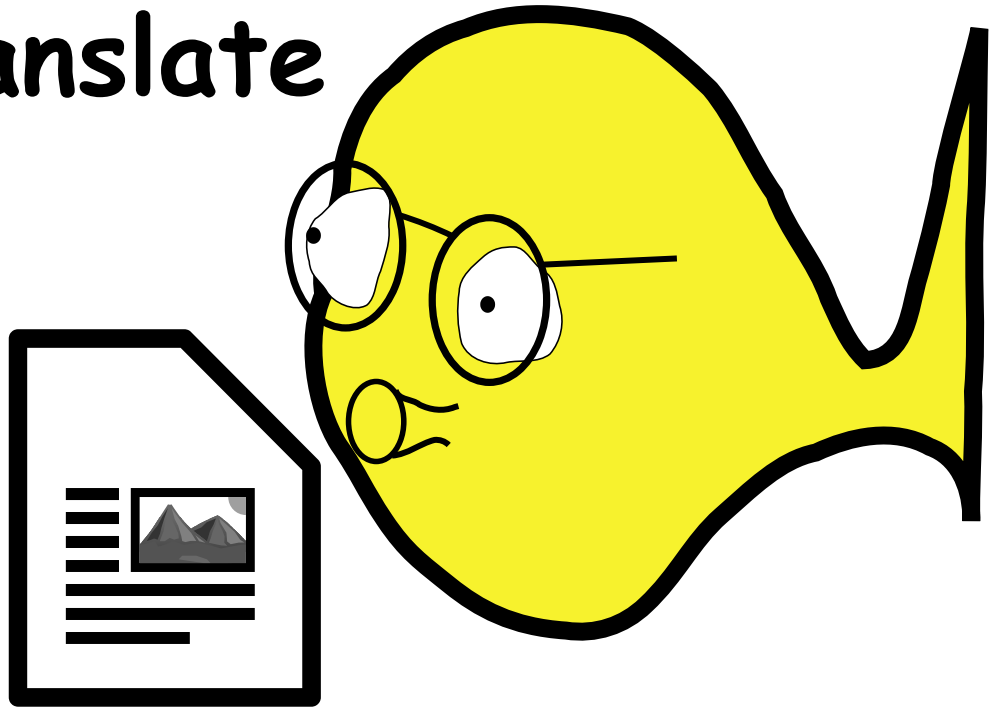
LibreOffice Translate



Offline AI-powered
Machine Translation
with a single Click

Built with: LibreOffice, PyTorch, OpenNMT

https://github.com/lernapparat/lotranslate/

Neural Machine Translation for LibreOffice

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ALMERIA | 13 Sept. 2019

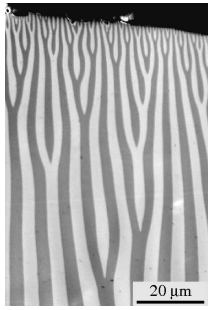
Agenda

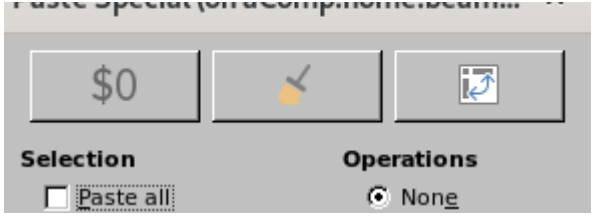
- About me
- LibreOffice Translate – An Extension for Writer
- How much UI do we need?
- Under the hood
  - Neural Machine Translation
  - NMT models meet the real world
  - PyTorch & OpenNMT
  - How to train new models
  - Pains of a LibreOffice Python extension with many dependencies
- Better Integration with Writer / other parts LibreOffice

Hi, I'm Thomas Viehmann

My background:

- did some Pattern Recognition and Neural Networks in 2000, but moved on to mathematics
- Ph.D. in Mathematics, modelling patterns in magnets
- 9 years of insurance risk modelling
- Recently lots of modelling in the ML context
- 2 tiny LibreOffice patches



