SELEXINI

SEmantic **LE**Xicon **IN**duction for **I**nterpretability and diversity in text processing

Induction de lexiques sémantiques pour l'interprétabilité et la diversité en traitement de textes

Projet financé par l'Agence Nationale de la Recherche
2022-2025

Program

Thursday July 07 (Luminy campus)

- 14:30-15:30 Invited talk by Denis Paperno
- 15:30-16:00 Overview of the project
- 16:00-16:30 Tour de table
- 16:30-17:00 coffee break
- 17:00-18:30 Working group on WP1
- 18:30-21:00 ~~Hike+picnic+swim in Sugiton~~ Picnic + swim on the Prado beach ☀

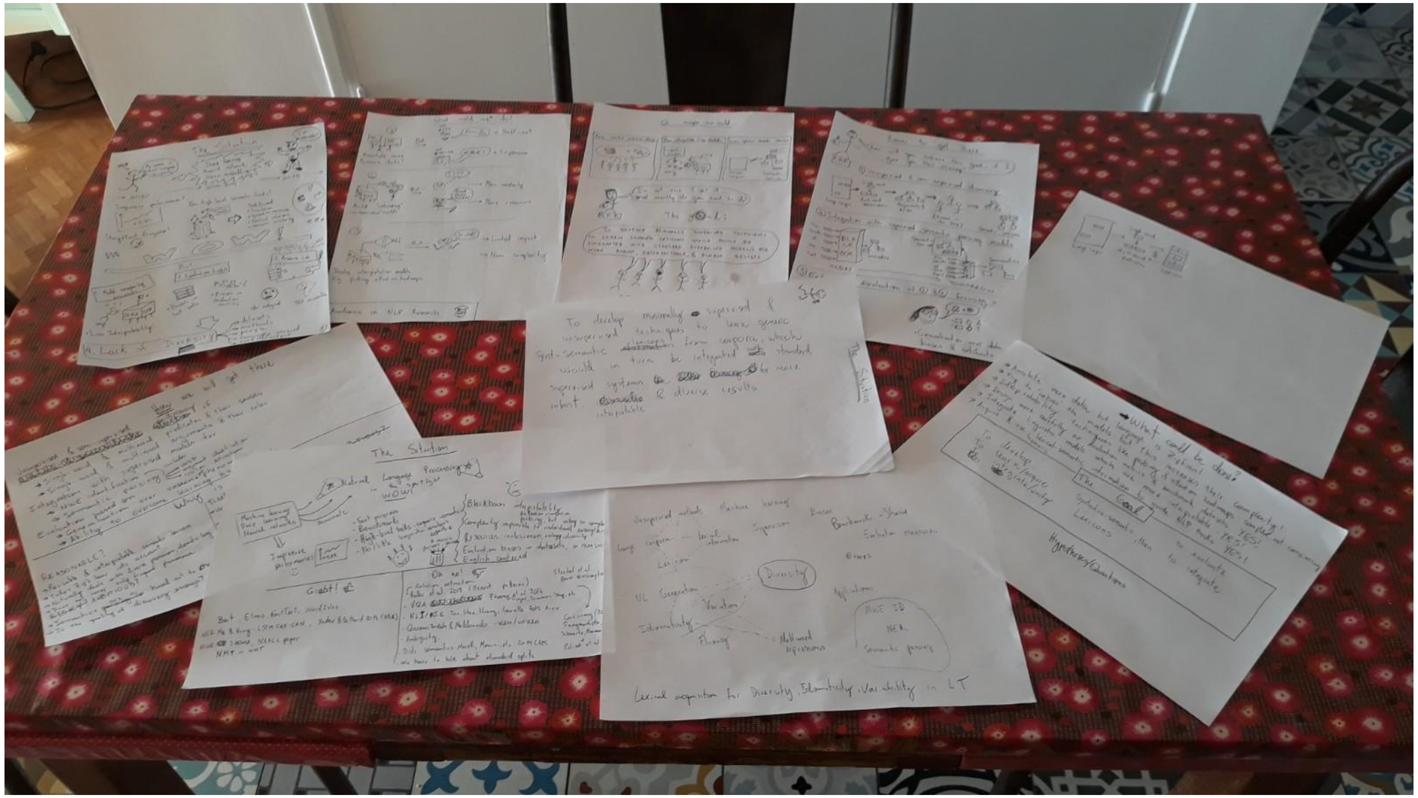
Friday July 08 (St Charles campus)

