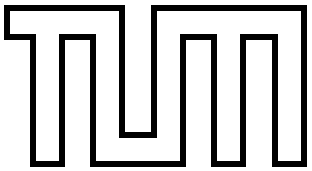

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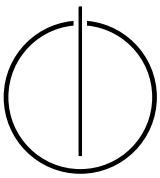

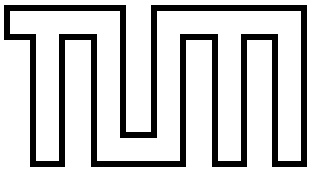

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Implementing a mobile app for object detection

Entwicklung einer mobilen App zur Objekterkennung

Author:	David Drews
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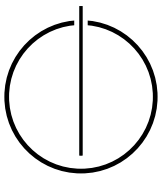
Advisor:	Severin Reiz, M.Sc.
Submission Date:	15th of August 2021



I confirm that this bachelor's thesis is my own work and I have documented all sources and material used.

Munich, 15th of August 2021 David Drews

Abstract

Nam dui ligula, fringilla a, euismod sodales, sollicitudin vel, wisi. Morbi auctor lorem non justo. Nam lacus libero, pretium at, lobortis vitae, ultricies et, tellus. Donec aliquet, tortor sed accumsan bibendum, erat ligula aliquet magna, vitae ornare odio metus a mi. Morbi ac orci et nisl hendrerit mollis. Suspendisse ut massa. Cras nec ante. Pellentesque a nulla. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. Aliquam tincidunt urna. Nulla ullamcorper vestibulum turpis. Pellentesque cursus luctus mauris.

Acronyms

ML	Machine Learning
CV	Computer Vision
NN	Neural Network
CNN	Convolutional Neural Network
ResNet	Residual Neural Network
ReLU	Rectified Linear Unit

Contents

1. Introduction

1.1. Growing Support for Running Machine Learning Operations on Mobile Devices

1.2. Privacy Implications of On-Device Machine Learning

2. Background Theory in Computer Vision

2.1. History of Computer Vision

2.2. Typical Tasks in the Field of Computer Vision

2.3. Computer Vision on Mobile Devices

3. State of the Art Solutions for Object Detection on Mobile Devices

3.1. Introduction to XYZ Networks

3.2. Some Deep

3.3. Dive Into

3.4. Object Detection

3.5. Theory Fun

4. App Development

4.1. Previous State of the Application

4.1.1. Use Cases

4.1.2. Notable Design Decisions

4.2. Development Goals

4.2.1. Migration From Java to Kotlin

4.2.2. New Functionality: Object Detection

4.3. Implementing Object Detection Based on the TensorFlow Lite Framework

4.3.1. Some Deep

4.3.2. Dive Into

4.3.3. Object Detection

4.3.4. Implementation Fun

5. Results

5.1. Performance of Object Detection Algorithms on Mobile Devices

5.2. Future Work

A. Screenshots of the Application

B. Tips With Greetings From the Chair

Here are tips along the way:

B.1. Tips

B.1.1. How to Describe

When listing several points you have three basic options:

- itemize
- enumerate
- description

1. itemize
2. enumerate
3. description

itemize short, unordered

enumerate short ordered

description listing of descriptions. Also nice for longer ones.

B.1.2. How to Quote

> "This is a quote!"

- Citations to a source can be made like this `\cite{gratl17task}` = [Gra17]

  Always join text and the citation with a non-breaking space: `text~\cite{foo}`.
- Referencing Sections, Figures, Tables, Formulas: `\autoref{sec:tips}` = Appendix B.
- Footnotes for url or further notes: `\footnote{\url{https://www.top500.org}}` = [1]

B.1.3. How to Math

Use the align environment for equations especially if you want to align them somehow.

$$1 + 1 \neq 3 \tag{B.1}$$

$$\left(\frac{10}{1}\right) - 9 = 1 \tag{B.2}$$

[1] `https://www.top500.org`

B.2. Environments

B.2.1. How to Figure

Anything can also be put in multiple columns.

