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Bachelor Thesis

Machine Learning for Indoor Localization
2nd Presentation

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Outline

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  - With / Without Magnetic Field
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Goal of the Project

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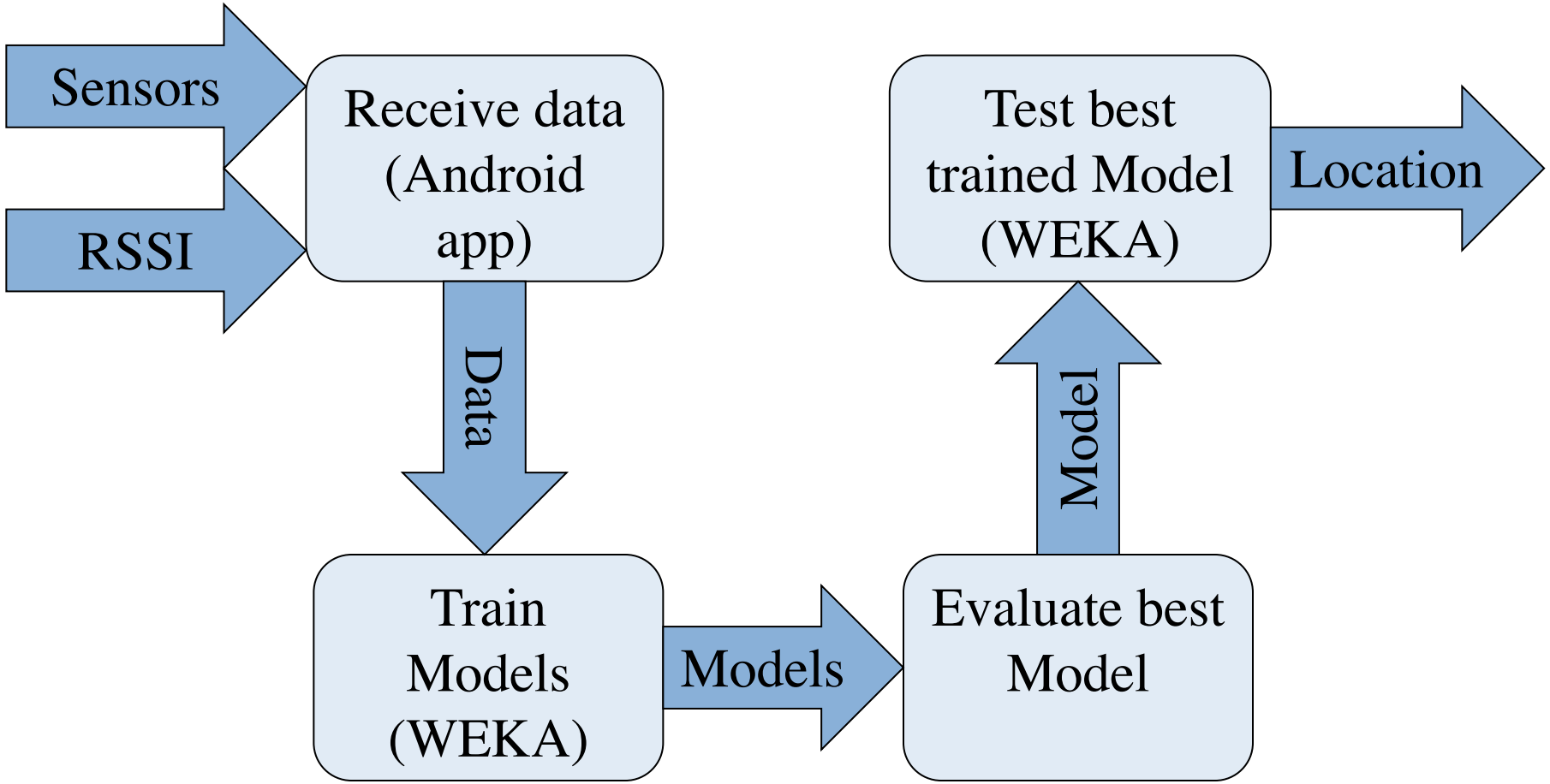
- Component to enhance Indoor Tracking System
- Should improve localization at specific points
- Use RSS values and sensor data from smartphone
- Due to complexity: use machine learning algorithms
- Improve accuracy and performance

Proposed Solution

- Android app to collect data
- WEKA for machine learning
- Experiment on which algorithms work best