- 9:00-10:00 Working group on WP1
- 10:00-11:00 Working group on WP2
- 11:00-11:30 coffee break
- 11:30-12:30 Working group on WP5
- 12:30-14:00 Lunch

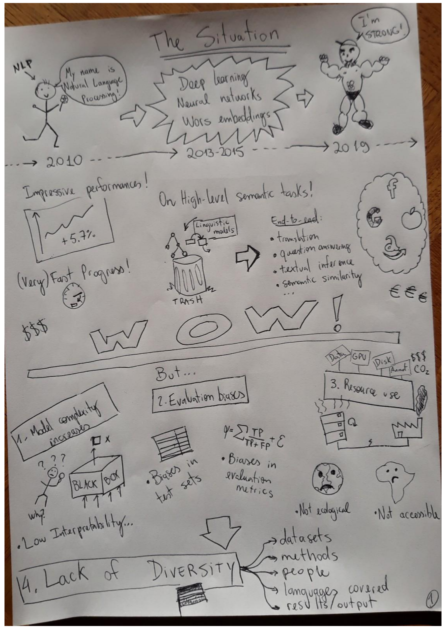
Where do we come from

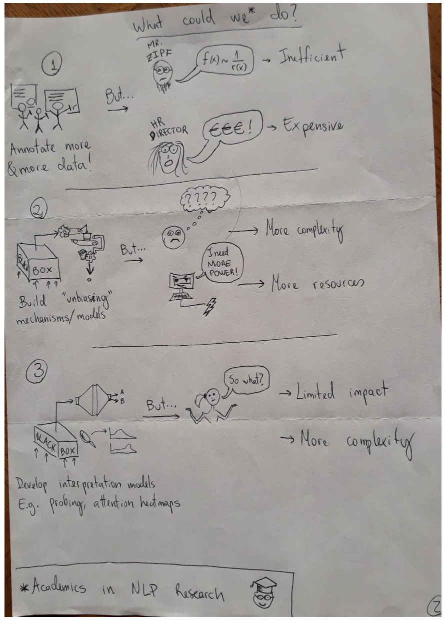
- PARSEME COST Action
- PARSEME-FR project
  - Parsing and **multiword expressions** in French

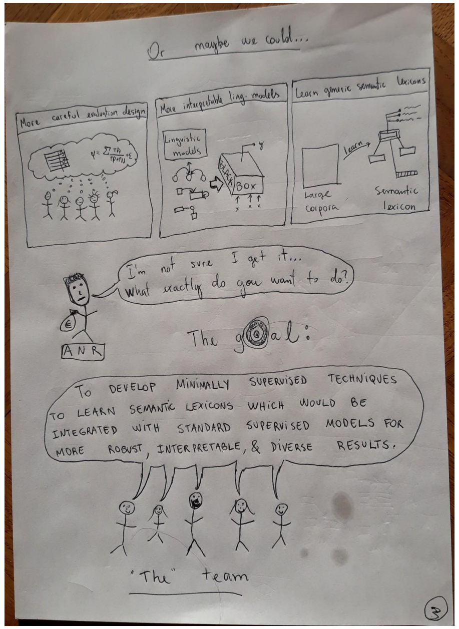
The birth of SELEXINI

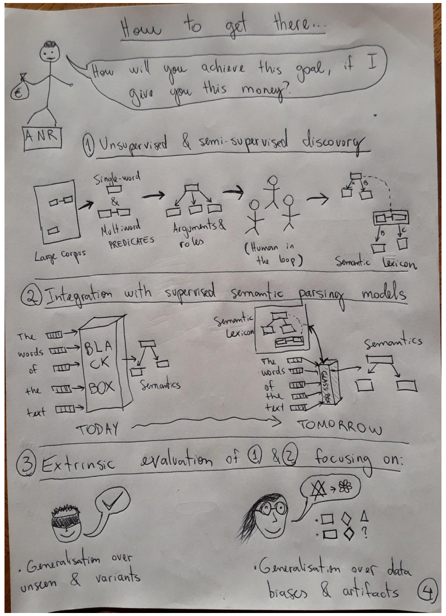

The Solution
The Goals
To develop minimally supervised & unsupervised techniques to learn generic synt-semantic lexicons from corpora, which would in turn be integrated with standard supervised systems for more robust, interpretable & diverse results
The Situation
Natural Language Processing
WOW!
Diversity
MWE ID
NER
Semantic parsing
Lexical acquisition for Diversity, Idiomaticity, Variability in LT
What could be done?
The Goal
Hypotheses/Questions

