

# Module 6

## Other OCR engines: ABBYY, Tesseract

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ABBYY

# ABBYY: Overview

- Russian company with leading OCR products:
  - FineReader (desktop product or CLI; not suitable for our purposes)
  - [FineReader Engine SDK](#) (Windows, Mac, Linux)
  - [Recognition Server](#) (Windows)
  - [Cloud OCR SDK](#)
  - an excellent [comparison](#) of the different products at [www.succeed-project.eu](http://www.succeed-project.eu) with hints helping you choose the right one
- state-of-the-art binarization and document analysis (zoning without semantics)
- was partner in IMPACT project
- can recognize [Fraktur \(Gothic script\)](#) and uses lexica with historical spellings (not in FineReader desktop or CLI)
- you can use your own lexica (API)
- limited capability for glyph training
- many output formats (e.g. txt, pdf, xml)
- format supported by PoCoTo: ABBYY XML (not in FineReader desktop)

## ABBYY invocation

- for all SDK versions (Recognition Server, Engine, Cloud service) you will need to script your commands
- in the next practice module (m7), you will use the Cloud service with a provided script
- example: recognize a directory with page images of a historical German book with FineReader Engine SDK 11 for Linux
  - both text and xml output (with character confidences)
  - use historical lexicon
  - recognize Gothic typeface

```
for i in *.tif; do  
    /opt/FRE11.1/Samples/CommandLineInterface/CLI \  
    -if "$i" -tet UTF8 \  
    -f Text -f XML --xmlWriteAsciiCharAttributes \  
    -of ../"${i}.tif/.abbyy.txt}" -of ../"${i}.tif/.abbyy.xml}" \  
    -rl OldGerman -rtt Gothic  
done
```

## ABBY example: Die Grenzboten (1841)

- project done at Staats- und Universitätsbibliothek Bremen (Manfred Nölte)
- digitization support (zoning, OCR, correction) by BBAW, Berlin (Geyken, Bönig, Haaf, Jurish, Thomas, Wiegand, Würzner)

# Deutschland und Belgien.

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## Was wir wollen.

Wir könnten die Erscheinung dieser Blätter mit wenigen Worten motiviren:

Brüssel! — Wenige Städte in Europa bieten gleiche Vortheile der periodischen Presse, durch Lage und **Verhältnisse**. Innerhalb achtzehn Stunden bringt die Post das Neueste aus Paris hieher. Das Dampfboot aus

# ABBY xml output

- box coordinates (left, top, right, bottom)

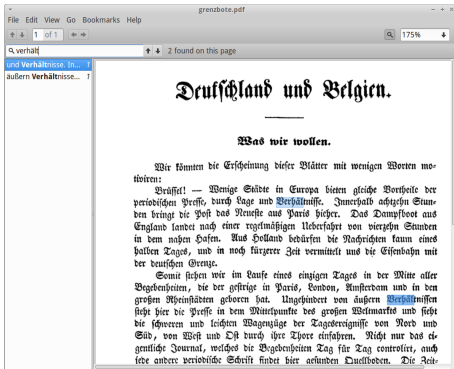
```

<charParams l="1552" t="1199" r="1584" b="1269"> </charParams>
<charParams l="1585" t="1199" r="1649" b="1269" charConfidence="85">V</charParams>
<charParams l="1655" t="1217" r="1679" b="1265" charConfidence="100">e</charParams>
<charParams l="1683" t="1217" r="1713" b="1267" charConfidence="39">r</charParams>
<charParams l="1715" t="1199" r="1751" b="1285" charConfidence="25">h</charParams>
<charParams l="1757" t="1199" r="1791" b="1267" charConfidence="100">ä</charParams>
<charParams l="1795" t="1201" r="1821" b="1267" charConfidence="100">l</charParams>
<charParams l="1823" t="1209" r="1843" b="1267" charConfidence="34">t</charParams>
<charParams l="1845" t="1219" r="1883" b="1267" charConfidence="40">n</charParams>
<charParams l="1885" t="1199" r="1905" b="1265" charConfidence="56">i</charParams>
<charParams l="1909" t="1199" r="1961" b="1283" charConfidence="87">s</charParams>
<charParams l="1909" t="1199" r="1961" b="1283" charConfidence="87">s</charParams>
<charParams l="1953" t="1219" r="1979" b="1267" charConfidence="100">e</charParams>
<charParams l="1981" t="1249" r="1999" b="1269" charConfidence="57">.</charParams>
<charParams l="2000" t="1199" r="2090" b="1277"> </charParams>