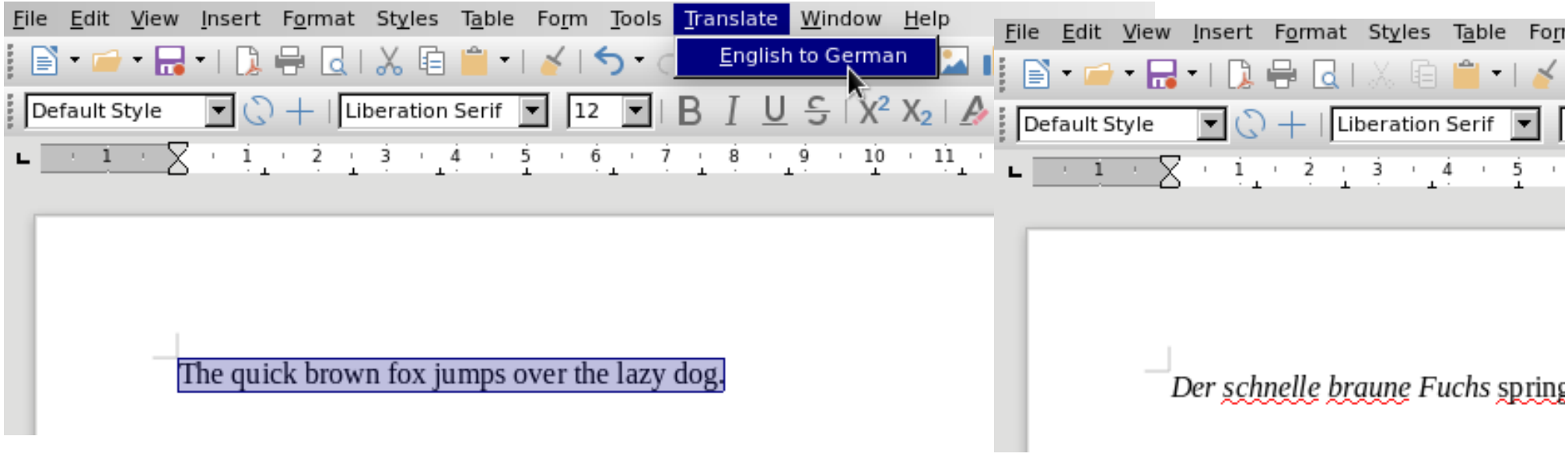


ML Training & Consultancy through: http://mathinf.eu/

Blog about ML stuff: http://lernapparat.de/

LibreOffice Translate

Idea: very simple (1-click) machine translation of text in Writer



https://github.com/lernapparat/lotranslate/

Development supported by the German Ministry of Research and Technology through the Prototype Fund. (Thank you!)

How much UI do we need?

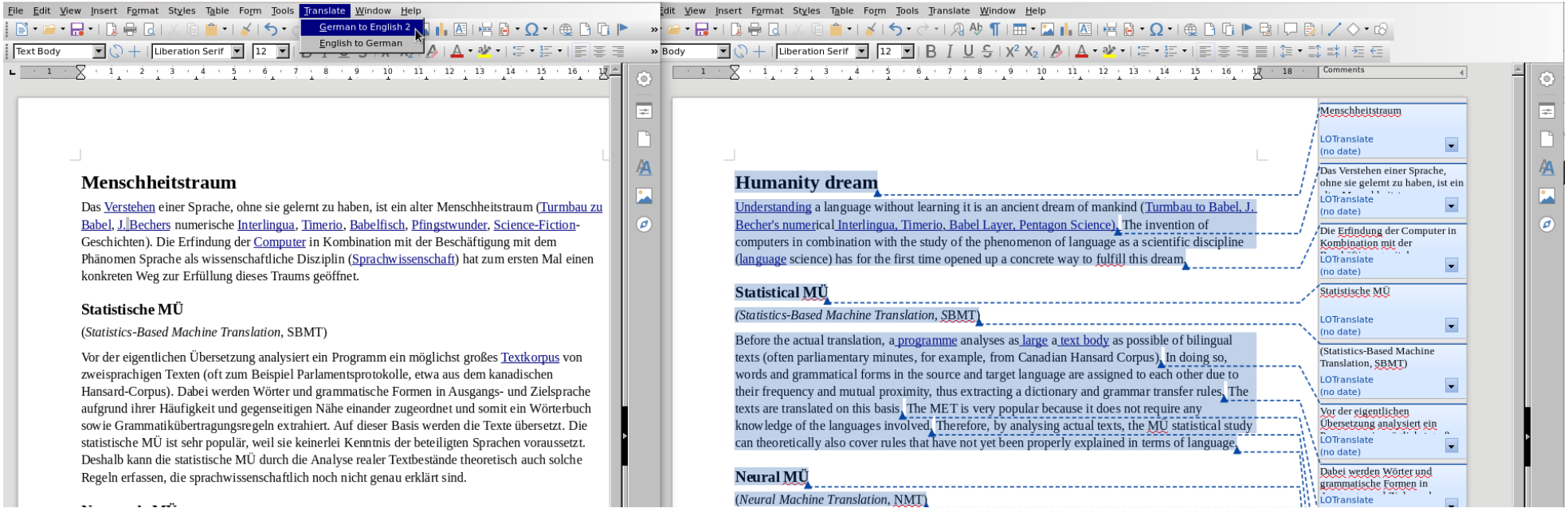
Researched other Translation tools workflow:
"Text→Sidebar→Translation → Edit → Insert"