The birth of SELEXINI






Or maybe we could...
More careful evaluation design
$\varphi = \sum \frac{TP}{TP+TN} + \mathcal{E}$
More interpretable ling. models
Linguistic models
y
BLACK BOX
x x x
Learn generic semantic lexicons
learn
Large corpora
Semantic lexicon
I'm not sure I get it... What exactly do you want to do?
€
ANR
The goal:
TO DEVELOP MINIMALLY SUPERVISED TECHNIQUES TO LEARN SEMANTIC LEXICONS WHICH WOULD BE INTEGRATED WITH STANDARD SUPERVISED MODELS FOR MORE ROBUST, INTERPRETABLE, & DIVERSE RESULTS.
"The" team
3


How to get there...
€
How will you achieve this goal, if I give you this money?
ANR
1 Unsupervised & semi-supervised discovery
Large corpus
Single-word & Multiword PREDICATES
Arguments & roles
(Human in the loop)
A B
B C
Semantic Lexicon
2 Integration with supervised semantic parsing models
The words of the text
BLACK BOX
Semantics
Semantic Lexicon
The words of the text
GLASS BOX
Semantics
TODAY
TOMORROW
3 Extrinsic evaluation of 1 & 2 focusing on:
• Generalisation over unseen & variants
?
• Generalisation over data biases & artifacts
4

NLP today: between enthusiasm…

- Continuous representations highly adapted to neural models
- Transfer learning by fine-tuning large language models pre-trained on raw text using self-supervision
- Significant and regular performance improvements on all tasks
- End-to-end approaches possible, bypassing the need for traditional linguistic analysis