Progress

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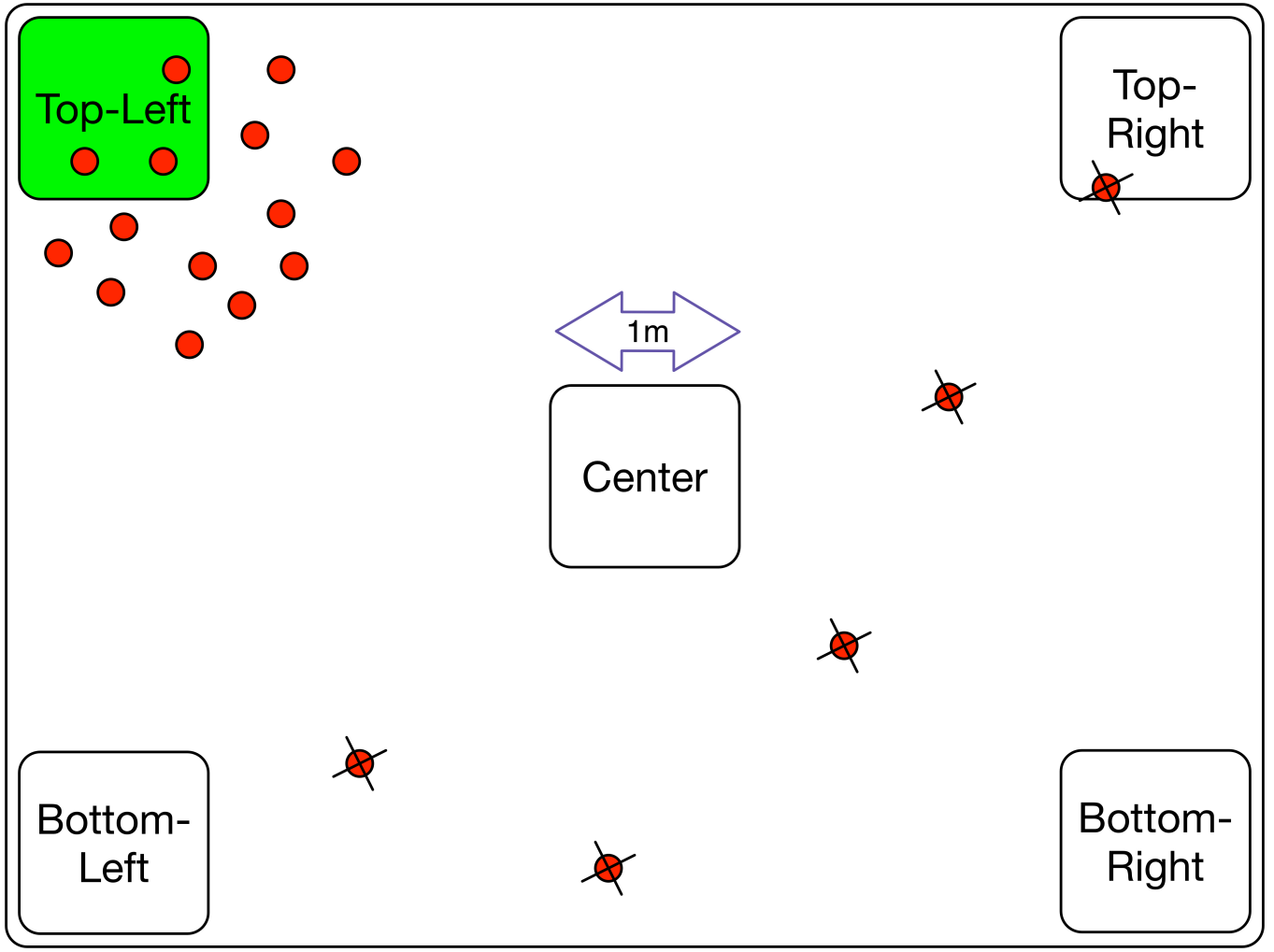
- Until first presentation
  - Integrated WEKA 3.7.3 into Android app (https://github.com/rjmarsan/Weka-for-Android)
  - Implemented functionality to collect data
  - Implemented first performance and accuracy tests

- Additionally until now
  - Continuous data collection now: allows data points to be collected much faster
  - Ran experiments for both room recognition and landmark recognition
  - Ran lots of experiments on which features improve the result
  - Ran lots of experiments to tweak parameters of ml methods (autoweka)

