

## Projekstudiumsbericht

Sommersemester 2024

### TITEL DER ARBEIT

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## **Sperrvermerk**

Der vorliegende Projektstudiumsbericht beinhaltet interne und vertrauliche Informationen der Musterfirma. Die Weitergabe und das Anfertigen von Abschriften des Inhalts dieser Arbeit ist im Gesamten als auch in Teilen untersagt.

Ausnahmen bedürfen einer schriftlichen Genehmigung der Musterfirma.

## **Zusammenfassung**

Your abstract text goes here. Check your departmental regulations, but generally this should be less than 300 words. See the beginning of Chapter X for more.

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**Abbildungsverzeichnis**

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**Tabellenverzeichnis**

**Glossar**

**LaTeX** A document preparation system

**BibTeX** A tool for formatting lists of references

**Abkürzungsverzeichnis****AI** Artificial Intelligence**ML** Machine Learning



**Symbolverzeichnis**

$\alpha$  Alpha symbol used in mathematics and science

$\beta$  Beta symbol used in mathematics and science

## 1 Template

### 1.1 Section A

This is regular text.

#### 1.1.1 Section A-1

This is regular text.[1]

#### 1.1.2 Section A-2

„And I am a cited text!“[vgl. 2, S. 152]

##### Section A-2-i

`some_file.ending` This is an inline correction (highlighting can be disabled in `report.tex`).

This is a whole paragraph which is being highlighted.

Just some *italic* text. Just some **bold** text. Just some **very bold** text.

### 1.2 Section B

This is regular text.

