Passenger Flows:
Crowd Mobility Analytics with Edge Computing in Public Transport

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System Overview

■ **Goal:** Exploit multiple types of sensors integrated with IoT devices for passenger estimation and monitoring passenger flows in public transport.

Feature Overview

■ **A non-intrusive system**

➢ Multi-modal sensors including GPS, Inertial Measurement Units (IMU), and Wi-Fi antennas are integrated with a lightweight Edge device to perceive human mobility and environmental conditions

■ **Real-time on-board detection**

➢ The passenger estimation and passenger flows algorithms are running in a single Raspberry Pi for real-time detection.
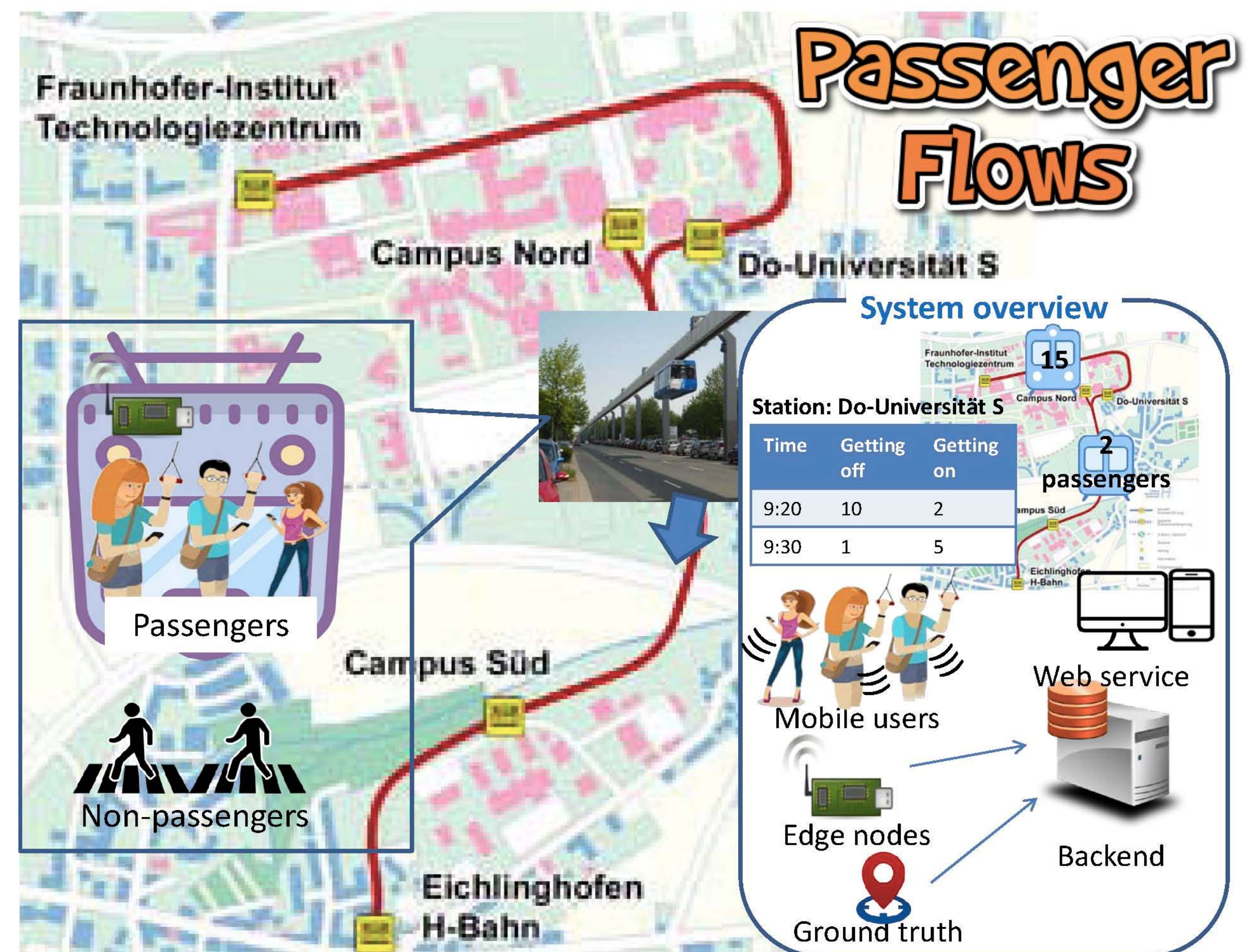