What is the advantage of using the sidebar?
→ You see original and translation side by side.

(Happily, the Prototype Fund sponsored a coaching regarding UI / UX which helped in reflecting this.)

How much UI do we need?

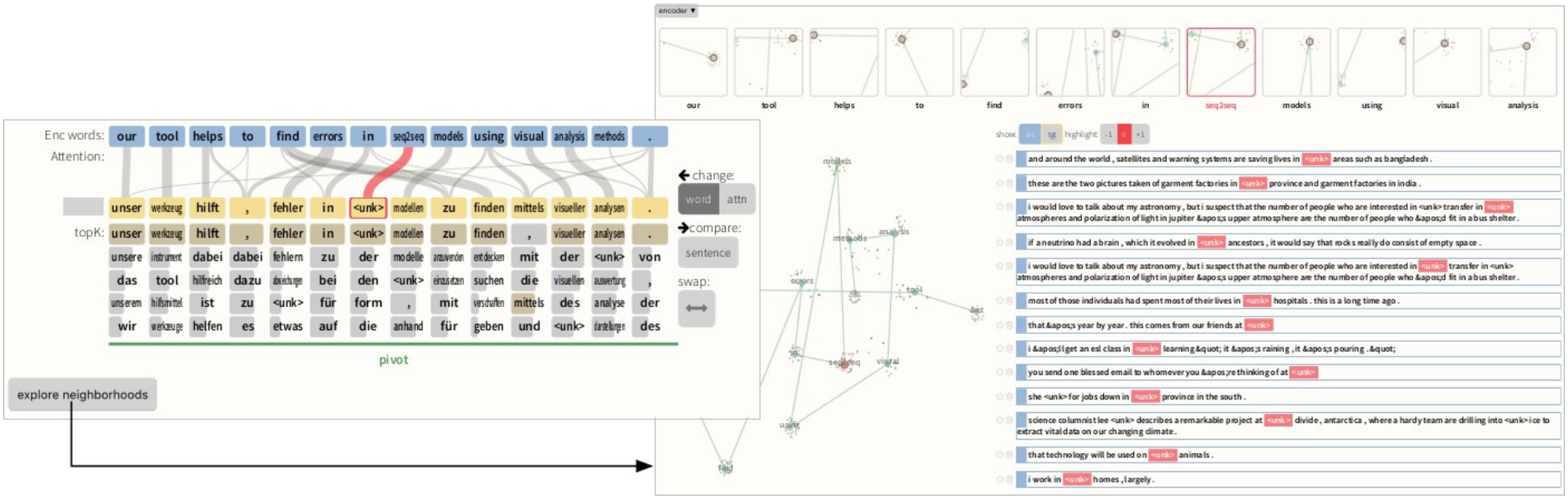
LOTranslate use Annotations instead (also saves UI coding):



...annotations are optional

How much UI do we need?

