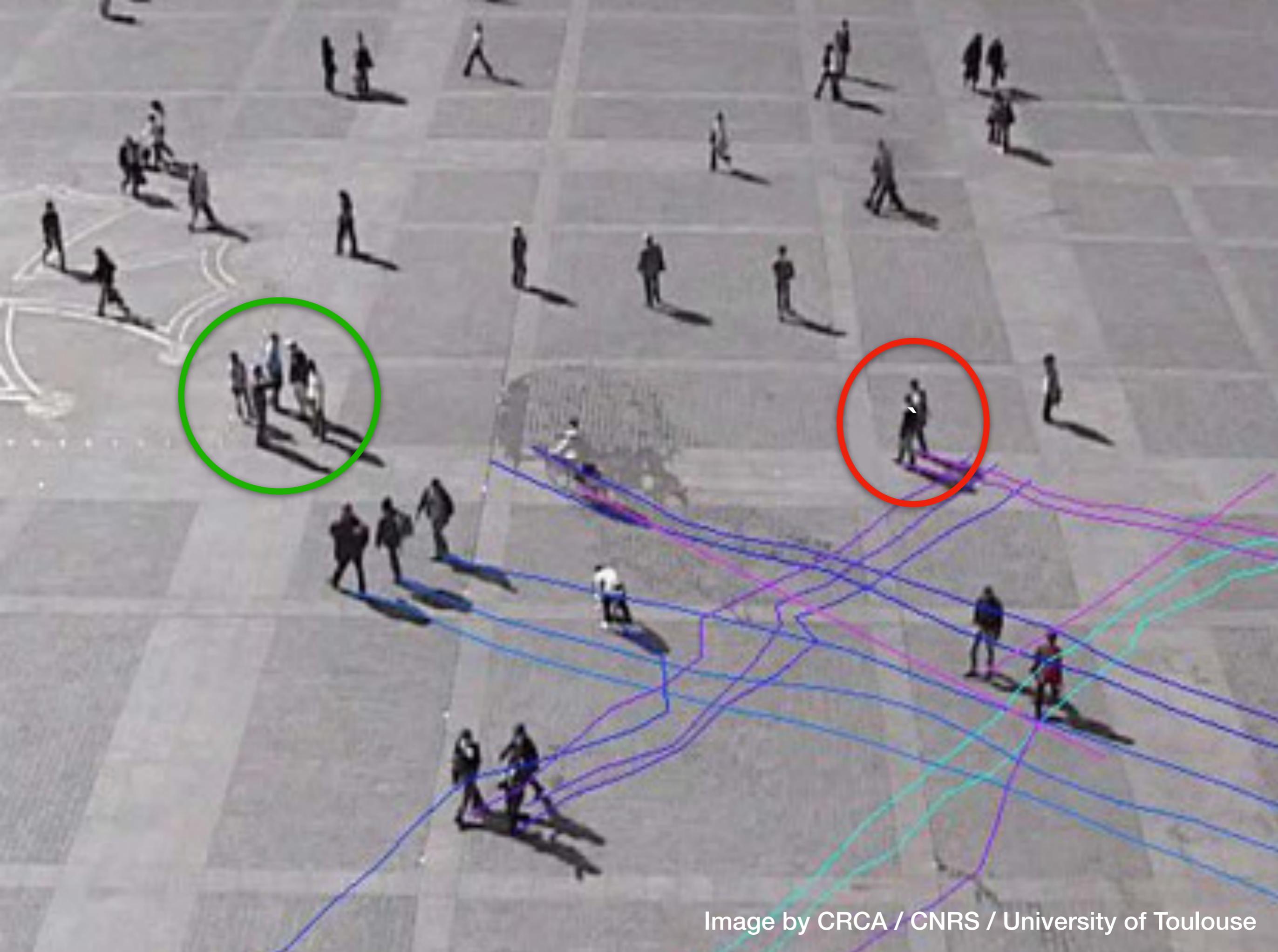


Detecting Social Interactions using Multi-Modal Mobile Sensing

Kleomenis Katevas, Katrin Hänsel, Richard Clegg,
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Kendon's F-formation System

“two or more people cooperate together to maintain a space between them to which they all have direct and exclusive access”
(Kendon, 1990)

- Directly facing each other.
- A distance between people exists (O-space).
- Rarely cross the “O-space”.
- Re-adjusting their position to maintain the F-formation.
- They remain structured and organised among most situations.