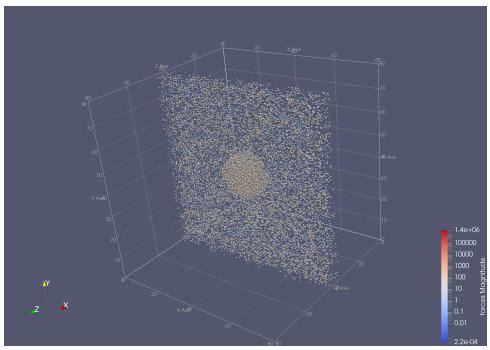


Figure B.1.: Some Caption. Always also include a source if it wasn't created by you!
Source: [Gra17]

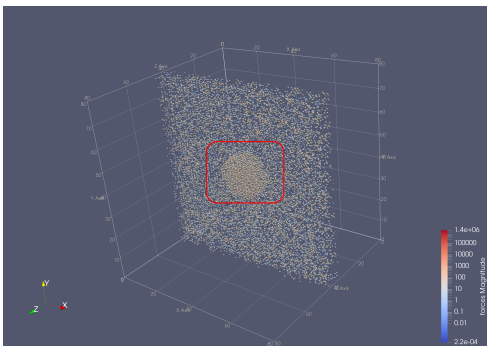
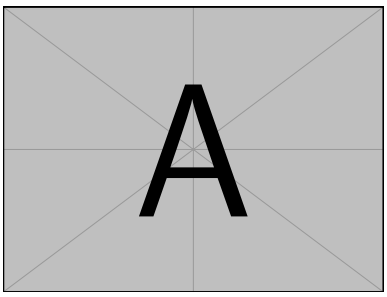
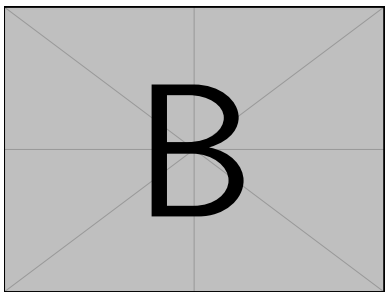


Figure B.2.: Figures can be drawn on or completely generated with tikz.

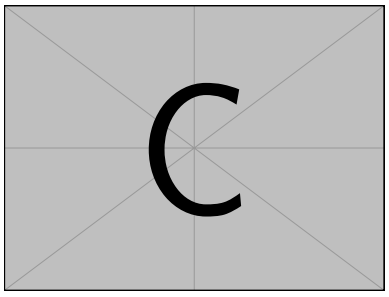
Subfigures If grouping of several pictures seems reasonable, think about using subfigures. This often comes in handy with plots.



(a) example-image-a



(b) example-image-b



(c) example-image-c

Figure B.3.: One caption to describe them all.

B.2.2. How to Algorithm

Algorithm 1: Bogosort

Input: data array
Output: data sorted

```
// Checks if array is sorted
Function is_sorted(data):
    for i ← 0 to data.size() - 1 do
        if data[i] > data[i+1] then
            return false
    return true
// actual algorithm
Function bogosort(data):
    while not is_sorted(data) do
        random.shuffle(data)
```

Figure B.4.: some description what is happening

B.2.3. How to Code

Listing B.1: General form of a typical runner() function.

```
1  void runner(int type, void *data){
2    switch(type)
3    case taskType1:
4    // do stuff using data
5    case taskType2:
6    // do other stuff using data
7  }
```

Listing B.1: General form of a typical runner() function.

B.2.4. How to Table

bla left	bla centered over two lines	bla right
bla left	bla centered	cell spanning two rows
cell spanning two columns		

Table B.1.: Fancy table that can contain line breaks and extended cells.

List of Figures

List of Tables

Bibliography

[Gra17] Fabio Alexander Gratl. Task based parallelization of the fast multipole method implementation of ls1-mardyn via quicksched. Master's thesis, Institut für Informatik 5, Technische Universität München, Garching, November 2017.