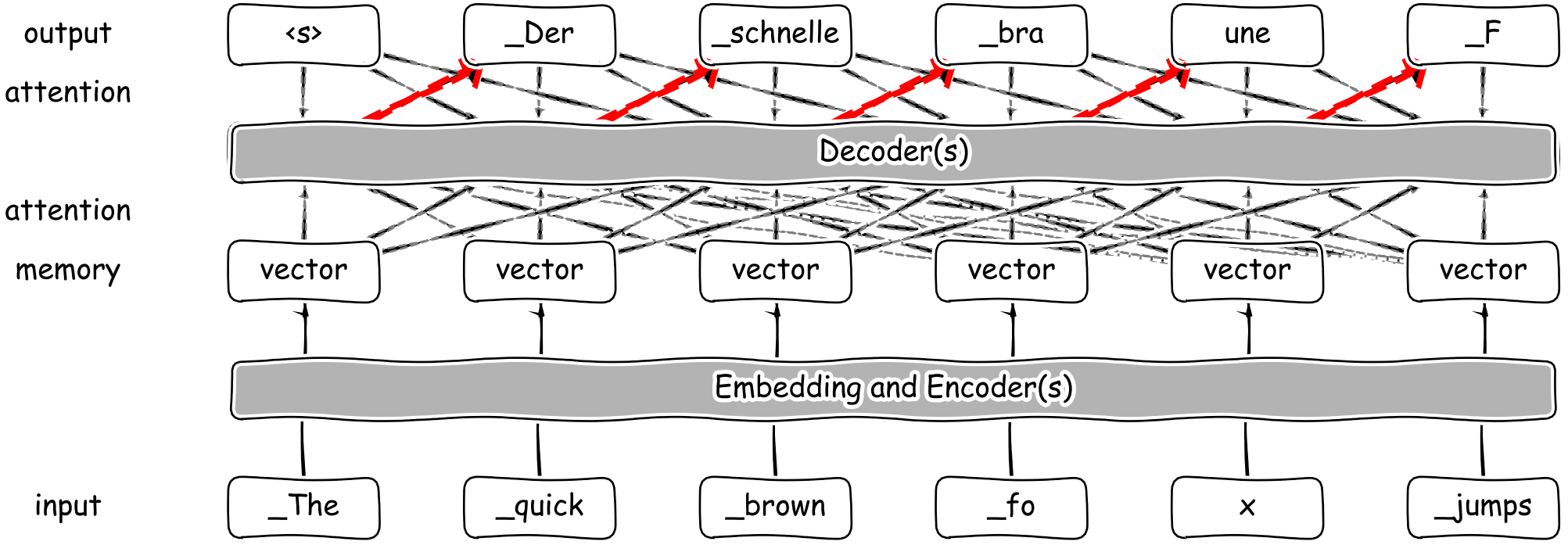
There are interesting visualizations of model "innards"...



(Source: Strobelt et al.: Seq2Seq-Vis)

... but are they useful here without intervention options?

Oversimplified structure of NMT network



- Red arrows: Predictions. Attention "causal" and also in Encoder.
- Similar to the ones used by well-known online services, to recent news-making models (BERT, OpenAI GPT2,...)
- Trained through back-propagation of error term.

NMT models meet the real world

- Need to translate more than one sentence → need to split
- Want to preserve formatting

→ Use Attention to map (heuristics for "end-bias")

→ Paragraph formatting? (currently clumsy bit-by-bit insertion)

	_The	_quick	_brown	_fo	x	_jump	s	_over	_the	_la	zy	_dog	.
_Der	0.07	0.42	0.13	0.03	0.01	0.03	0.02	0.02	0.01	0.02	0.01	0.00	0.24
_schnelle	0.02	0.76	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.01
_bra	0.00	0.03	0.90	0.02	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
une	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.94
_F	0.00	0.00	0.06	0.02	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
uch	0.00	0.00	0.00	0.75	0.18	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.04
s	0.01	0.01	0.01	0.02	0.05	0.02	0.01	0.01	0.00	0.00	0.01	0.01	0.85
_spring	0.00	0.00	0.00	0.00	0.00	0.86	0.08	0.03	0.00	0.00	0.00	0.00	0.02
t	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.93
_über	0.00	0.03	0.02	0.00	0.00	0.04	0.03	0.03	0.04	0.11	0.02	0.01	0.67
_den	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.05	0.32	0.19	0.01	0.40
_fa	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.08	0.84	0.00	0.03
ul	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.06	0.73	0.00	0.20
en	0.00	0.01	0.03	0.01	0.00	0.06	0.01	0.03	0.01	0.04	0.03	0.06	0.71
_Hund	0.00	0.01	0.01	0.00	0.02	0.01	0.00	0.02	0.01	0.02	0.08	0.04	0.77
.	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.01	0.00	0.01	0.00	0.01	0.93
</s>	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.01	0.00	0.00	0.95

Building on PyTorch & OpenNMT

PyTorch

- great Python Deep Learning framework,
- quite well-liked in deep learning research,
- large and very nice community

(I'm biased, though.)

OpenNMT

- Quite comprehensive framework for Neural Machine Translation and related tasks
- More library / application like than many other "code for the paper" style implementation.