Research Questions

- *How can we detect stationary social interactions happening in planned events using mobile sensing technology?*
- *Which phone sensors are the most appropriate?*

Why is this important?





Social Networking Study

Case Study:

- 45 minutes speed networking event.
- 24 Participants:
 - 10 Male and 14 Female
 - Age 19 - 28 years
- iPhone users using a data collection app based on SensingKit framework.

Collected Data:

- Accelerometer
- Gyroscope
- Motion Activity
- iBeacon™ Proximity
- *Magnetometer*
- *Arm acceleration*
- *Heart rate*
- *Temperature*
- *GSR (skin conductivity)*



Radius RadBeacon Dot



Estimote Location Beacon



SensingKit

<https://sensingkit.org>



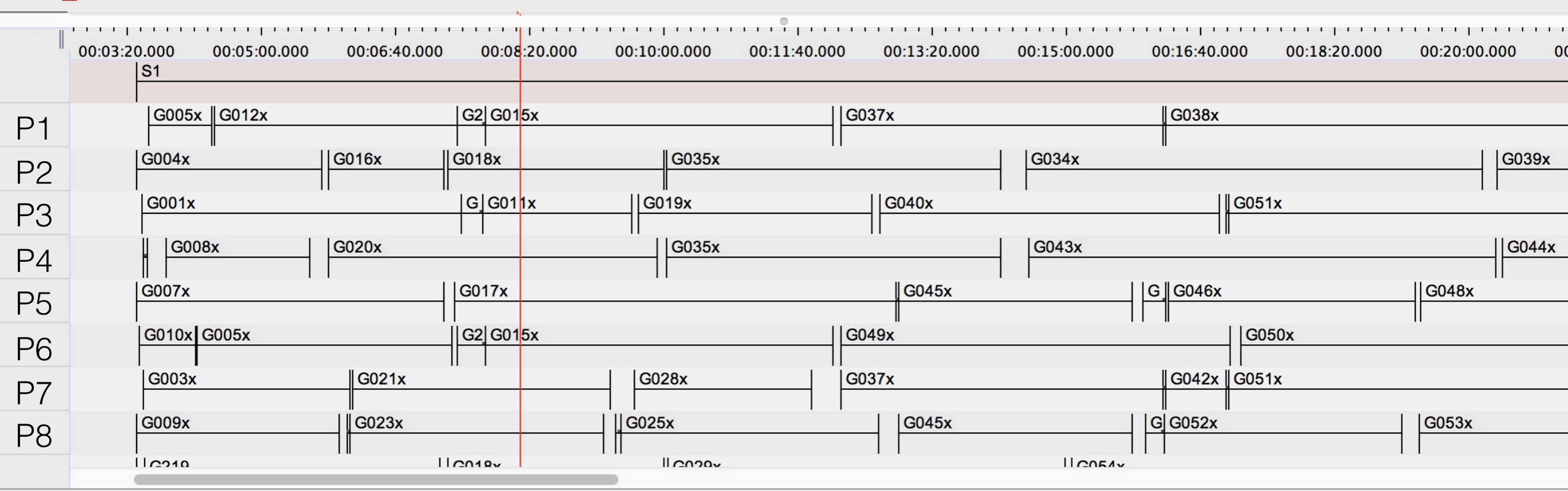


00:08:13.000

Selection: 00:00:00.000 - 00:00:00.000 0



Selection Mode Loop Mode



Data Analysis

Binary Target Variable:

{1} a pair is interacting together

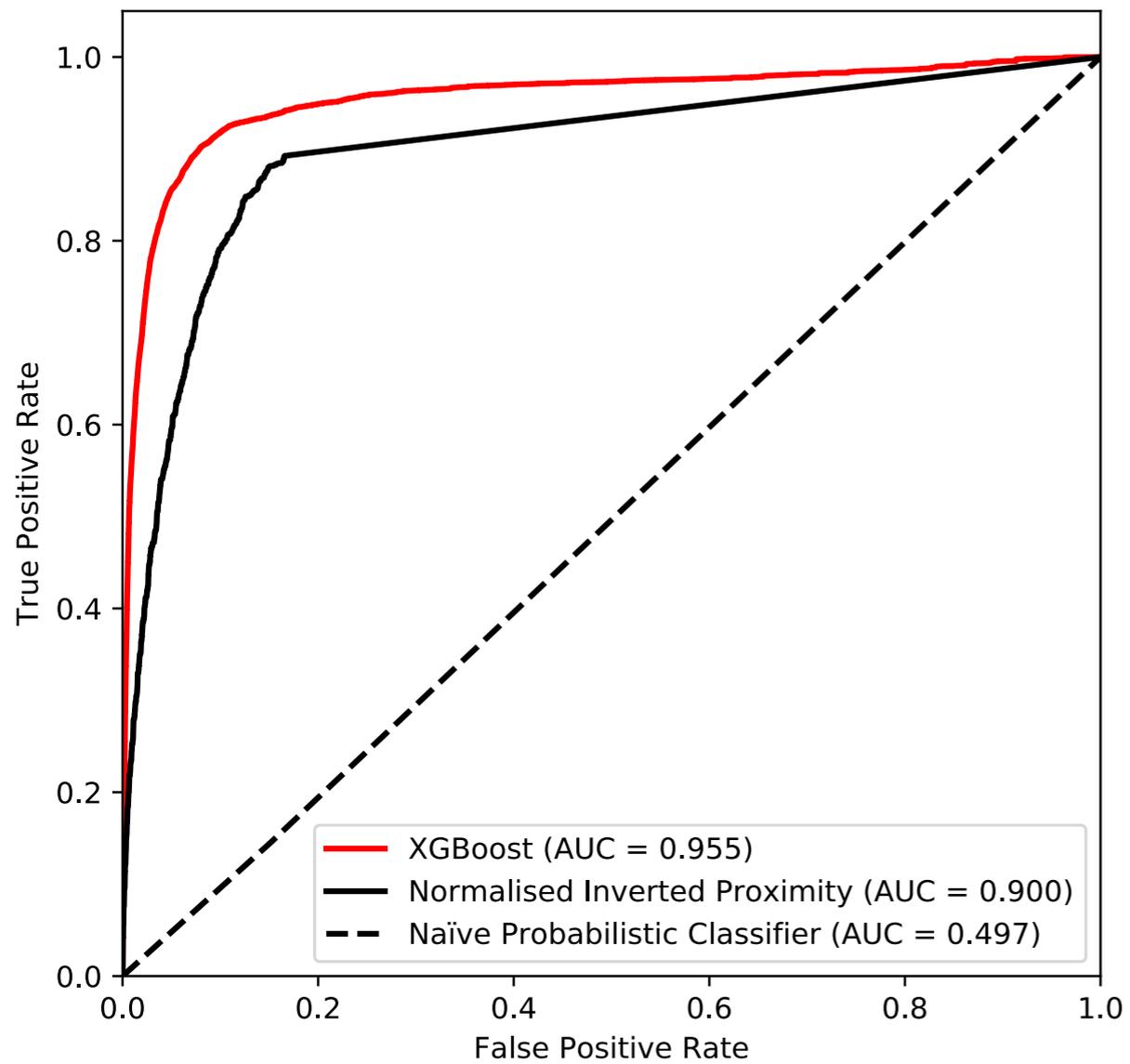
{0} a pair is not interacting

dmlc
XGBoost

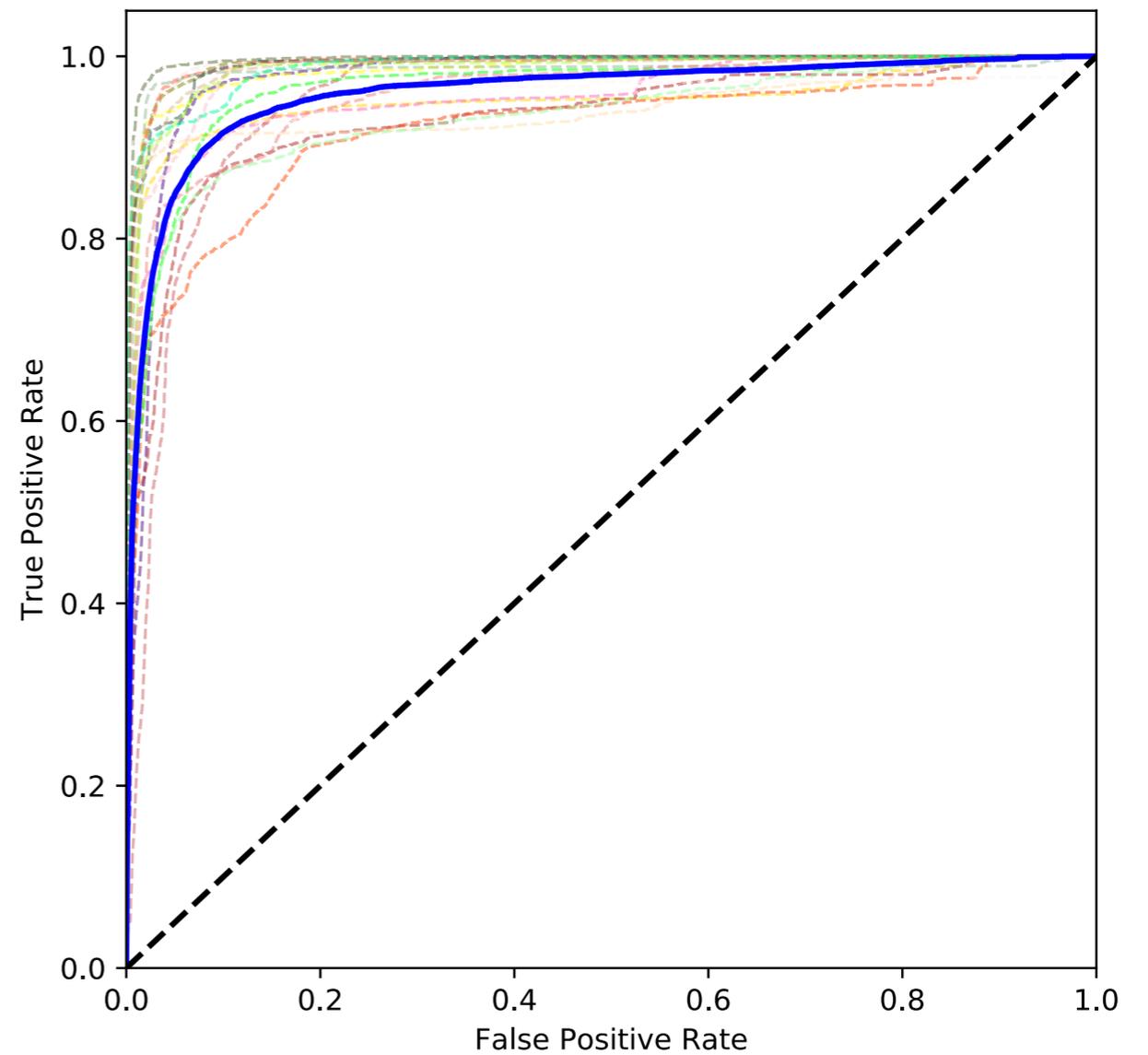
74 features for each of the
 $C(24,2) = 276$ user combinations:

- Interpersonal Space (2)
- Device Position
(one-hot encoded)
- Indoor Positioning (5)
- Motion & Orientation (7)
- Past Information (56)

