# **Study Notes**

Author

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# **List of Definitions**

A.1 Definition (Gaussian distribution) . . 29

LIST OF DEFINITIONS LIST OF DEFINITIONS

## **List of Abbreviations**

```
CS
GD Gradient Descent 23
SVM Support Vector Machine 12, 23
Math
gcd greatest common divisor 17
Physics
QFT Quantum Field Theory 27
QM Quantum Mechanics 27
```

List of Abbreviations List of Abbreviations

# **List of Symbols**

```
CS

A Algorithm 23

Math

C the set of all complex numbers 12

N the set of all natural numbers 12

R the set of all real numbers 12

\vec{v} a vector 12

Physics

\hat{H} Hamiltonian 27

L Lagrangian 27
```

List of Symbols List of Symbols

## **Preface**

## Contents

0.1	Features of this template	
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0.3	Copyright and License	

## 0.1 Features of this template

#### 0.1.1 crossref

different styles of clickable definitions and theorems

• nameref: Gaussian distribution

• autoref: Definition A.1

• cref: Definition A.1

• hyperref: Gaussian

#### 0.1.2 ToC (Table of Content)

- mini toc of sections at the beginning of each chapter
- list of theorems, definitions, figures
- the chapter titles are bi-directional linked

#### 0.1.3 header and footer

fancyhdr

- right header: section name and link to the beginning of the section
- left header: chapter title and link to the beginning of the chapter
- footer: page number linked to ToC of the whole document

List of Symbols 0.2 Related Tools

#### 0.1.4 bib

- titles of reference is linked to the publisher webpage e.g., [Kit+02]
- backref (go to the page where the reference is cited) e.g., [Chi09]
- customized video entry in reference like in [Bab16]

#### 0.1.5 preface, index and appendix

index page at the end of this document...

### 0.1.6 symbol and glossary (abbreviation)

```
examples: \mathbb{R}, \mathbb{N}, \mathbb{C}, Support Vector Machine (SVM), \vec{v}
```

#### usage

· glossary package

```
pdflatex notes_template.tex
makeglossaries notes_template
pdflatex notes_template.tex
```

• glossary-extra package and bib2gls

```
pdflatex notes_template.tex
bib2gls notes_template
pdflatex notes_template.tex
```

### 0.2 Related Tools

#### 0.2.1 VSCode

Extension: Latex Workshop by James Yu

#### settings

To explain ....

#### 0.2.2 lualatex and latexmk

.latexmkrc configuration file

```
 \begin{array}{l} \\ \text{pdflatex}_{\square=\square} \text{'lualatex}_{\square-\text{synctex}=1}_{\square-\text{interaction}=\text{nonstopmode}_{\square-\text{-shell}-\text{escape}_{\square}} \% 0_{\square} \% S'; \\ \\ \text{@generated}_{\text{exts}}_{\square=\square} \text{(@generated}_{\text{exts}},_{\square} \text{'synctex.gz')}; \\ \\ \text{spdf}_{\text{mode}_{\square}=\square} 1; \\ \\ \text{add}_{\text{cus}}_{\text{dep}} \text{('glo',}_{\square'} \text{'gls',}_{\square} 0,_{\square'} \text{'makeglo2gls')}; \\ \\ \text{sub}_{\square}_{\text{makeglo2gls}_{\square}} \text{\{} \\ \\ \text{system} \text{("makeindex}_{\square-\text{s}_{\square}} \text{'$$_{\text{col}}$'$},_{\square} 0 \text{'.ist}_{\square-\text{t}_{\square}} \text{'$$_{\text{col}}$'$},_{\square} 0 \text{'.gls}_{\square-\text{o}_{\square}} \text{'$$_{\text{col}}$'$},_{\square} 0 \text{'.gls}_{\square'} \text{'$$_{\text{col}}$'$},_{\square} 0 \text{'.gls}_{\square'} \text{'},_{\square} 0 \text{'.gls}_{\square'} 0 \text{'.gls}_{\square'} \text{'},_{\square} 0 \text{'.gls}_{\square'} 0 \text{'.gls}_{\square} 0 \text{'.gls}_{\square'} 0 \text{'.gls}_{\square'} 0 \text{'.gls}_{\square'} 0 \text{'.gls}_{\square'} 0 \text{'.gls}_{\square'} 0 \text{'.gl
```

```
# Also delete the *.glstex files from package glossaries-extra. Problem is,
# that that package generates files of the form "basename-digit.glstex" if
# multiple glossaries are present. Latexmk looks for "basename.glstex" and so
# does not find those. For that purpose, use wildcard.
$clean_ext = "%R-*.glstex";
push @generated_exts, 'glstex', 'glg';
add_cus_dep('aux', 'glstex', 0, 'run_bib2gls');
# PERL subroutine. $ [0] is the argument (filename in this case).
# File from author from here: https://tex.stackexchange.com/a/401979/120853
sub run_bib2gls {
   if ( $silent ) {
        my $ret = system "bib2gls --silent --group '$_[0]'"; # Original version
        my $ret = system "bib2gls --silent --group $_[0]"; # Runs in PowerShell
        my $ret = system "bib2gls --group '$_[0]'"; # Original version
       my $ret = system "bib2gls --group $_[0]"; # Runs in PowerShell
   };
   my ($base, $path) = fileparse( $_[0] );
   if ($path && -e "$base.glstex") {
       rename "$base.glstex", "$path$base.glstex";
   }
   # Analyze log file.
   local *LOG;
   LOG = "_[0].glg";
    if (!$ret && -e $LOG) {
       open LOG, "<$LOG";
   while (<LOG>) {
            if (/^Reading (.*\.bib)\s$/) {
       rdb_ensure_file( $rule, $1 );
   }
   close LOG;
   return $ret;
}
```

