

# KNOWLEDGE EXTRACTION FROM USAGE DATA OF MOBILE DEVICES WITH EDUCATIONAL PURPOSES

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## MOTIVATION

- Using Machine Learning [1, 2] techniques to obtaining user patterns and indicators.
- Learning Analytics (LA) [3] focuses on pattern detection in educational contexts.
- New devices: wearables [4] -> wrist wearables.
- Using biometric data from wrist wearable devices to detect new patterns.

## THESIS OBJECTIVES

1. Study of wearable devices.
  - Evolution and market share of these devices.
  - Sensors features and availability.
  - Data access mechanisms.
2. Research and proposal of student indicators.
  - Sleep indicators: sleep quality (SQ), sleepiness(S), chronotype(C).
  - Stress indicators: accumulated (AC), instant level(IN).
3. Design of an architecture.
  - Data collection.
  - Homogenization.
  - Analysis.
4. Analysis and applicability in a certain e-learning contexts.

## RESULTS & DISCUSSIONS

### Research achievements

- Proposal of sleep indicators and algorithms.
  - SQ. Error detection lower than 18%.
  - S. Efficiency greater than 96% (using C4.5 classifier).
  - C. It is under revision. Current error detection is 0%.
- First study of stress indicators.
- First version of the architecture.
- Development of an Analytics-Server and various apps to capture data from wearables.
- Applicability: in class management and self regulation.

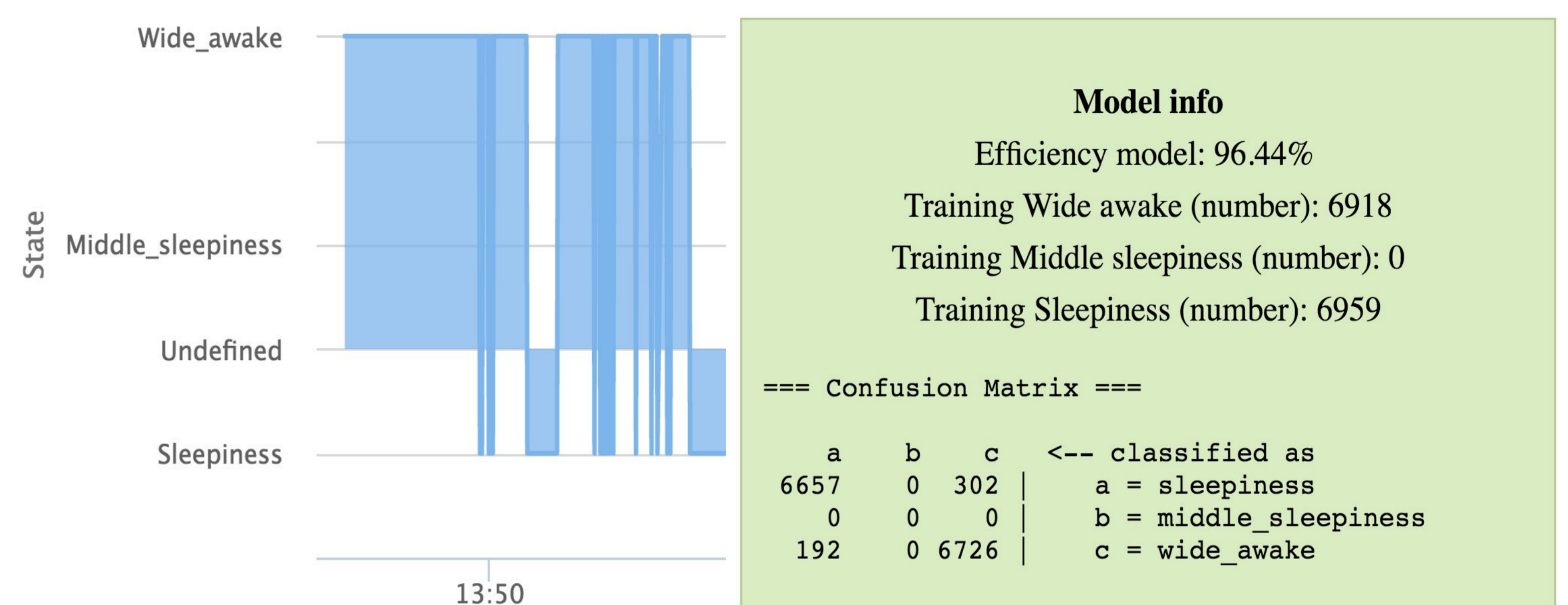
### Publications

- Journals: accepted [5], under review [6, 7].
- Conferences: [8, 9].

