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De-identification of French medical narratives

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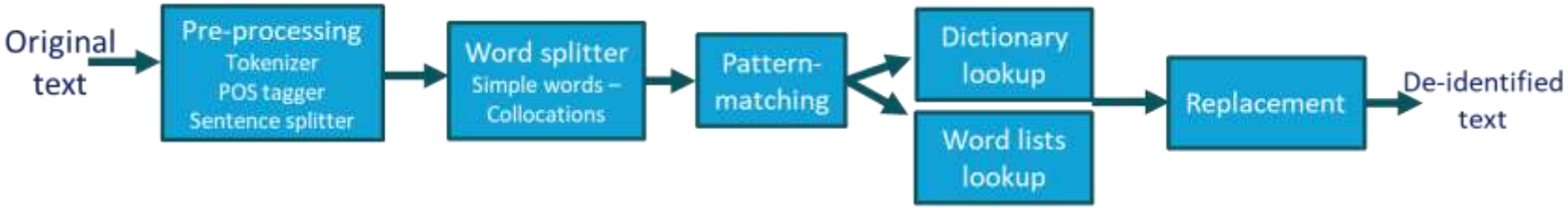
THEORETICAL FRAMEWORK

- Medical narratives contain:
  - Important medical information for secondary usage
  - Protected Health Information (PHI), Personal Identifiable Information (PII)
- De-identification: process of masking or removing sensitive data
  - Ensure data security and privacy
  - Preserve data integrity
- US Health Insurance Portability and Accountability Act (HIPAA) regulation

METHOD

- Named Entity Recognition (NER) task:
  - Names (patients, doctors, nurses, health insurance companies)
  - Locations
  - Elements of dates
  - Addresses
  - Telephone and fax numbers
  - Social security numbers
- Symbolic (rule-based) method via finite state automata
- Replacement of de-identified PHI by credible surrogate information

METHOD



METHOD

Advantages

- High precision and high recall text recognition
- Correctable, reproducible and sharable rules
- Explainable results
- Hospital production environment

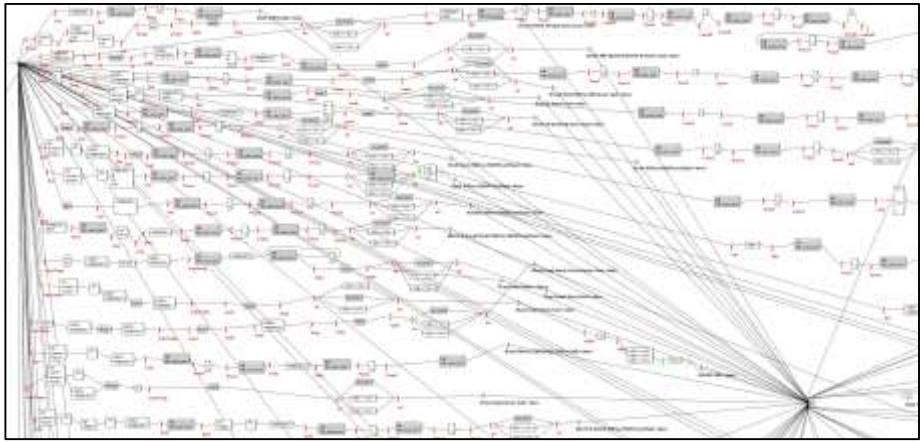
Disadvantages

- Language dependent
- Context dependent
- A lot of working hours and human resources

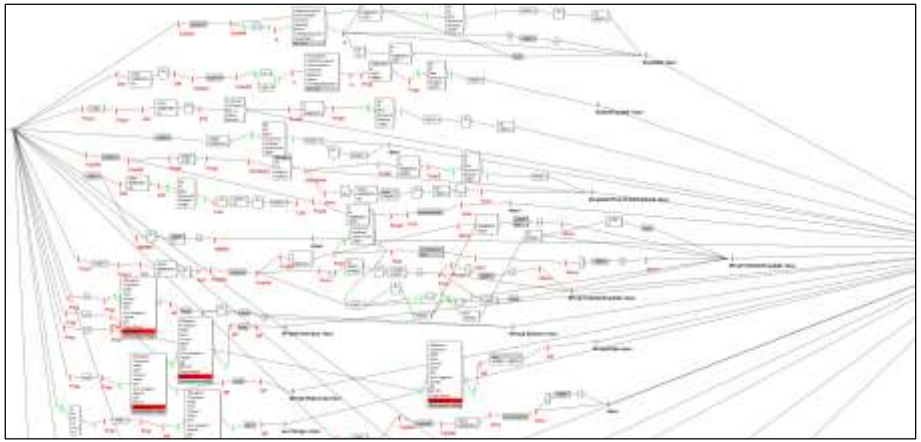
TOOL

- *Unitex* corpus processor:
  - Multilingual open-source tool
  - Developed by S. Paumier at the Paris-Est Marne-la-Vallée university
  - Lexicon- and grammar-based
  - Downloadable at http://unitexgramlab.org/

FINITE STATE AUTOMATA



De-identification of dates



De-identification of places

PATIENT & PHYSICIAN NAMES

- Use of internal and external triggers for the identification of person's names:
  - Titles: *Monsieur (Mr), Madame (Mrs), Dr, Prof, Dresse*
  - Specializations*: Mr X, general practitioner or Mr X specialized in breast cancer*
- Proper names not de-identified: *maladie de Parkinson [Parkinson's disease]*
- Replacement of person names with false names selected randomly

EXAMPLE

Initial text

- **M. Gaudet-Blavignac** a été transféré à la **clinique de Joli-Mont** le **06 janvier** 2018.
- Il est convenu de la mise en place d'une aide infirmière quotidienne par la **FSASD**.

De-identified text

- **M. Foufi** a été transféré à la **Clinique** le **30 février** 2018.
- Il est convenu de la mise en place d'une aide infirmière quotidienne **à domicile**.

DE-IDENTIFICATION RESULTS

	Dates	Patient names	Physician names	Locations	Total performance
Precision	98.9%	99.7%	100%	96.3%	99.1%
Recall	92.3%	99.2%	98.8%	78.7%	93.4%

CURRENT STATUS

- 30 finite state automata for French documents
- Construction of a manually annotated dataset
- De-identification rules for German

NEXT STEPS

- Processing of time intervals
- Other types of medical documents
- Rules for de-identifying medical documents in Italian

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