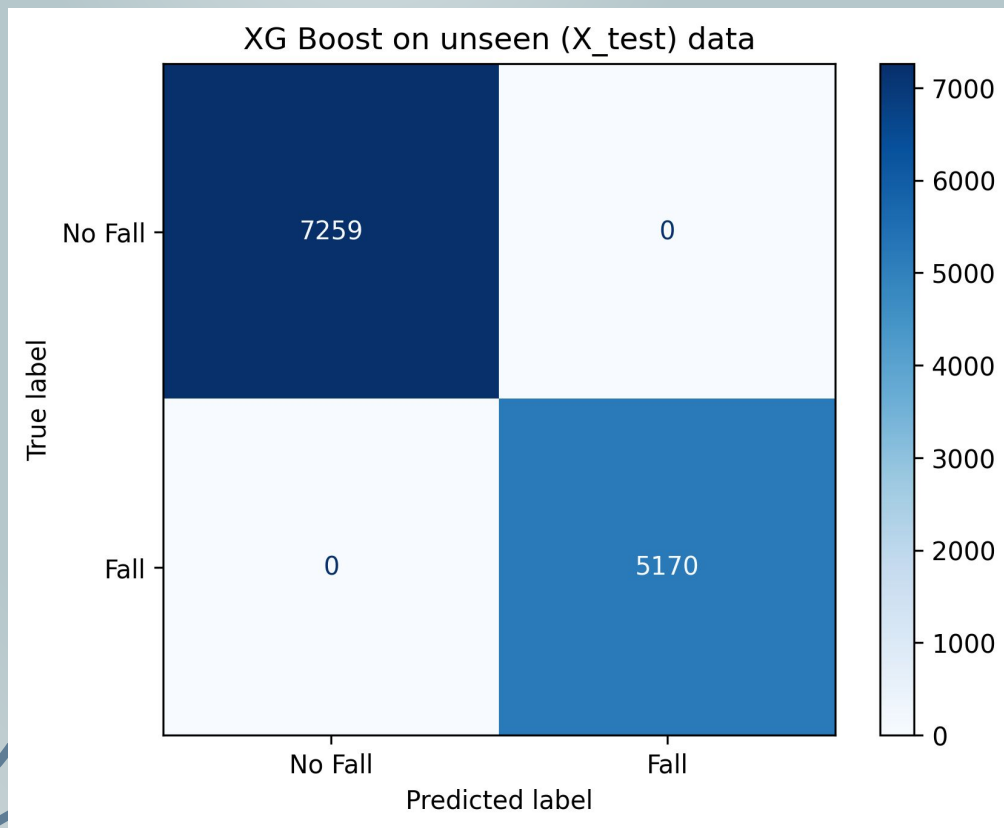
kNN GS = **99.42%**

XG Boost Results: Time

Cross-Val Prediction Time for Each Model

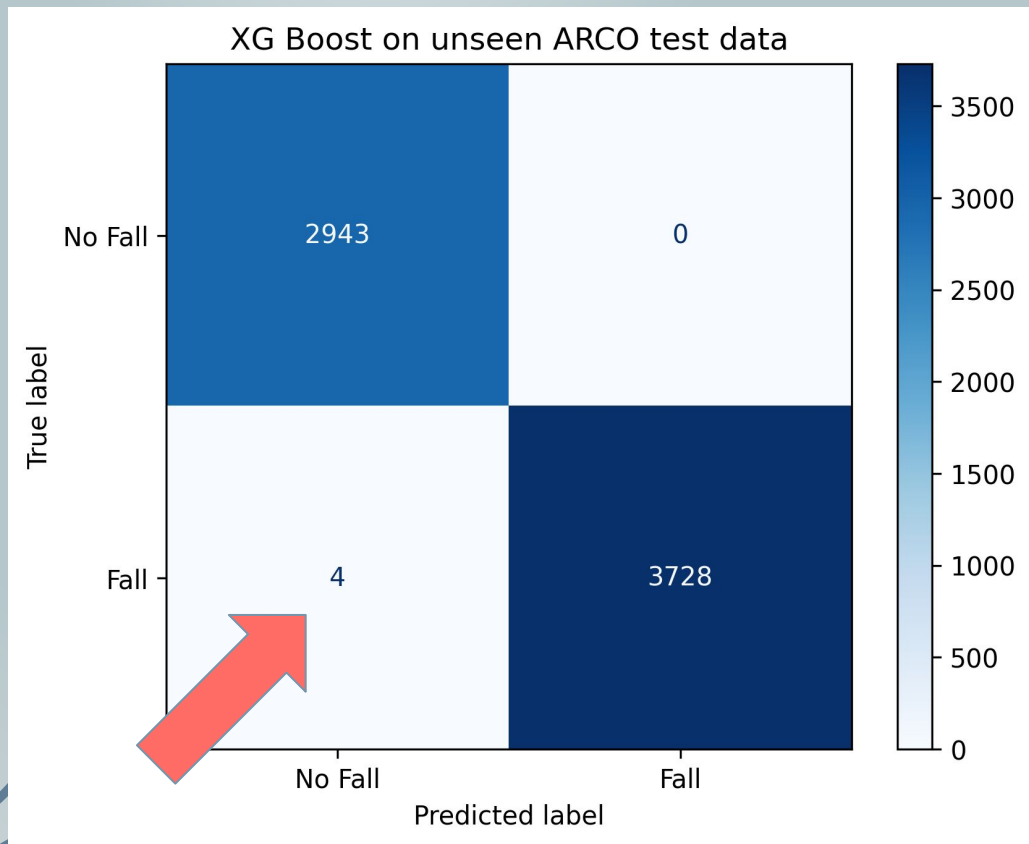


XG Boost on Unseen Data

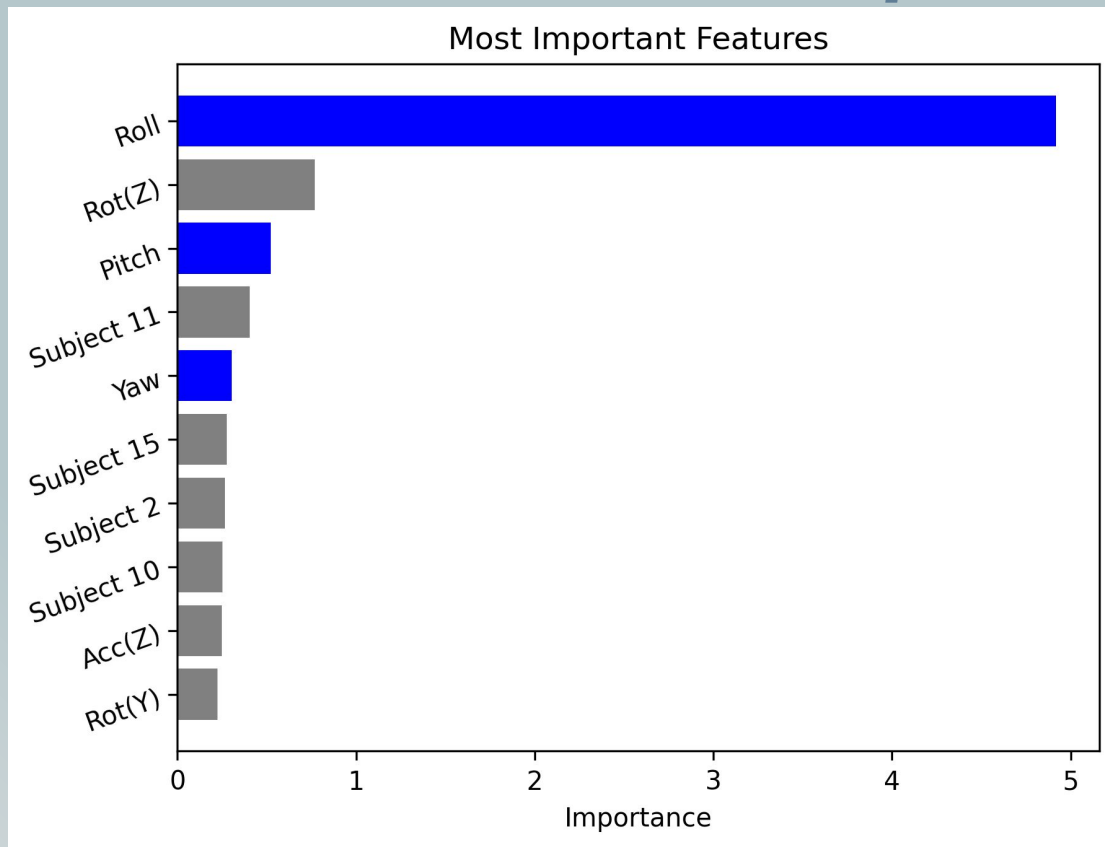


