

# DEPARTMENT OF INFORMATICS

TECHNISCHE UNIVERSITÄT MÜNCHEN

Thesis type (Bachelor's Thesis in Informatics, Master's Thesis in  
Robotics, ...)

**Thesis title**

Aly Saleh

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**Titel der Abschlussarbeit**

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Submission Date:	Submission date

I confirm that this thesis type (bachelor's thesis in informatics, master's thesis in robotics, ...) is my own work and I have documented all sources and material used.

Munich, Submission date

Aly Saleh

## Acknowledgments

# Abstract

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**1.1.1 Show how Iot is being currently used, its pros and cons**

**1.1.2 Give an idea about the devices used to make a distributed sensor network**

## **1.2 Motivation**

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**2.1 Introduce Edge, Fog and Pervasive computing, how they are used in this context**

**2.2 Explain how sensor data data is modeled and distributed in the current published approaches**

**2.3 Illustrate what are the ideas and possible network mechanisms and protocols that could be used data transfer**

**2.3.1 Server To Server**

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**3.1.1 Show how the different sensors have data been modeled to fit our requirements for further use in computations**

### **3.2 Data Distribution Mechanism Across Different Nodes**

**3.2.1 Explain data distribution among several nodes to apply pervasive computing**

### **3.3 Moving Data Through the Network**

**3.3.1 Explain how the data travel around the network, which protocols was used and why.**

### **3.4 Pushing the Computation to the Edges "Nodes"**

**3.4.1 Explain the data computation in the nodes, how it is designed to fit our needs**

#### **3.4.2 Dealing with Dependencies**

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### **3.5 Overall System Design**

## **4 Evaluation**

### **4.1 Use Case Implementation**

**4.1.1 Explain why did we choose this specific use case in particular**

**4.1.2 Explain the Implementation**

### **4.2 Implementation Evaluation**

**4.2.1 Show that the implementation is a proof of concept that the approach is sound**

**4.2.2 Show why specific implementation details were chosen over others**

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# Bibliography

- [Lam94] L. Lamport. *LaTeX : A Documentation Preparation System User's Guide and Reference Manual*. Addison-Wesley Professional, 1994.