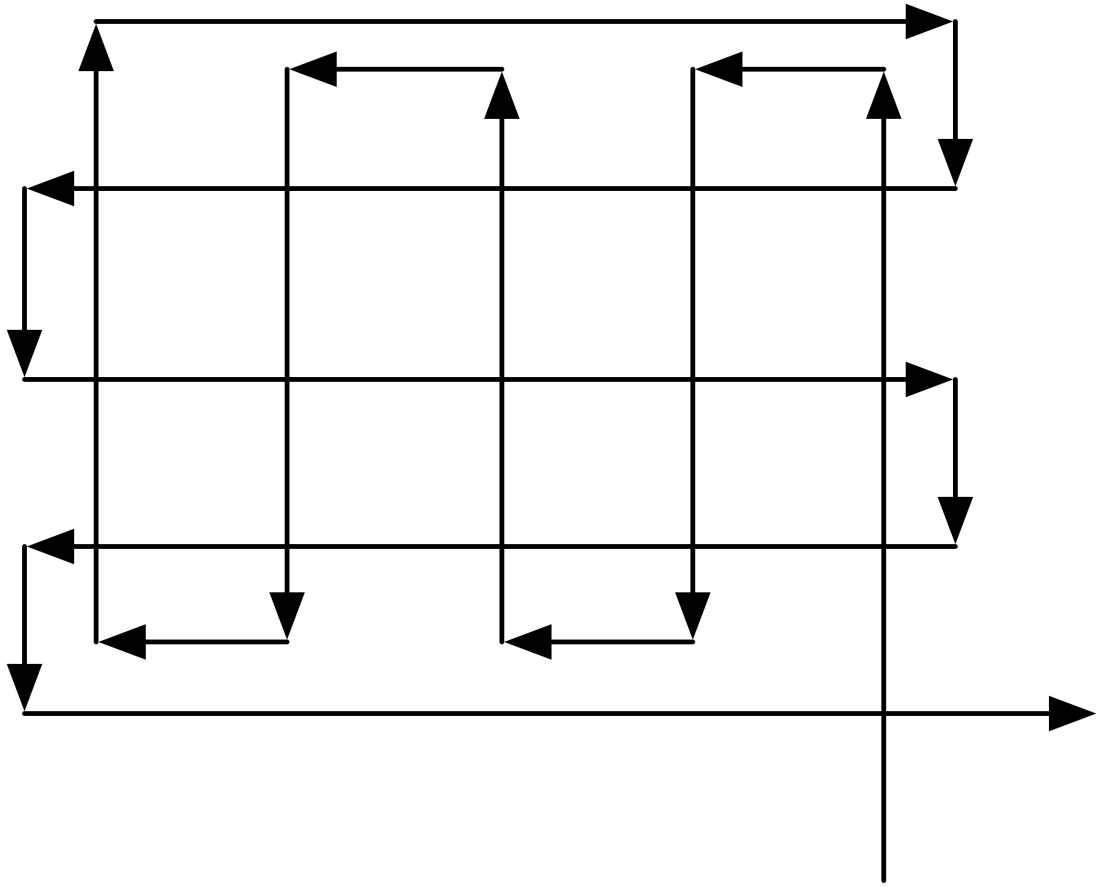
Landmarks

- Small area inside a room (around 1m^2)
- Why do we need Landmarks?
  - Higher local accuracy inside a room
  - Higher prediction confidence inside a room
  - → Provide new starting point for tracking system where we can be almost absolutely sure of!
  - Points far away are very unlikely → exclude them