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```

1 if _algorithm == "MD5" or _algorithm == "MD5-SESS":
2     def md5_utf8(x):
3         if isinstance(x, str):
4             x = x.encode("utf-8")
5         return hashlib.md5(x).hexdigest()
6     hash_utf8 = md5_utf8

```

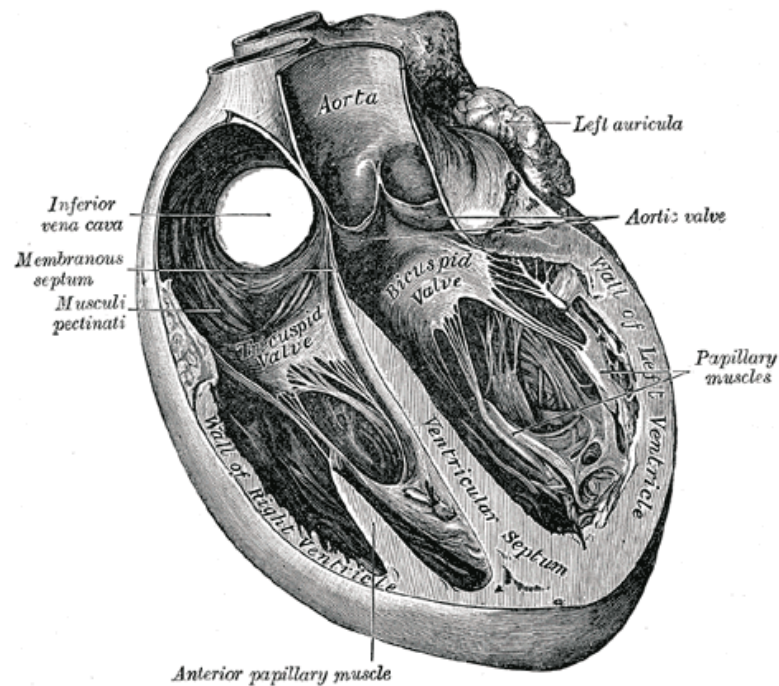
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**Quellcode 1.1:** Verwendung eines Algorithmus mit extrem langem und nicht ins TOC passendem Titel

## 2 Introduction

### 2.1 Motivation

The rapid advance of minimally-invasive cardiac procedures promises improvements in patient safety, procedure efficacy, and access to treatment. While percutaneous



**Abbildung 1:** And I'm the caption appearing next to the actual graphic. So I can be quite extensive, and, even if not very sensible, completely distinct from the TOC variant.

coronary intervention (PCI) has become routine and highly effective [3], catheter procedures in areas such as electrophysiology (EP) and valve replacement are still coming of age. This progress is driven by demographics and the improvement in general cardiac care, as patients surviving initial cardiac events go on to require treatment for sequelae [4]. The growing need for advanced treatment is being answered by developments in catheter technology and procedures. These tools are continually advancing to access and manipulate an ever-broader range of anatomy [2].

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## 2.2 Contribution

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## 3 Background

### 3.1 Introduction

This document introduction won't serve as a complete primer on  $\text{\LaTeX}$ . There are plenty of those online, and googling your questions will often get you answers, especially from <http://tex.stackexchange.com>.

Instead, let's talk a little about a few of the features and packages lumped into this template situation. The `savequote` environment at the beginning of chapters can add some wittiness to your thesis. If you don't like the quotes, just remove that block.

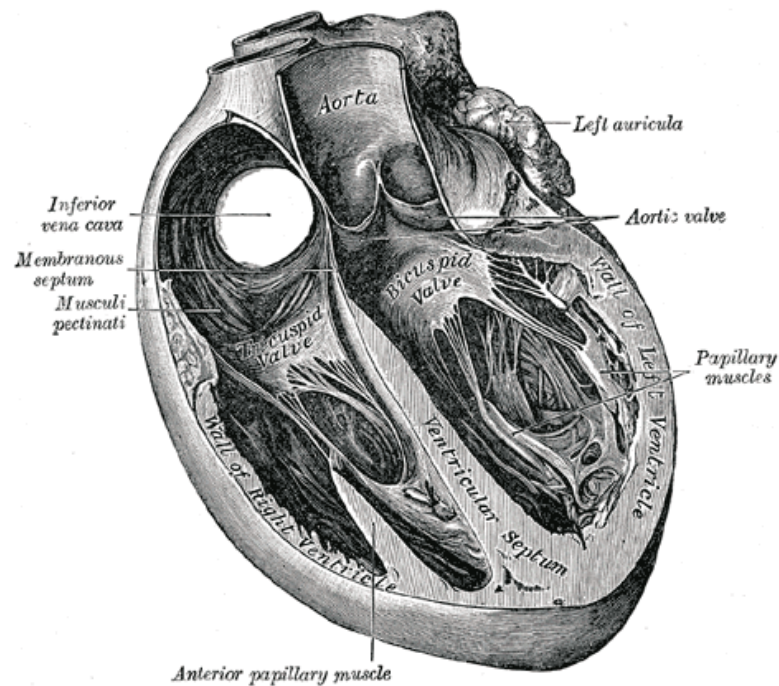
For when it comes time to do corrections, there are two useful commands here. First, the `mccorrect` command allows you to highlight a short correction like this one. When the thesis is typeset normally, the correction will just appear as part of the text. However, when you declare `\correctionstrue` in the main `Oxford_Thesis.tex` file, that correction will be highlighted in blue. That might be useful for submitting a post-viva, corrected copy to your examiners so they can quickly verify you've completed the task.

For larger chunks, like this paragraph or indeed entire figures, you can use the `mccorrection` environment. This environment highlights paragraph-sized and larger blocks with the same blue colour.

Read through the `Oxford_Thesis.tex` file to see the various options for one- and two-sided printing, including or excluding the separate abstract page, and turning corrections and draft footer on or off, and the separate option to centre your text on the page (for PDF submission) or offset it (for binding). There is also a separate option for master's degree submissions, which changes identifying information to candidate number and includes a word count. (Unfortunately,  $\text{\LaTeX}$  has a hard time doing word counts automatically, so you'll have to enter the count manually if you require this.)

## 3.2 Cardiac Imaging

Within months of Röntgen's discovery of the X-ray in 1895[5], cardiac pathology was being investigated via non-invasive imaging [6]. Over the intervening years, cardiac imaging modalities and techniques have advanced significantly. Clinically, cardiac imaging is used for two broad purposes: diagnosis of pathophysiology and guidance of interventional procedures. These applications impose different requirements on imaging equipment, image acquisition time, computational complexity, spatial and temporal resolution, and tissue discrimination. The common diagnostic and interventional cardiac imaging techniques in current clinical practice are reviewed below. An accessible introduction to the physics of medical imaging can be found in Webb's *Introduction to Biomedical Imaging* [7]. A comprehensive overview of the use of imaging in clinical cardiology is presented in Leeson's *Cardiovascular Imaging* [8].



