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# Data Collection and Preparation for Currency Adaptation

Applied Data Science in an Industrial Banknote Image Recognition Framework

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1.1	31.01.2014	Correction	Layout changed
1.2	07.02.2014	Addition	Chapter 1.1 extended

# Management Summary

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# **1. Project Goals**

## **1.1. Reference Data Sets for Training and Test data**

The goal is to have accurate and consistent data sets, which are stored in a format that makes use of the Microservice based MOVEm Data Management Toolchain. Namely these test sets should fulfil the following criteria:

- Accuracy: Data in test sets has been checked for correct labeling and or given a label in case it was missing.
- Consistency: Different adaptations for the same currency should use the same data sets.

## **1.2. Mechanism for subclassifying Data Sets according to context-dependent criteria**

It should be possible to generate data sets according to user specific criteria like: "All EUR notes that were classified as fake", "All USD notes for which tape was detected".

## **1.3. Automated process for generating and maintaining Reference Note Data Sets**

A process has to be defined for generating Reference Data Sets automatically as well as updating and expanding them when new data is added to the Data Pool.





## 2. Instructions

The following table shows some of the most important packages used in the  $\text{\LaTeX}$  template.

Package	Function
cmbright	sans serif font "Computer Modern Bright", which supports text encodings OT1, T1 and TS1, as well as the mathematical signs and AMS symbols
ae	provides better resolution fonts in PDF files
fancyhdr	easy adjustment of head- and foot lines
graphicx	integration of graphics in $\text{\LaTeX}$ documents
booktabs	better presentation of tables
textpos	simplified and absolute positioning of boxes on the page
hyperref	package to compile links into PDF files
geometry	simplified and improved adaptation of the standard type area
makeidx	simple Index compilation (see section 2.1)
glossaries	compilation of glossaries (see section 2.2)

Table 2.1.: Packages

### 2.1. Subject Indices

$\text{\LaTeX}$  is not able to create an Index in the basic configuration. This can be created in  $\text{\LaTeX}$  with the `makeidx` package and the `makeindex` program. The following page contains a detailed explanation of how the package works, and its application:

<http://en.wikibooks.org/wiki/LaTeX/Indexing>

Roughly summarized the following points are needed for an index:

- Embed the package `makeidx`.
- Initialize the compilation with the command `\makeindex`.
- Continuously initializing words in the text with the command `\index{}`.
- During the first passage of the document's compilation, the directory is created and definitions marked with `\index{}` are stored in the `.idx` file.
- During the second passage the `.idx` file is sorted, formatted and stored as `.ind` file whereas  $\text{\LaTeX}$  then inserts the `.ind` file into the document.

## 2.2. Glossary

A glossary can also be created in L<sup>A</sup>T<sub>E</sub>X with the `makeindex` program and the `glossaries` package. The following list shows the procedure to generate a glossary:

- Integration of the package `glossaries`.
- If necessary, a personal database may be created including glossary entries. This template works with such a database, which is stored in the `databasefolder`. Entries from the database are only written in the directory if the word in the text is actually stated.
- With the `\makeglossaries` command a new compilation is initialized.
- New entries can be created with the command `\newglossaryentry{<SHORTCUT>}{name={<NAME>},description={<DESCRIPTION>}}`.
- In the text continuously referencing words with the command `\gls{<SHORTCUT>}`.
- Similar to the compilation of the index, the directory is only embedded into the document during the second passage.

In order to work accurately, the glossary must be compiled with `makeindex` after post-editing the document. For this the following code in the command line is to be executed:

```
makeindex -s template.ist -t template.glg -o template.gls template.glo
```

With most L<sup>A</sup>T<sub>E</sub>X editors, this can be stated as a post-processing step. The following explanation is for the TeXnic-Center program. Under the menu "Build" > "Define Output Profile..." (short: alt + F7) in the "Postprocessor" register, the window shown in Figure 2.1 can be found. Then it is necessary to insert a new entry, when an application as well as an argument must be specified. The application can be found in the MiKTeX installation (`..\MiKTeX X.X\miktex\bin\makeindex.exe`). As an argument, the following line must be entered:

```
-s "%tm.ist" -t "%tm.glg" -o "%tm.gls" "%tm.glo"
```