Mean prediction time:
0.01 sec

XG Boost on unseen ARCO Test data

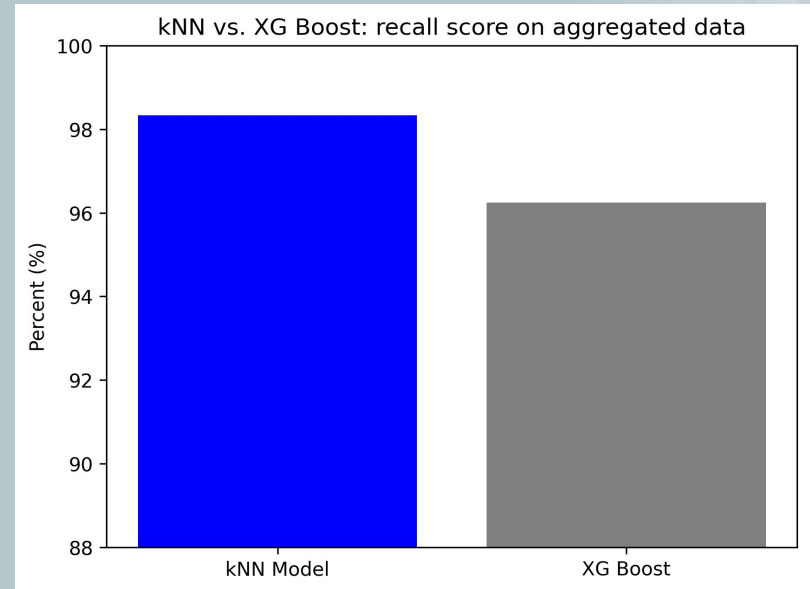
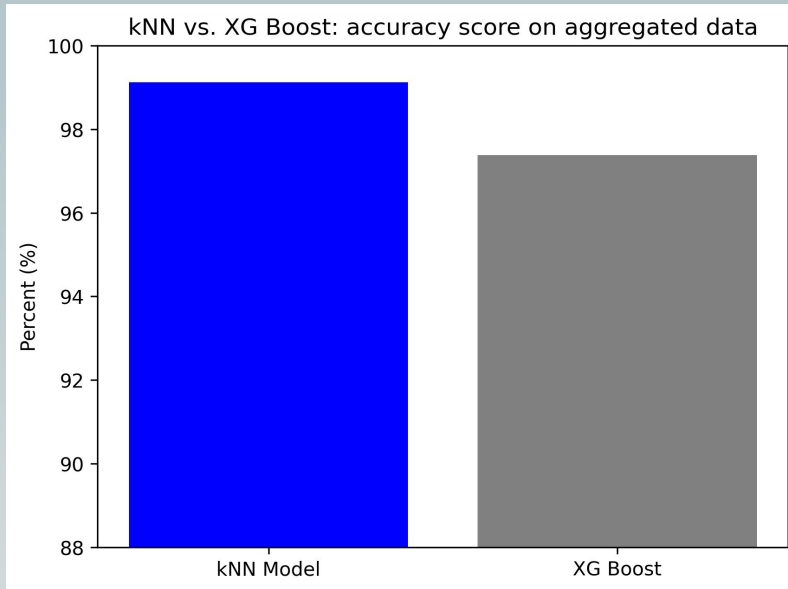


XG Boost: Feature Importance



Alternative Model: *Time Lapse*