## 0.3 Copyright and License

GitHub: https://github.com/Jue-Xu/Latex-Template-for-Scientific-Style-Book Overleaf:

# Part I Mathematics

## Chapter 1

## **Discrete Math**

#### **Contents**

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gls example

- gcd;
- Greatest common divisor (gcd);

#### 1.1 Proof

Lemma 1.1.

Claim 1.1.

Theorem 1.1.

Example 1.1.

Fact 1.1.

#### Remark 1.1.

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## 1.2 Quantifier

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## 1.3 Graph

"Graph Isomorphism in Quasipolynomial Time" [Bab16]

## 1.4 Number theory

Figure example

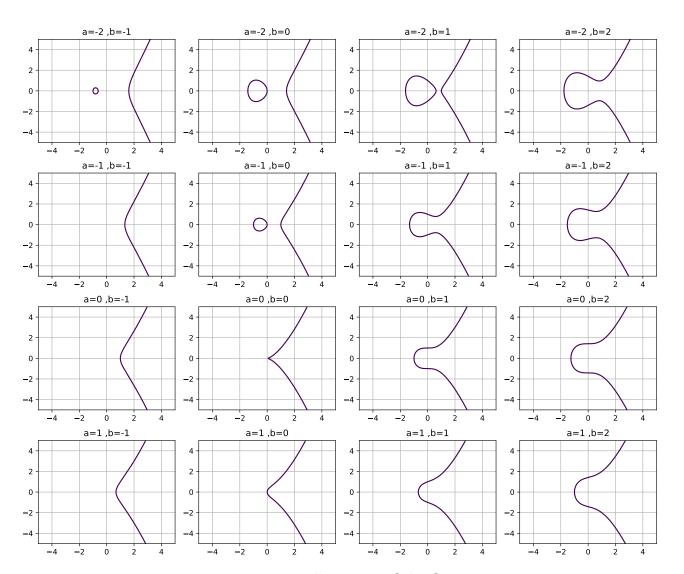


Figure 1.1: Elliptic curves [Chi09]

# Part II Computer Science

# **Chapter 2**

# **Machine Learning**

A; SVM; Gradient Descent (GD); GD

## Chapter 2 Machine Learning

Part III

**Physics** 

# **Chapter 3**

# **Quantum Mechanics**

 $\hat{H};$  Quantum Field Theory (QFT); QM; L

## Chapter 3 Quantum Mechanics

# Appendix A

# **Formulas**

## A.1 Gaussian distribution

Definition A.1 (Gaussian distribution). Gaussian distribution

**Theorem A.1** (Central limit theorem).

# **Bibliography**

- [Bab16] László Babai. "Graph Isomorphism in Quasipolynomial Time". Jan. 19, 2016. arXiv: 1512.03547 [cs, math] (cit. on pp. 12, 19). Online video
- [Chi09] Andrew M. Childs. *Universal Computation by Quantum Walk*. Physical Review Letters 102.18 (May 4, 2009), p. 180501. arXiv: 0806.1972 (cit. on pp. 12, 20).
- [Kit+02] Alexei Yu Kitaev et al. *Classical and quantum computation*. 47. American Mathematical Soc., 2002 (cit. on p. 12).

BIBLIOGRAPHY BIBLIOGRAPHY

# **Alphabetical Index**

 $egin{array}{ll} G & I & I \\ Gaussian \ distribution, \ 29 & index, \ 12 \end{array}$