```

# Searchable pdf

output formats: searchable pdf (87kB), text and image (4.3kB)



# ABBYY assessment

- undisputed leader in industrial space
- used in large-scale projects (newspapers, libraries)
- good preprocessing: binarization, document analysis
- use for 19th c. and later (even Fraktur)
- single glyphs can be trained, but not complete typesets
- closed source, cannot be adapted/trained outside of company
- results on early printings currently unsatisfactory



# Tesseract

# Tesseract: History

- developed by [Ray Smith](#):
  - 1984 PhD project sponsored by HP
  - 1988 developed for HP scanner products
  - 1994 project cancelled
  - 1995 UNLV evaluation (among 3 best products)
- 2005 open sourced by HP
- since 2006: taken on by Google
  - layout analysis, 39 languages
  - continuous development and improvement
  - used internally (but not exclusively) for Google books
- Ray Smith's [tutorial slides](#) (2014) give fascinating background and insights
- some [documentation](#)

# Tesseract invocation

- from the command line:

```
tesseract <imagefile> <outputbase> -l LANG
```

- example:

```
tesseract 0001.tif 0001 -l deu-frak
```

the output file will be 0001.txt

- hOCR format:

```
tesseract 0001.tif 0001 -l deu-frak html
```

- searchable pdf:

```
tesseract 0001.tif 0001 -l deu-frak pdf
```

- you may also use a GUI (not all options are available)

# Tesseract hOCR output format

- either text (txt) or **hOCR**, an html-format with embedded segmentation info
- hOCR is a valid PoCoTo input format
- bounding box: x0y0 x1y1

```
<span class='ocrx_word' id='word_1_33' title='bbox 1584 1199 1997 1284; \
x_wconf 87' lang='deu-frak' dir='ltr'>Verhältnisse.</span>
```

- hOCR has word tokens (separated by white space) as smallest unit
- Ben Kiessling ([Nidaba](#) project), Kay Würzner have achieved character xml output (ABBYY-like)

## Searchable pdf

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File Edit View Go Bookmarks Help

1 of 1 146,04%

verhältnisse 2 found on this page

und Verhältnisse. Innerhalb ac... 1  
äußern Verhältnissen steht hie... 1

## Deutschland und Belgien.

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### Was wir wollen.

Wir könnten die Erscheinung dieser Blätter mit wenigen Worten motiviren:

Brüssel! — Wenige Städte in Europa bieten gleiche Vortheile der periodischen Presse, durch Lage und Verhältnisse. Innerhalb achtzehn Stunden bringt die Post das Neueste aus Paris hierher. Das Dampfboot aus England landet nach einer regelmäßigen Ueberfahrt von vierzehn Stunden in dem nahen Hafen. Aus Holland bedürfen die Nachrichten kaum eines halben Tages, und in noch kürzerer Zeit vermittelt uns die Eisenbahn mit der deutschen Grenze.