Training new models

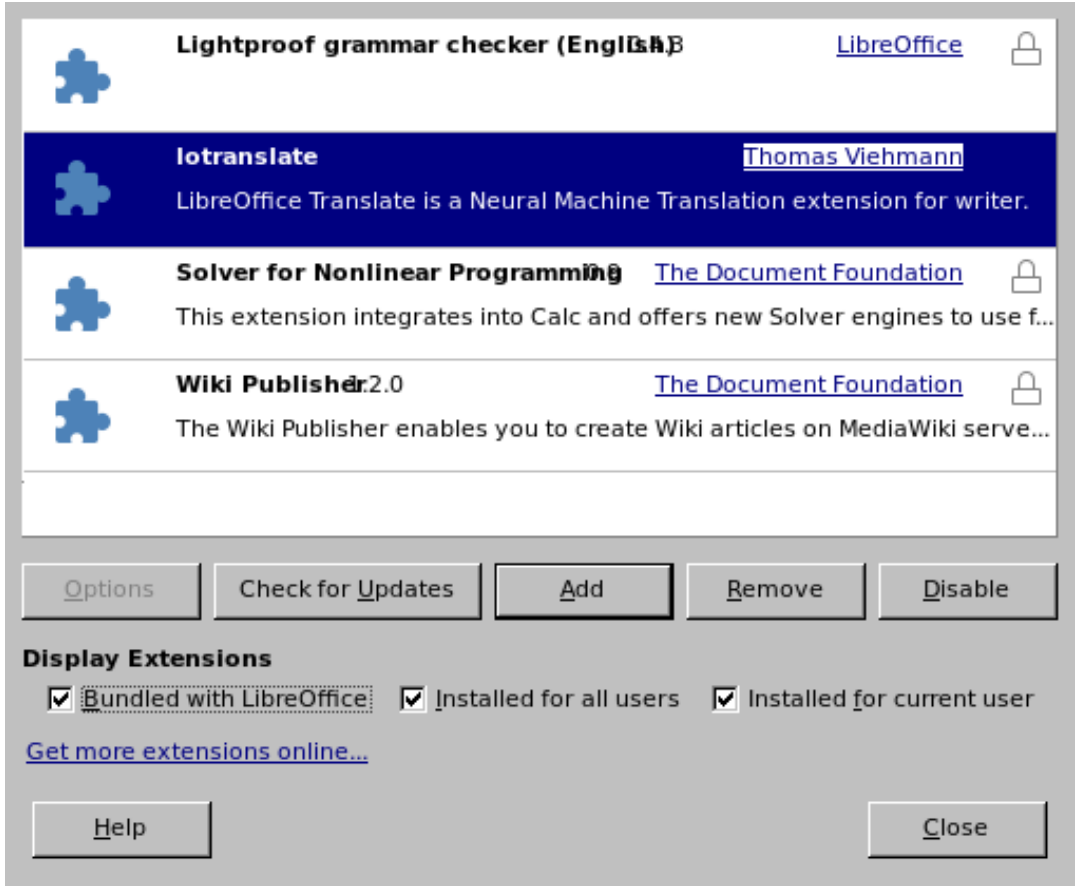
- Needs parallel corpus of sentences (no word alignment needed)
  EN-DE: 4.5 Million pairs
- Needs (at least one) "gaming" GPU – for 1-2 weeks
  (that is 30-70 KWh per model – compare to ~2.400 KWh per year for a family of 5 - and the GPU)
- Vocabulary preparation
- Training (this is what takes long)
- Evaluation (mostly "closeness" on a holdout set + inspection)
- Probably also want domain adaptation (i.e. specialize from "general" model to one specific for a domain, e.g. legal text).

Packaging the extension

- Quite a few Python modules as dependencies: OpenNMT, PyTorch, SynTok (to get sentences) + quite a few indirect ones
- Some are platform / Python-Version specific
- Current solution: build "simple" OXT
- Install dependencies in fresh LibreOffice with pip
- Copy site-packages into OXT zipfile (30MB → 150MB)
- Automate OXT build?

Probably want to shed some dependencies, maybe port to C++.