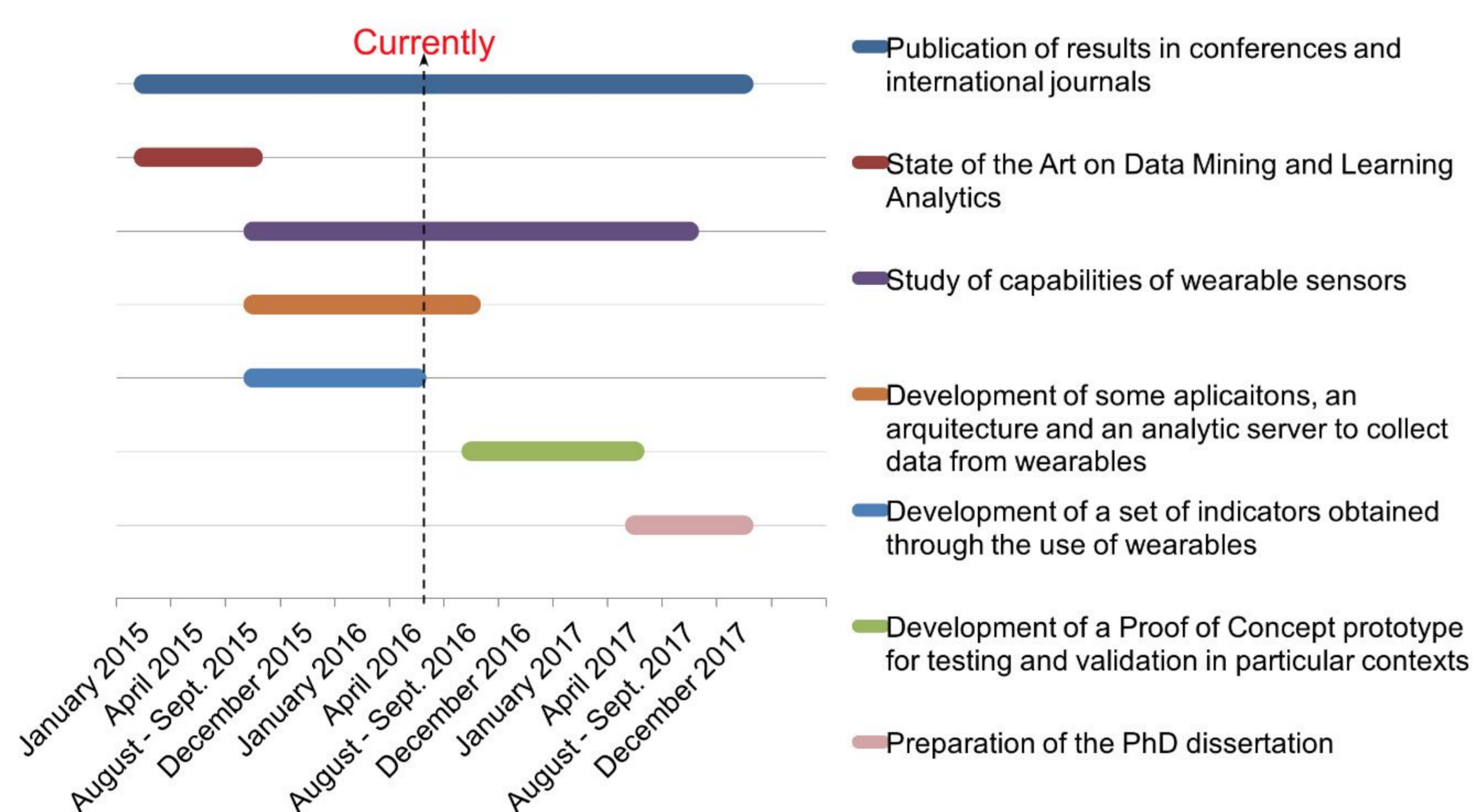
## TESTED WEARABLES

Wearable	Sensors	Indicators
Microsoft Band	Heart rate, accelerometer, gyroscope, GPS, light sensor, temperature sensor, UV ray sensor, galvanometer and microphone	SQ, S, C, AC, IN
Fitbit Surge	Heart rate, accelerometer, gyroscope, GPS, light sensor, magnetic sensor and altimeter	SQ, C
LG Watch R	Heart rate, accelerometer, gyroscope, barometer and microphone	SQ, S, C, AC, IN
Jawbone Up move	Accelerometer	SQ, C