Somit stehen wir im Laufe eines einzigen Tages in der Mitte aller Begebenheiten, die der gestrige in Paris, London, Amsterdam und in den großen Rheinstädten geboren hat. Ungehindert von äußern Verhältnissen steht hier die Presse in dem Mittelpunkte des großen Weltmarkts und sieht die schweren und leichten Wagenzüge der Tagesereignisse von Nord und Süd, von West und Ost durch ihre Thore einfahren. Nicht nur das eigentliche Journal, welches die Begebenheiten Tag für Tag controlirt, auch jede andere periodische Schrift findet hier gesunden Quellsboden. Die Zeit-

# Tesseract Training

- when to train:
  - enable recognition of a new “language”
  - rather, what is trained are glyph shapes:
    - new alphabet (Latin, Cyrillic, Greek etc.)
    - new typeface (Schriftart: Antiqua, Fraktur)
    - new font (Schriftsatz: special instance of a typeface, e.g. 12 pt Caslon italic)
    - *optionally* add language data (wordlists)
  - better recognition of special glyphs (e.g. recognize long s as f, not s)
- training data are in files of the form LANG.traineddata
- glyph shape training data and language support data (wordlists) are tied up in the same file
- language data can be exchanged without retraining (better and larger wordlists)

## Tesseract assessment

- in every respect not as good as ABBYY
- but a fascinating tool for experiments and research:
  - open source
  - can be trained and adapted
  - then almost as good as ABBYY in recognition (not in preprocessing, language detection, output formats etc.)
  - many people provide training data (Nick White: ancient Greek!)
- can it be used for large scale projects?
  - recognition: yes
  - but OCR is a whole workflow of many steps (preprocessing!)
  - needs to be supplemented by other open source tools
  - makes it more complicated to build and monitor, but is possible
- provides an independent OCR result (output of both engines can be combined for error reduction)

# Evaluation



## Evaluation (101 pages of *Die Grenzboten*)

- use the UNLV/ISRI toolkit (see Module 0: Software)
- works on text pages (compared to ground truth):
  - ocrevalutf8 accuracy gt-file OCR-file
  - ocrevalutf8 wordacc gt-file OCR-file
  - combined report for many files: accsum, wordaccsum
- use `vote` for combining the output of several engines (>2)
- evaluation of first 101 pages of Grenzboten, mean values
  - no postcorrection, no training
  - voted has 1926 wrong characters, 984 wrong words

engine	character acc.	word acc.	lexicon
ABBYY FRE11	98.86	96.48	OldGerman
Tesseract 3.03	97.78	93.11	German
OCROpus 0.7	98.17	91.60	none
voted	<b>99.28</b>	<b>97.59</b>	

# Comparison of OCR engines

## ABBYY:

**268702** Characters  
**3062** Errors  
**98.86%** Accuracy

Errors	Marked	Corr. -Gener.
<b>271</b>	0	{e}-{c}
<b>264</b>	0	{<\n>}-{ }
<b>244</b>	0	{<\n><\n>}-{ }
<b>79</b>	0	{ }-{ }
<b>55</b>	0	{"}-{"}
<b>54</b>	0	{en}-{m}
<b>54</b>	0	{s}-{S}
<b>48</b>	0	{m}-{n:}
<b>46</b>	0	{R}-{N}

## Tesseract:

**268702** Characters  
**5954** Errors  
**97.78%** Accuracy

Errors	Marked	Correct-Generated
<b>372</b>	0	{ }-{-}
<b>246</b>	0	{ü}-{ii}
<b>228</b>	0	{ }-{ }
<b>215</b>	0	{I}-{J}
<b>211</b>	0	{v}-{V}
<b>208</b>	0	{ }-{<\n>}
<b>175</b>	0	{u}-{n}
<b>140</b>	0	{n}-{u}
<b>136</b>	0	{c}-{e}



# More information

# Homework

- register for a free ABBYY developer account:
  - [register](#) with name of your app (make up a project name)
  - [enter a Cloud OCR SDK promo code](#)
  - promo code: (ask instructor)
  - 1.000 pages valid until 15 of January, 2016  
(thanks to Michael Fuchs of ABBYY Deutschland)
- install Tesseract for your OS (see Module 0: Software)