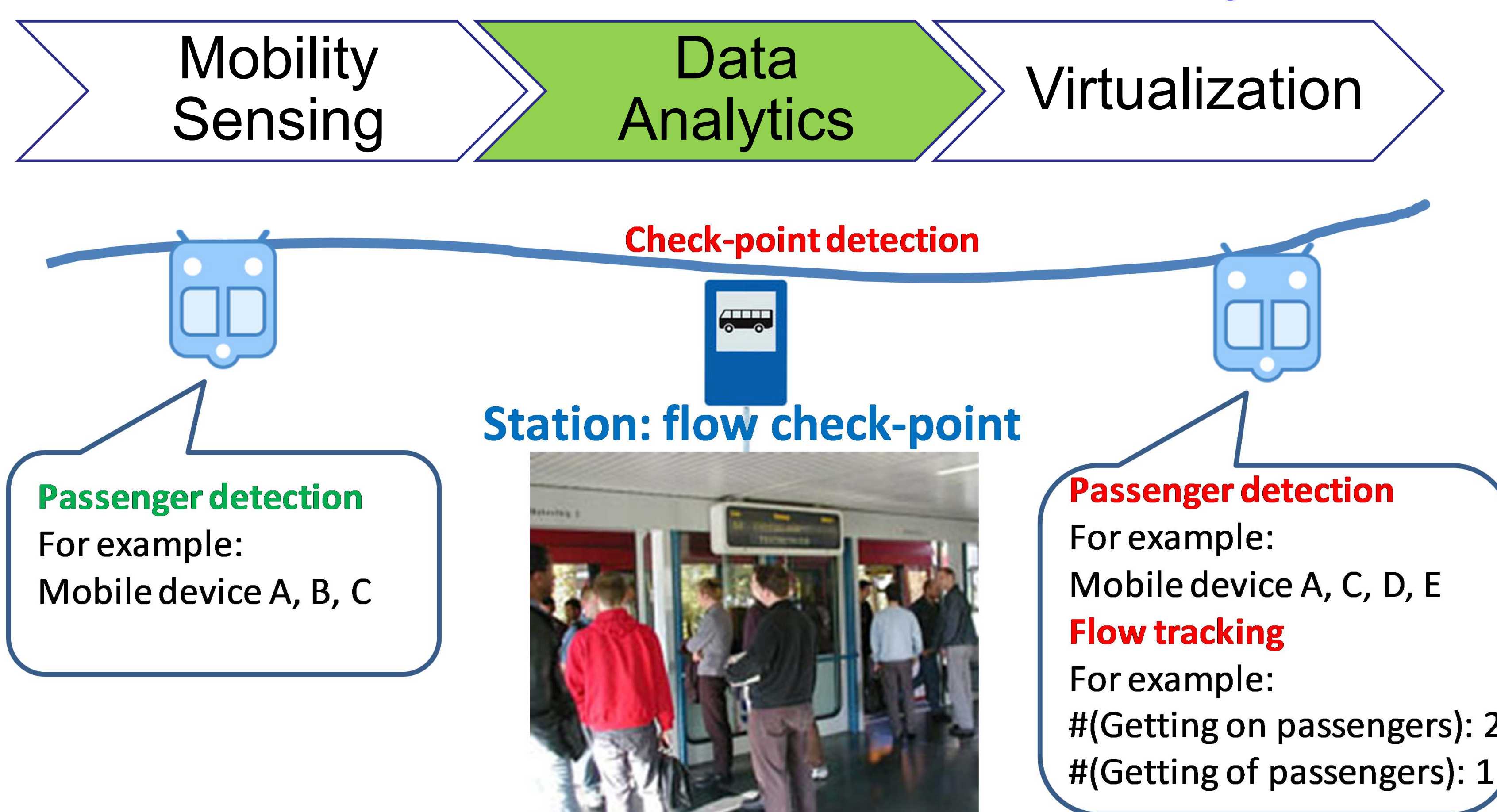Figure: An overview of Passenger Flows

System Design

Figure: The key idea of tracking passenger flows

■ **Stop detection**:

➢Detect the name of train stop and the status of the train based on GPS data, linear acceleration, and magnetic strength.

