Software projects

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Objective

Put into practice some of the NLP tools and methodologies acquired throughout the NLP master's program.

This course will consist of:

- bibliographic research
- problem analysis and selection of the appropriate NLP tool
- applying good development practices: documentation, testing, ethical analysis
- evaluating systems

Course organization

10 sessions, incl. this one and the final one with your presentations

Mandatory to present each time:

- GitHub repository
- Overleaf

Course evaluation

Important points:

- reproducibility
- the right tool for the task
- grade: final presentation + repository and overleaf (doc)

Team organization

- 1 student in charge of project management (organization, planning, retro-planning)
- 1 student in charge of documentation (git, comments, reproducibility)
- 1 student in charge of QA (tests)
- 1 student in charge of ethics

#1 - Evaluate gender biases in LM cover letters

Adapt [Ducel et al., 2024]'s system to another inflected language

Goal: automatically evaluate gender biases in generated cover letters on different prof. fields

- well-defined
- in an inflected language other than FR and IT
- contact: fanny.ducel@inria.fr

Tasks/requirements:

- Work on an inflected language that has gender inflections like German, Hindi, Spanish, ...
- Find available autoregressive Language Models that can easily run on Grid5k
- Find a Spacy model (or equivalent POS-tagger) for the language
- Find a lexical resource with gendered entities (i.e. woman, baker, journalist, ...)
- Adapt some of the linguistic rules to detect morpho-syntactic gender markers
- Run bias metrics and analyse the generated gender distributions

#2 -Study stereotypical biases in LM medical assistance

Goal: document existing stereotypical biases in healthcare and uncover LM biases

- midly defined
- English or French
- contact: fanny.ducel@inria.fr

Tasks/requirements:

- Bibliographic research on stereotypes and biases that impact people's health based on their demographic group (gender, sexual orientation/identity, race, disability, weight, socio-economic status, ...)
- Think of prompts to exhibit LM's stereotypical biases
- Design the experimental setting with the right tools (medical NER, ...)
- Evaluate the results wrt state of the art

Example: comparing the answers of a LM when a user describes their symptoms (e.g. a woman that can't breathe = panic attack vs. a man that can't breathe = heart attack).

#3 - Normativity of LLMs

Goal: Design an experiment and evaluate the normativity of LLMs

- well-defined
- Preferably in French or English
- contact: valentin.richard@loria.fr

Steps:

1. Adapt a bias evaluation protocol (minimal pairs) to the evaluation of normative constructions and discourses
2. Gather a list of normative constructions, e.g.
   - split infinitive: *to boldly go*
   - preposition stranding: *the book I told you about*
   - "ne" omission: *J'aime pas.*
   - In situ embedded interrogative: *Je sais c'est quoi.*
3. Create a list of meta-linguistics discourses, e.g.
   - *You must say "X".*
   - *Construction "X" is incorrect / poor English.*
4. Compute and compare the scores (with and without meta-linguistic discourses) on different LLMs

#4 -Automatic detection of greenwashing discourse

"The term "greenwashing" was coined in the 1980s to describe outrageous corporate environmental claims." [The Guardian]

Goal: automatically detect if a text contains greenwashing content

- midly defined / open
- any language (preferably not English, but...)

Tasks/requirements:

- Bibliographic research on greenwashing and greenwashing detection
- Building a corpus
- Design the experimental setting with the right tools
- Evaluate the results wrt state of the art

#5 - Automatic detection of transphobia

Goal: develop a tool to automatically detect transphobic comments (for example on YouTube videos)

- open
- French (or language TBD, not English or Tamil)

Tasks/requirements:

- Building a corpus
- Manual analysis/annotation of transphobic content (can be offensive)
- Experiment building a tool to automatically detect transphobia
- Evaluate the results wrt state of the art

#6 - Automatic "translation" from inclusive to standard French (and v.v)

Goal: develop a tool to automatically transform the existing inclusive forms (·()/) into standard French and, if possible, reverse

- midly open
- French

Tasks/requirements:

- Building a small corpus
- Manual analysis of the different forms of inclusiveness
- Develop a tool
- Evaluate the results

#7 - A NLP approach to language typology

Goal: using Grew and grewpy, compare the distribution of some syntactic patterns in annotated treebanks across treebanks and/or between languages. E.g. in [Choi et al., 2021], patterns were designed for the six possible word orders (SVO, OVS...).

- well-defined
- multilingual
- contact: bruno.guillaume@loria.fr

Steps for the project:

- Explore the different mathematical tools available comparing distributions (to evaluate the similarity or dissimilarity between two distributions).
- Design sets of complementary requests and compute their distribution on a set of corpora either on UD or SUD 2.14.
- Observe how the distributions are similar or dissimilar in treebanks in one language or for different languages.
- Can you find some observations that allows to reconstruct the languages families?

#8 - Analysis of city council meeting minutes

Goal: From of city council minutes (PDFs) identify Renewable Energy projects (wind/solar/methanization/...) decided in the minutes, their level of maturity, their success or failure

- well-defined
- French
- contact: hugues@mazancourt.com (DataPolitics)

Steps for the project:

- Raw material: Meeting minutes (55,000 documents over the past 5 years)
- Minutes are not made to be machine-readable. A text version (OCR) can be provided
- Linguistics: determining the maturity of a project: from a powerless elected of official talk (good or bad) about wind turbines to a firm approved decision of implantation...

#9 - Exploring Zero-Shot POS Tagging for Under-Resourced Languages

Goal: Compare the performance of XLM-R and Glot500 when fine-tuned for POS tagging on a better-resourced language and then applied directly to a low-resource language without further training. Analyze the impact of subword tokenization on cross-lingual transfer

- well-defined
- low-resourced languages (tbd)
- contact: dbernhard@unistra.fr

Steps for the project:

- Model fine-tuning using datasets from better-resourced languages within the Universal Dependencies framework
- Zero-Shot Transfer to low-resource languages with existing POS annotated corpora (for evaluation purposes)
- Subword Tokenization Analysis: investigate how differences in tokenization between source and target languages impact the performance of zero-shot POS tagging

Choi, H.-S., Guillaume, B., Fort, K., and Perrier, G. (2021).
Investigating Dominant Word Order on Universal Dependencies with Graph Rewriting.
In RANLP 2021 - Recent Advances in Natural Language Processing, Online, Bulgaria.

Ducel, F., Névéol, A., and Fort, K. (2024).
Évaluation automatique des biais de genre dans des modèles de langue auto-régressifs.
In TALN 2024, Toulouse, France.