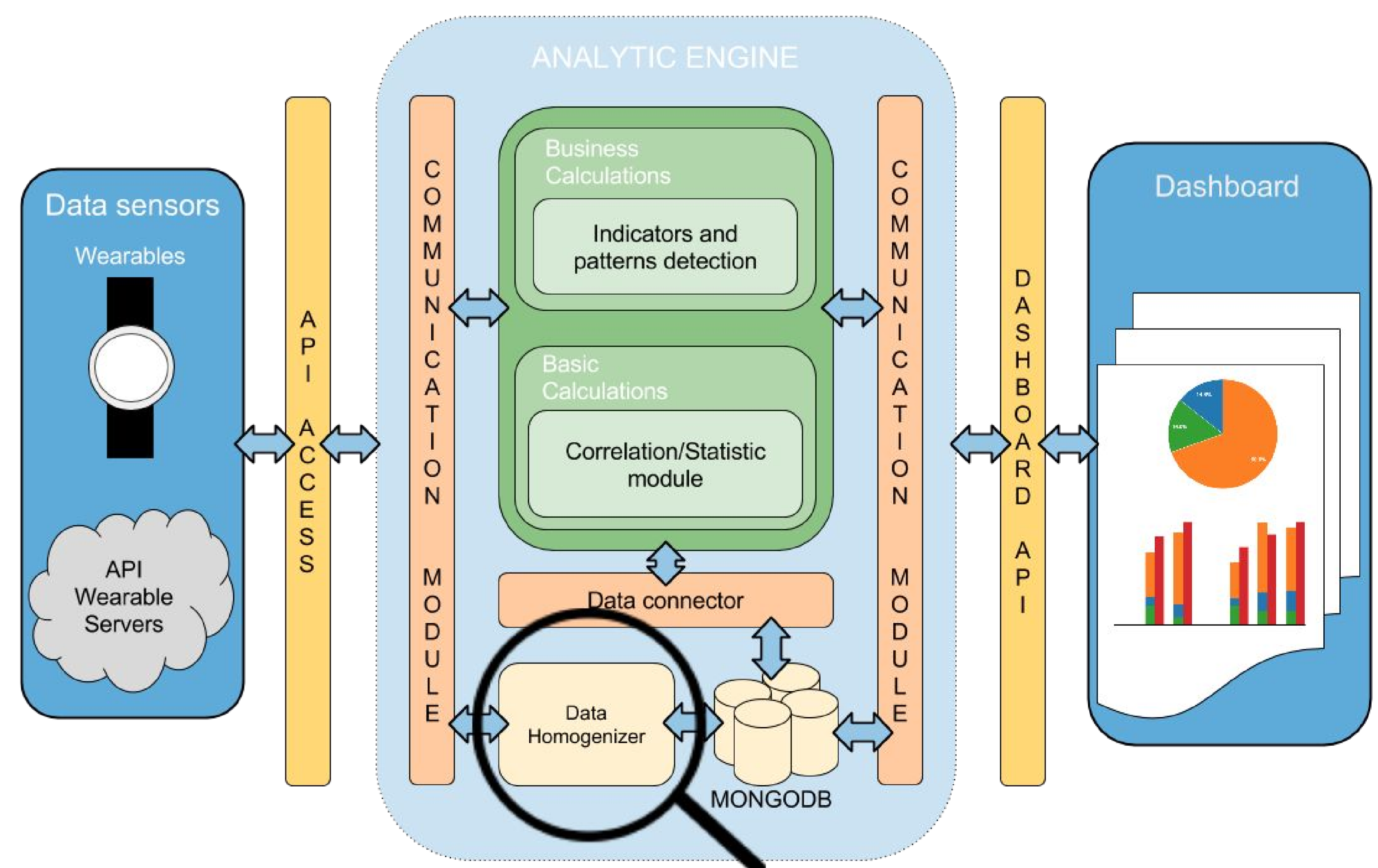
## REAL TIME ANALYTICS



## RESEARCH PLAN



## ARCHITECTURE



## NEXT YEAR PLANNING

Continue the research about data, sensors, technologies and operating systems of wearable devices.

Fix problems in applications and carry out a pilot in a simulated or real environment.

Final model to calculate the proposed indicators.

## REFERENCES

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