Results

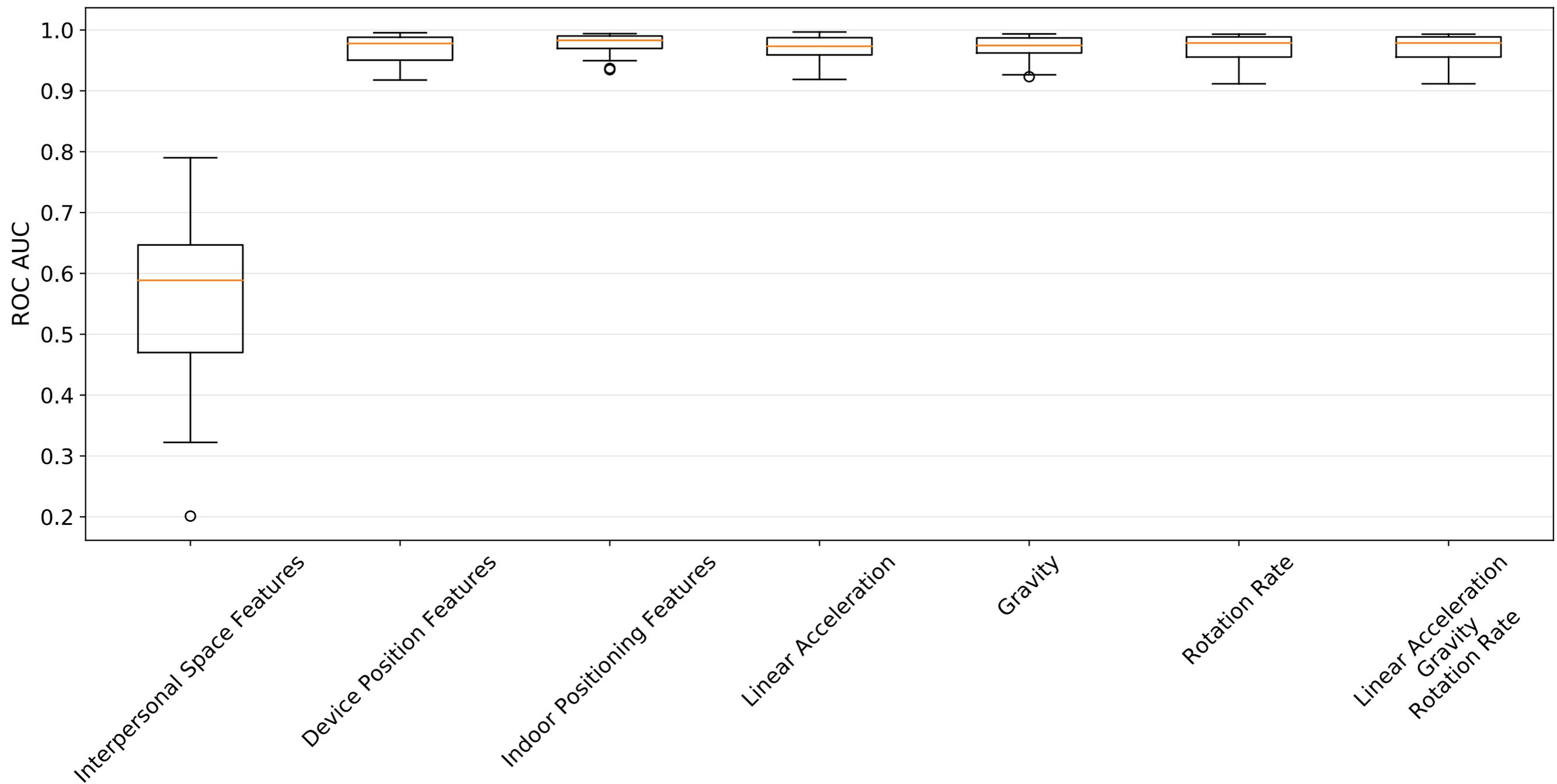


General Performance



Performance per Participant

Sensor Importance



Summary

- We detect stationary social interactions inside crowds using mobile sensor data.
- We achieved a performance of 95.5% ROC AUC.
- Evaluation was made in a natural setting with 24 participants.
- Dataset will be available in CrowDad repository (<https://crowdad.org>).

Future Work

- Detect group formations
- Explore the use of the relative orientation using the magnetometer sensor.
- Investigate other types of social interactions, such as the flocking behaviour.
- Apply the model in a real-world social event and present analytics about the ways in which people are interacting.



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Thank you for your attention!

For more details, please read:

Kleomenis Katevas, Hamed Haddadi, Laurissa Tokarchuk, Richard G. Clegg, "*Detecting Group Formations using iBeacon Technology*", 4th International Workshop on Human Activity Sensing Corpus and Application (HASCA 2016) in conjunction with ACM UbiComp 2016, Heidelberg, Germany, September 2016.

Kleomenis Katevas, Hamed Haddadi, Laurissa Tokarchuk, "*SensingKit — A Multi-Platform Mobile Sensing Framework for Large-Scale Experiments*", Extended abstract, ACM MobiCom 2014, Maui, Hawaii, September 2014.

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