**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.

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**System Design**

- **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.

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**Experiments in TU Dortmund**

- **Mobility Sensing**
- **Data Analytics**
- **Virtualization**

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**Web Visualization**

- **Passenger Flows**
  - Campus Nord
  - Detection of passengers and non-passengers

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**Hardware Design**

- **Powerbank**
- **Raspberry Pi**

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**Figure:** An overview of Passenger Flows

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**Figure:** The key idea of tracking passenger flows

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**Figure:** Hardware design

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

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