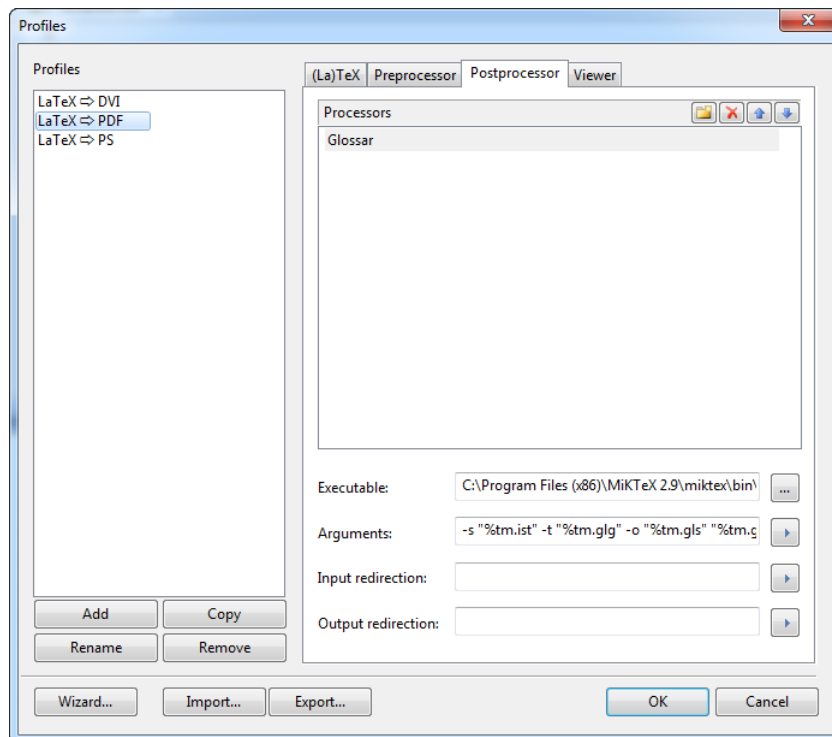


Figure 2.1.: Post-processing

## 2.3. Bibliography

To compile a bibliography one must resort to BibTeX. The folder database includes a .bib file with various database entries. How the entries are to be compiled, can be taken from various sources of the Internet or books. The entries in the database will only be written to the directory of the document when the source is actually cited in the text.

Under the following addresses further explanations are found in order to compile the database and its use:

- <http://en.wikipedia.org/wiki/BibTeX>
- <http://www.bibtex.org/>



## 3. Test of type area

Far far away, behind the word mountains, far from the countries Vokalia and Consonantia, there live the blind texts. Separated they live in Bookmarksgrove right at the coast of the Semantics, a large language ocean. A small river named Duden flows by their place and supplies it with the necessary regalia. It is a paradisematic country, in which roasted parts of sentences fly into your mouth. Even the all-powerful Pointing has no control about the blind texts it is an almost unorthographic life. One day however a small line of blind text by the name of Lorem Ipsum decided to leave for the far World of Grammar.

### 3.1. The Big Oxmox

The Big Oxmox advised her not to do so, because there were thousands of bad Commas, wild Question Marks and devious Semikoli, but the Little Blind Text didn't listen. She packed her seven versalia, put her initial into the belt and made herself on the way. When she reached the first hills of the Italic Mountains, she had a last view back on the skyline of her hometown Bookmarksgrove, the headline of Alphabet Village and the subline of her own road, the Line Lane. Pityful a rethoric question ran over her cheek, then she continued her way. On her way she met a copy.

$$\mathcal{N}(x | \mu, \Sigma) = \frac{1}{(2\pi)^{D/2}} \frac{1}{|\Sigma|^{(1/2)}} \exp\left(-\frac{1}{2}(x - \mu)^T \Sigma^{-1}(x - \mu)\right) \quad (3.1)$$

The copy warned the Little Blind Text, that where it came from it would have been rewritten a thousand times and everything that was left from its origin would be the word "and" and the Little Blind Text should turn around and return to its own, safe country. But nothing the copy said could convince her and so it didn't take long until a few insidious Copy Writers ambushed her, made her drunk with Longe and Parole and dragged her into their agency, where they abused her for their projects again and again. And if she hadn't been rewritten, then they are still using her.

### 3.2. Type dummy text

This is a typo dummy text. On it you can see if all the letters there are and how they look. Sometimes one uses words like Hamburgefonts, Rafgenduks or Handgloves to test fonts. Sometimes phrases that contain all letters of the alphabet - one calls these sets "pangrams".

Well known is this: The quick brown fox jumps over the lazy old dog. Often in type dummy texts also foreign-language sentence parts are installed (AVAIL™ and Wefox® are testing aussi la Kerning) to test the effect in other languages. In Latin, for example, almost every font looks good.

