



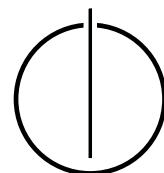
DEPARTMENT OF INFORMATICS

TECHNICAL UNIVERSITY OF MUNICH

Bachelor's Thesis in Informatics

Implementing a mobile app for object detection

David Drews





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Implementing a mobile app for object detection

**Entwicklung einer mobilen App zur
Objekterkennung**

Author: David Drews
Supervisor: Univ.-Prof. Dr. Hans-Joachim Bungartz
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

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Acronyms

ML Machine Learning.

Acronyms

Glossary

deep learning is a branch of machine learning utilising artificial neural networks for information processing. The extensive internal structure of these networks is characterised by numerous intermediate ("hidden") layers between the input layer and the output layer.

Glossary

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1. Motivation

The field of deep learning is actually a branch of Machine Learning (ML).

- 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

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4.1. Previous State of the Application

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4.1.2. Notable Design Decisions

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4.3.2. Dive Into

4.3.3. Object Detection

4.3.4. Implementation Fun

5. Results

5.1. Performance

5.2. Accuracy

5.3. Possible Applications

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 | 1. itemize | itemize short, unordered |
| • enumerate | 2. enumerate | enumerate short ordered |
| • description | 3. description | 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.

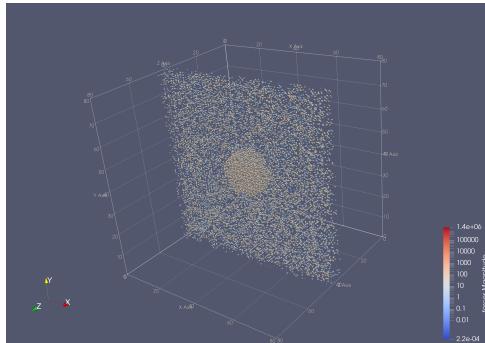


Figure B.1.: Some Caption. Always also include a source if it wasn't created by you!
Source: [Gra17]

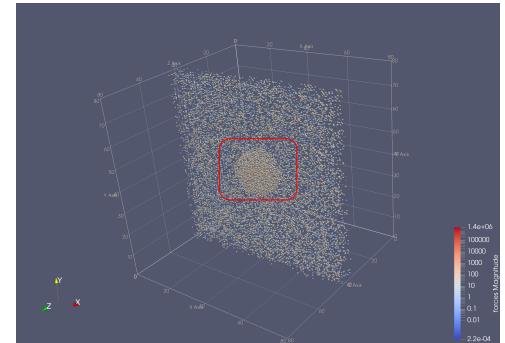
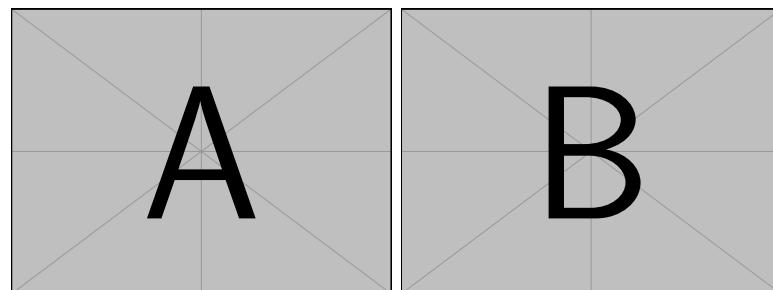


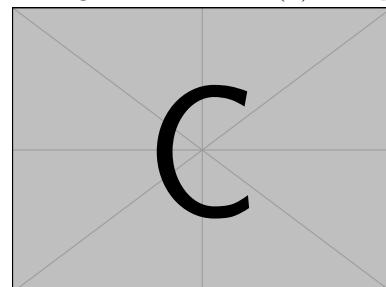
Figure B.2.: Figures can be drawn on or completely generated with tikz.

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

1 **Function** is_sorted(*data*):
2 **for** *i* \leftarrow 0 **to** *data.size()* - 1 **do**
3 **if** *data*[*i*] > *data*[*i*+1] **then**
4 **return** false
5 **return** true

// actual algorithm

6 **Function** bogosort(*data*):
7 **while** not is_sorted(*data*) **do**
8 **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.

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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.