■ **Passenger estimation**:

➢Correlate the number of mobile devices and the ground-truth using regression algorithms.

■ **Passenger flows**:

➢ Detect the numbers of people getting on/off the train
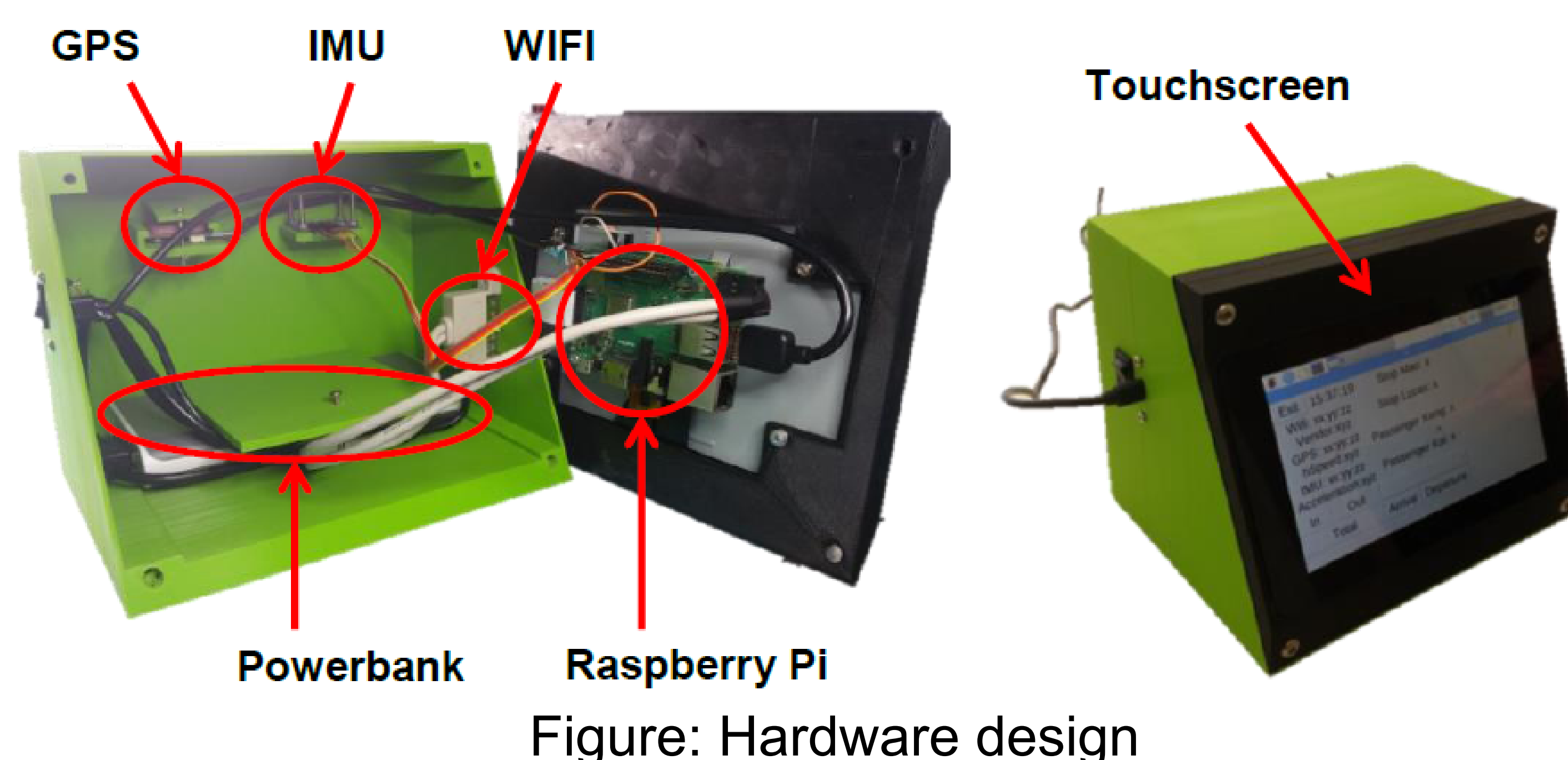
Experiments in TU Dortmund

Figure: Hardware design

Figure (a) H-Bahn Monorail at TU Dortmund; (b) UI for collecting the ground-truth and displaying the analytics results.

Web Visualization