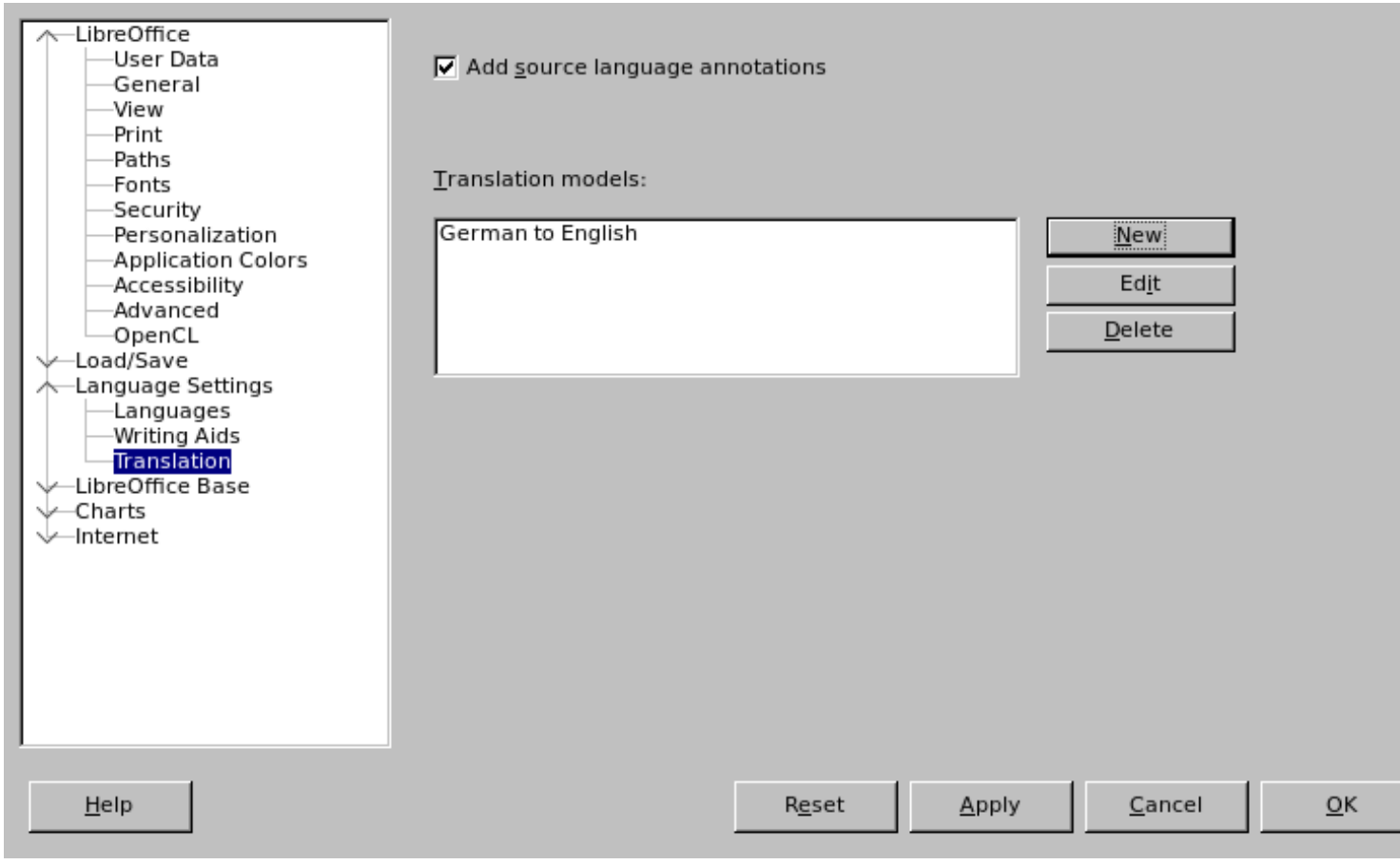
UI - Installation



- Standard Extension
- (Only) for Windows: all dependencies bundled

UI – Installation of Translation Models

Install translation models (unpacked from ZIP file) in the in a new Options page



Better integration with LibreOffice?

Some things I would like your input on:

- How much is MT a desired standard feature?
- Working on other than Writer text?
- Do we need more UI?
- Interest in more languages?
- What size of language models is acceptable? (x.xGB per language pair) Distribution channel?

How to make this more useful?

- Better integration with LibreOffice Writer (e.g. set the Language properties...)
- Would you train a model for your language (pairs)?
  What do you look for for training models?
  (except a speedup / being more economical)
- Open Corpora: http://opus.nlpl.eu/
  (incidentally uses translated UI strings as a source)
- NMT researchy (or catching up with NMT research):
  - Can we use dictionaries, too?
  - Improve using "weakly aligned" texts? (from gutenberg.org, LibreOffice documentation?)
    Related research: automatic filtering noisy corpora (WMT challenge 18 & 19)

Your other comments and observations

Thank you!

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https://lernapparat.de/