- Aggregated Data
- kNN vs. XG Boost





04

Conclusions

ARCO Research Smart Mirror

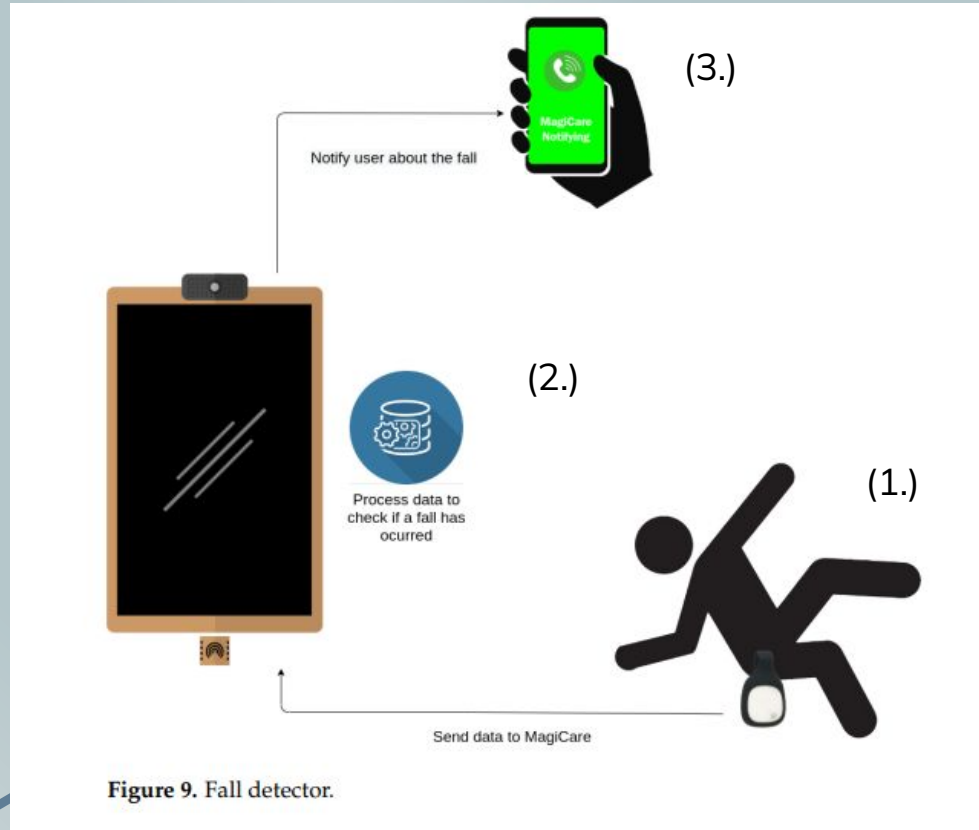


Figure 9. Fall detector.

Thank you!



Any questions?

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