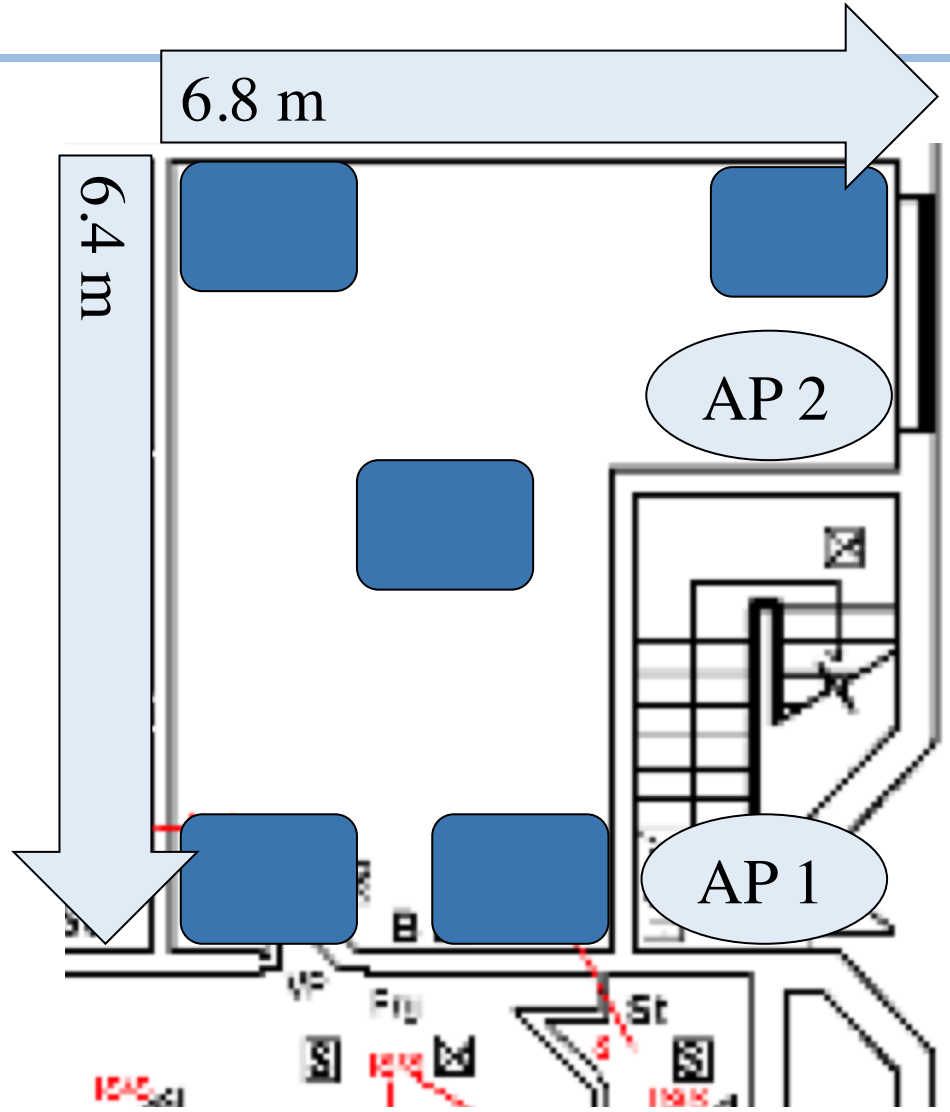
Experiment Methodology

- Collected in grid pattern
- Landmark level
  - About 500 data points per landmark
- With / without center landmark
- With / without magnetic field



Experiment Environment

- Apartment in student accommodation in Exeter, England
- Kitchen area
- 2 specially installed access points + 2 others from university network (location unknown)