#### 3.2.1. Demonstrandum

Quod erat demonstrandum. Seit 1975 fehlen in den meisten Testtexten die Zahlen, weswegen nach TypoGb. 204 §ab dem Jahr 2034 Zahlen in 86 der Texte zur Pflicht werden. Nichteinhaltung wird mit bis zu 245 € oder 368\$ bestraft. Genauso wichtig in sind mittlerweile auch Äçcëntë, die in neueren Schriften aber fast immer enthalten sind. Ein wichtiges aber schwierig zu integrierendes Feld sind OpenType-Funktionalitäten. Je nach Software und Voreinstellungen können eingebaute Kapitälchen, Kerning oder Ligaturen (sehr pfiffig) nicht richtig dargestellt werden.

### Subsubsection

This is a typo dummy text. On it you can see if all the letters there are and how they look. Sometimes one uses words like Hamburgetons, Rafgenduks or Handgloves to test fonts. Sometimes phrases that contain all letters of the alphabet - one calls these sets "pangrams".

### Subsubsection

Well known is this: The quick brown fox jumps over the lazy old dog. Often in type dummy texts also foreign-language sentence parts are installed (AVAIL™ and Wefox® are testing aussi la Kerning) to test the effect in other languages. In Latin, for example, almost every font looks good. Quod erat demonstrandum.

## 3.3. Webstandards

Everywhere the same old story. The layout is complete, the text is slow in coming. This layout is now not naked in space and small and empty occurs, I help out: the dummy text. Created exactly for this purpose, always in the shadow of my big brother "Lorem Ipsum", I look forward every time you read a few lines. Because esse est percipi - being is to be perceived.

And now because you already have the goodness to accompany me a few more sentences long, I would like to take this opportunity to serve you not only as a stopgap, but to point out something that is going to be perceived as deserved: Web viz. See Web standards are the rules that build on the websites. So there are rules for HTML, CSS, JavaScript or XML, words that you might have heard of your developers. These standards ensure that all parties the maximum benefit from a website.

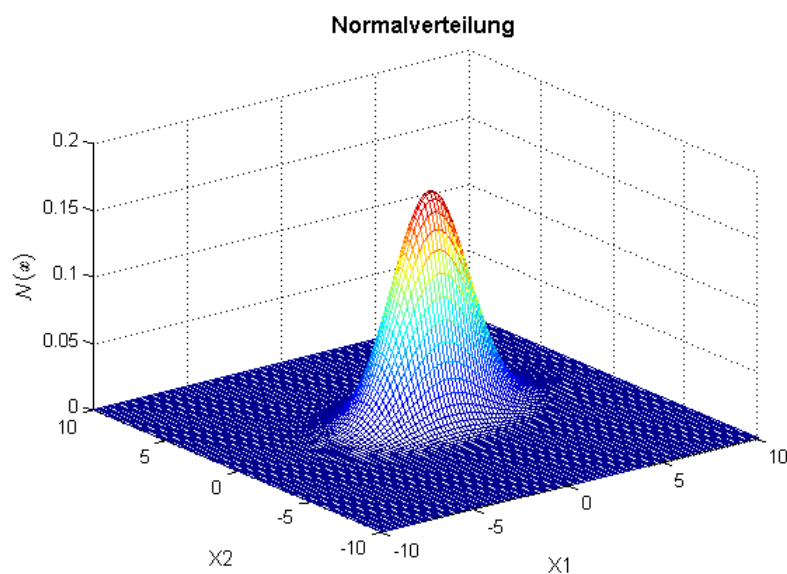


Figure 3.1.: Normal distribution

In contrast to previous websites we no longer need, for example, two different sites for the program Internet Explorer and another browser. It extends a page that - properly applied - both works on different browsers on the net, but just as good for printing or display on a cell phone is. Mind: A site for all formats. What a relief. Standards save time provide for the development costs and ensure that web pages can be easier to maintain later. Of course, only if everyone adheres to these standards.

## 4. Conclusion / Results

But I must explain to you how all this mistaken idea of denouncing pleasure and praising pain was born and I will give you a complete account of the system, and expound the actual teachings of the great explorer of the truth, the master-builder of human happiness. No one rejects, dislikes, or avoids pleasure itself, because it is pleasure, but because those who do not know how to pursue pleasure rationally encounter consequences that are extremely painful. Nor again is there anyone who loves or pursues or desires to obtain pain of itself, because it is pain, but because occasionally circumstances occur in which toil and pain can procure him some great pleasure. To take a trivial example, which of us ever undertakes laborious physical exercise, except to obtain some advantage from it? But who has any right to find fault with a man who chooses to enjoy a pleasure that has no annoying consequences, or one who avoids a pain that produces no resultant pleasure? On the other hand, we denounce with righteous indignation and dislike men who are so beguiled and demoralized by the charms of pleasure of the moment, so blinded by desire, that they cannot foresee the pain and trouble that are bound to ensue; and equal blame belongs to those who fail in their duty through weakness of will, which is the same as saying through shrinking from toil and pain. These cases are perfectly simple and easy to distinguish. In a free hour, when our power of choice is untrammelled and when nothing prevents our being able to do what we like best, every pleasure is to be welcomed and every pain avoided. But in certain circumstances and owing to the claims of duty or the obligations of business it will frequently occur that pleasures have to be repudiated and annoyances accepted. The wise man therefore always holds in these matters to this principle of selection: he rejects pleasures to secure other greater pleasures, or else he endures pains to avoid worse pains.