**Abbildung 2:** Four-chamber illustration of the human heart. Clockwise from upper-left: right atrium, left atrium, left ventricle, right ventricle.

### 3.2.1 Diagnostic Imaging

Beyond the chest X-ray ('plain film'), the key non-invasive imaging modalities in diagnostic cardiology are echocardiography, magnetic resonance imaging, and X-ray computed tomography, which are reviewed below. Nuclear medicine, including positron emission tomography (PET) and single-photon emission computed tomography (SPECT), are not discussed here, as they do not play a role in the chapters to follow.

#### Echocardiography

The use of acoustic waves for medical diagnosis, inspired by naval sonar, was initially developed in the 1940s [9]. By 1954, the first clinically useful cardiac ultrasound – examining motion of the mitral valve in stenosis – was reported [10]. These early scans were one-dimensional images ('A-mode'), sometimes repeated to generate a time axis ('M-mode'). The sector-scanning probe was developed in the 1970s [11, 12], leading to the 'B-mode' that a modern cardiologist would recognise as an echocardiogram.

## Literaturverzeichnis

- [1] DIN EN ISO 1234:1998-02:1998-02. *Splinte*. Deutsches Institut für Normung (DIN). Berlin: Beuth Verlag. ISBN: 978-5555-6883. URL: [www.din.de](http://www.din.de). Noch etwas Text. zurückgezogen.
- [2] J. Eduardo Sousa u. a. „New frontiers in interventional cardiology“. en. In: *Circulation* 111.5 (Feb. 2005), S. 671–681. URL: <http://circ.ahajournals.org/content/111/5/671> (besucht am 24.12.2014).
- [3] Dena M. Bravata u. a. „Systematic review: The comparative effectiveness of percutaneous coronary interventions and coronary artery bypass graft surgery“. In: *Annals of Internal Medicine* 147.10 (Nov. 2007), S. 703–716. URL: <http://dx.doi.org/10.7326/0003-4819-147-10-200711200-00185> (besucht am 24.12.2014).
- [4] David K. Foot u. a. „Demographics and cardiology, 1950–2050“. In: *Journal of the American College of Cardiology* 35.4 (März 2000), S. 1067–1081. URL: [http://dx.doi.org/10.1016/S0735-1097\(00\)00561-1](http://dx.doi.org/10.1016/S0735-1097(00)00561-1) (besucht am 24.12.2014).
- [5] Dennis D. Patton. „Röntgen and the Discovery“. In: *A History of the Radiological Sciences: Diagnosis*. Hrsg. von Raymond A. Gagliardi und Bruce L. McClennan. A History of the Radiological Sciences 1. Radiology Centennial, Inc., 1996, S. 31–46.
- [6] Herbert L. Abrams. „Cardiac radiology“. In: *A History of the Radiological Sciences: Diagnosis*. Hrsg. von Raymond A. Gagliardi und Bruce L. McClennan. A History of the Radiological Sciences 1. Radiology Centennial, Inc., 1996, S. 255–269.
- [7] Andrew Webb. *Introduction to Biomedical Imaging*. Wiley-IEEE Press, 2002.
- [8] Paul Leeson, Hrsg. *Cardiovascular Imaging*. English. 1st. Oxford Specialist Handbooks in Cardiology. Oxford: Oxford University Press, Aug. 2011.
- [9] Barry B. Goldberg, Raymond Gramiak und Atis K. Freimanis. „Ultrasonography“. In: *A History of the Radiological Sciences: Diagnosis*. Hrsg. von Raymond A. Gagliardi und Bruce L. McClennan. A History of the Radiological Sciences 1. Radiology Centennial, Inc., 1996, S. 413–442.
- [10] Inge Edler und Arne Gustafson. „Ultrasonic cardiogram in mitral stenosis“. en. In: *Acta Medica Scandinavica* 159.2 (1957), S. 85–90. URL: <http://onlinelibrary.wiley.com/doi/10.1111/j.0954-6820.1957.tb00109.x/abstract> (besucht am 17.12.2014).
- [11] N. Bom u. a. „Ultrasonic viewer for cross-sectional analyses of moving cardiac structures“. eng. In: *Biomedical Engineering* 6.11 (Nov. 1971), S. 500–505.
- [12] James M. Griffith und Walter L. Henry. „A sector scanner for real time two-dimensional echocardiography“. en. In: *Circulation* 49.6 (Juni 1974), S. 1147–1152. URL: <http://circ.ahajournals.org/content/49/6/1147> (besucht am 17.12.2014).



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Die Arbeit hat in gleicher oder ähnlicher Form noch keiner anderen Prüfungsbehörde vorgelegen.

Max Mustermann

Musterstadt, den 5. Februar 2026