Department of Information Engineering and Computer Science

Bachelor's Degree in
Information and Communications Engineering

Final Dissertation

# Thesis Title

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# Acknowledgments

*. . . thanks to my family, my girlfriend, my supervisors and all the U-Hopper Team . . .*

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# Abstract

Sentence that describes the problem ...

The abstract is a short summary of the work describing the target, the subject of the thesis, the methodology and the techniques, the data collection and elaboration, the explanation of the reached results and the conclusion. The abstract of the dissertation must have a maximum length of 3 pages and must include the following information:

- context and motivation
- short summary of the main problem you have dealt with
- developed and /or used techniques
- reached results, the personal contribution of the student has to be highlighted

# 1 Introduction

Brief introduction to the work @ U-Hopper.[1]

## 1.1 Problem statement

This is the problem ...

## 1.2 Approach to the problem

This is the approach ...

## 1.3 Outline

Here it is written how the thesis is organized ...

[1] website u-hopper.com

# 2 State of the Art

Literature review ...

## 2.1 Crowd analysis

Analyze the crowd ...

## 2.2 People counting methods

What are the methods for count the people ...

### 2.2.1 People estimation on buses

### 2.2.2 Why probe requests?

Here there are two interesting articles [2] [1]
Something else ... [3]

# 3 System Design and Methodology

Write about the methodology and the choices in the system design ...

## 3.1 System architecture

Describe the system architecture ...

## 3.2 Data collection

How I collected data ...

## 3.3 Data transfer

How I got the data ...

## 3.4 Data analysis

How I analyzed data ...

# 4 Implementation

Write about the implementation ...

## 4.1 Sniffer implementation

Write how the sniffer has been implemented on the Raspberry Pi ...

## 4.2 Implementation of the server for analysis

Write how server for analysis has implemented ...

# 5 Evaluation

Write about the implementation ...

## 5.1 Experimental validation

Write about the experiments ...

## 5.2 Evaluation of the results

Write an evaluation ...

# 6 Conclusions

The work is done ...

## 6.1 Future work

Write about future work ...

# Bibliography

[1] Ubaid Mehmood, I Moser, Prem Prakash Jayaraman, and Abhik Banerjee. "Occupancy estimation using WiFi: A case study for counting passengers on busses". In: *2019 IEEE 5th World Forum on Internet of Things (WF-IoT)*. IEEE. 2019, pp. 165–170.

[2] Lars Mikkelsen, Radoslav Buchakchiev, Tatiana Madsen, and Hans Peter Schwefel. "Public transport occupancy estimation using WLAN probing". In: *2016 8th International Workshop on Resilient Networks Design and Modeling (RNDM)*. IEEE. 2016, pp. 302–308.

[3] Ryo Nishide. "Filter efficiency analysis for extracting mobile device signals to estimate bus passengers population". In: *Proceedings of the 7th IIAE International Conference on Intelligent Systems and Image Processing*. 2019.