But I must explain to you how all this mistaken idea of denouncing pleasure and praising pain was born and I will give you a complete account of the system, and expound the actual teachings of the great explorer of the truth, the master-builder of human happiness. No one rejects, dislikes, or avoids pleasure itself, because it is pleasure, but because those who do not know how to pursue pleasure rationally encounter consequences that are extremely painful. Nor again is there anyone who loves or pursues or desires to obtain pain of itself, because it is pain, but because occasionally circumstances occur in which toil and pain can procure him some great pleasure. To take a trivial example, which of us ever undertakes laborious physical exercise, except to obtain some advantage from it? But who has any right to find fault with a man who chooses to enjoy a pleasure that has no annoying consequences, or one who avoids a pain that produces no resultant pleasure? On the other hand, we denounce with righteous indignation and dislike men who are so beguiled and demoralized by the charms of pleasure of the moment, so blinded by desire, that they cannot foresee the pain and trouble that are bound to ensue; and equal blame belongs to those who fail in their duty through weakness of will, which is the same as saying through shrinking from toil and pain. These cases are perfectly simple and easy to distinguish. In a free hour, when our power of choice is untrammelled and when nothing prevents our being able to do what we like best, every pleasure is to be welcomed and every pain avoided. But in certain circumstances and owing to the claims of duty or the obligations of business it will frequently occur that pleasures have to be repudiated and annoyances accepted. The wise man therefore always holds in these matters to this principle of selection: he rejects pleasures to secure other greater pleasures, or else he endures pains to avoid worse pains.



# Declaration of primary authorship

I / We hereby confirm that I / we have written this thesis independently and without using other sources and resources than those specified in the bibliography. All text passages which were not written by me are marked as quotations and provided with the exact indication of its origin.

Place, Date: [Biel/Burgdorf], 17.04.2021

Last Name/s, First Name/s: [Test Peter] [Müster Rösä]

Signature/s: ..... ..







# Bibliography

- [1] H. Kopka, *L<sup>A</sup>T<sub>E</sub>X, Band 1: Eine Einführung*. Pearson Studium, 2002, vol. 3.
- [2] F. Marti, "Schreiben über Technik – Redaktion und Gestaltung von technischen Berichten und anderen technikbezogenen Texten," Berner Fachhochschule, 2006.



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# APPENDICES

## A. Arbitrary Appendix

The European languages are members of the same family. Their separate existence is a myth. For science, music, sport, etc, Europe uses the same vocabulary. The languages only differ in their grammar, their pronunciation and their most common words. Everyone realizes why a new common language would be desirable: one could refuse to pay expensive translators. To achieve this, it would be necessary to have uniform grammar, pronunciation and more common words. If several languages coalesce, the grammar of the resulting language is more simple and regular than that of the individual languages. The new common language will be more simple and regular than the existing European languages. It will be as simple as Occidental; in fact, it will be Occidental.



## **B. Additional Appendix**

### **B.1. Test 1**

To an English person, it will seem like simplified English, as a skeptical Cambridge friend of mine told me what Occidental is. The European languages are members of the same family. Their separate existence is a myth. For science, music, sport, etc, Europe uses the same vocabulary. The languages only differ in their grammar, their pronunciation and their most common words. Everyone realizes why a new common language would be desirable: one could refuse to pay expensive translators. To achieve this, it would be necessary to have uniform grammar, pronunciation and more common words. If several languages coalesce, the grammar of the resulting language is more simple and regular than that of the individual languages. The new common language will be more simple and regular than the existing European languages.

#### **B.1.1. Environment**

It will be as simple as Occidental; in fact, it will be Occidental. To an English person, it will seem like simplified English, as a skeptical Cambridge friend of mine told me what Occidental is. The European languages are members of the same family. Their separate existence is a myth. For science, music, sport, etc, Europe uses the same vocabulary. The languages only differ in their grammar, their pronunciation and their most common words. Everyone realizes why a new common language would be desirable: one could refuse to pay expensive translators. To achieve this, it would be necessary to have uniform grammar, pronunciation and more common words.





## **C. Content of CD-ROM**

Content of the enclosed CD-ROM, directory tree, etc.