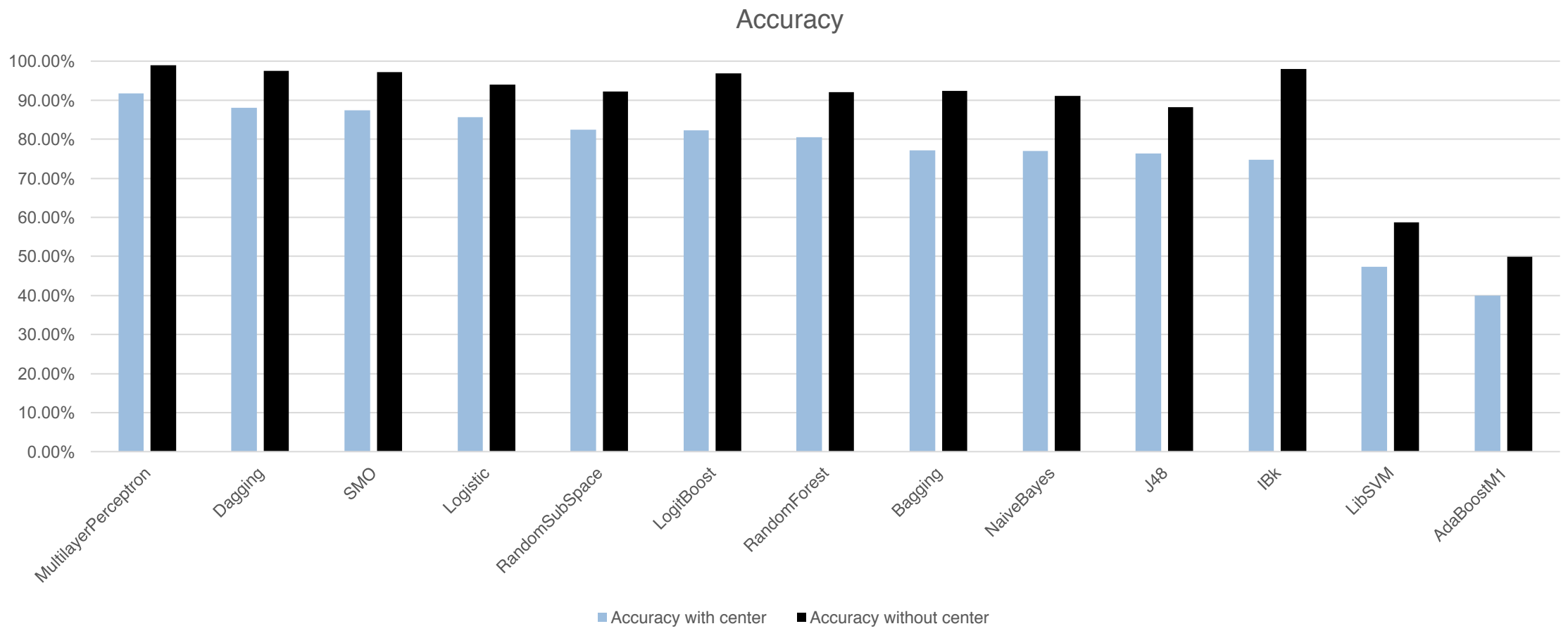


Preliminary Results

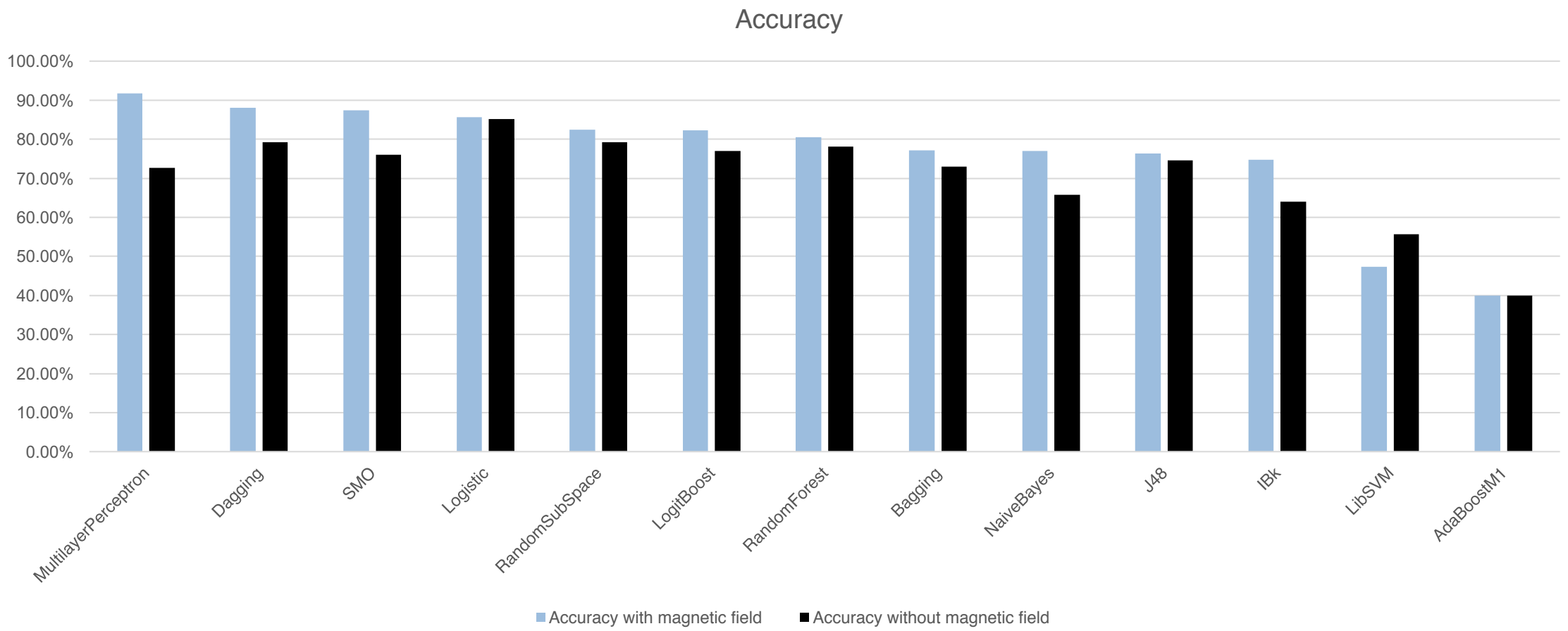
- Training is usually much more computation heavy (except in instance based methods like knn)
- Testing performance mostly is very fast (except in instance based methods like knn)

- → Focus on accuracy

Landmarks With/Without Center (with magnetic field)



Landmarks With/Without Magnetic Field (with center)



Further Work

- Add GPS as a feature (may help at building‘s border)
- Refactor and clean up the code
- Write documentation

Summary

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Done

- Data collection
- Weka integration
- Sensor data

TO DO

- GPS Integration
- Refactoring
- Documentation

Please ask! ☺

QUESTIONS ?