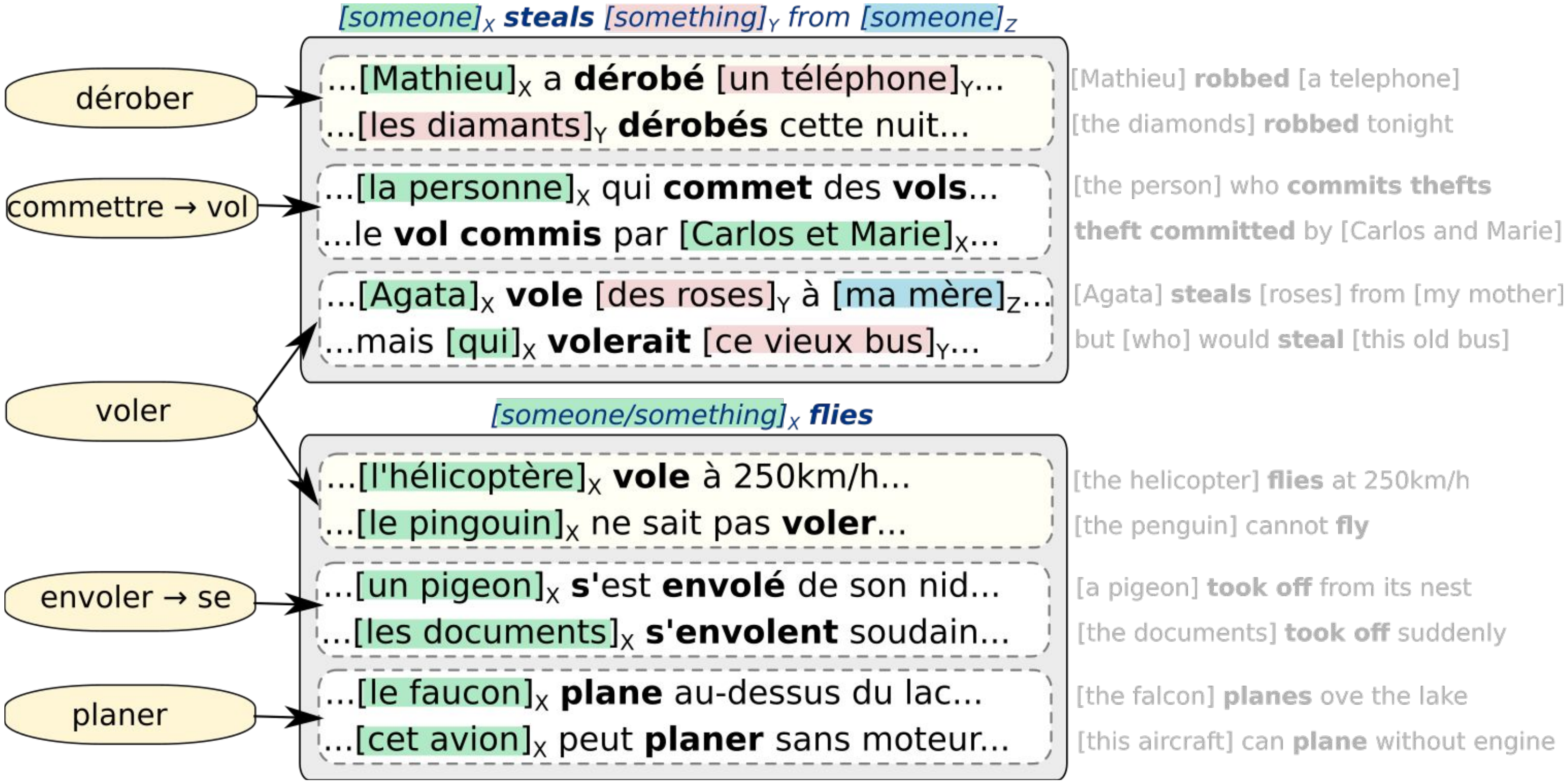
NLP today: ...and limitations

- **Model opacity**: millions (or billions) of real-numbered parameters
- **Lack of diversity**:
  - Repeated evaluation on potentially **biased** benchmarks
  - **Frequent** phenomena are favoured over rarer ones
  - Increase **performance** in spite of robustness
- **Implicit compositionality representations:**
  - Regular composition, e.g. argumental structure
  - Irregular composition, e.g. multiword expressions, idioms

The underlying hypotheses

- The notions of **lexicon** and **lexical units** are cognitively important
- Lexical-semantic notions of **senses** and **frames** provide useful generalisations
- **Explicitly** modelling lexical units brings **interpretability** to neural model's outputs

The (initial) lexicon model



*[someone]$_X$ **steals** [something]$_Y$ from [someone]$_Z$*

dérober

...[Mathieu]$_X$ a **dérobé** [un téléphone]$_Y$... — [Mathieu] **robbed** [a telephone]

...[les diamants]$_Y$ **dérobés** cette nuit... — [the diamonds] **robbed** tonight

commettre → vol

...[la personne]$_X$ qui **commet** des **vols**... — [the person] who **commits thefts**

...le **vol commis** par [Carlos et Marie]$_X$... — **theft committed** by [Carlos and Marie]

voler

...[Agata]$_X$ **vole** [des roses]$_Y$ à [ma mère]$_Z$... — [Agata] **steals** [roses] from [my mother]

...mais [qui]$_X$ **volerait** [ce vieux bus]$_Y$... — but [who] would **steal** [this old bus]

*[someone/something]$_X$ **flies***

...[l'hélicoptère]$_X$ **vole** à 250km/h... — [the helicopter] **flies** at 250km/h

...[le pingouin]$_X$ ne sait pas **voler**... — [the penguin] cannot **fly**

envoler → se

...[un pigeon]$_X$ **s'**est **envolé** de son nid... — [a pigeon] **took off** from its nest

...[les documents]$_X$ **s'envolent** soudain... — [the documents] **took off** suddenly

planer

...[le faucon]$_X$ **plane** au-dessus du lac... — [the falcon] **planes** ove the lake

...[cet avion]$_X$ peut **planer** sans moteur... — [this aircraft] can **plane** without engine

SELEXINI's ambitions

1. Develop techniques to **induce** semantic lexicons automatically
   - From raw corpora
   - Using semi-supervised clustering
     - Seeds = lexical units and example sentences from Wiktionary.fr
2. … and **use these lexicons** within neural NLP systems
   - MWE identification
   - Machine reading comprehension

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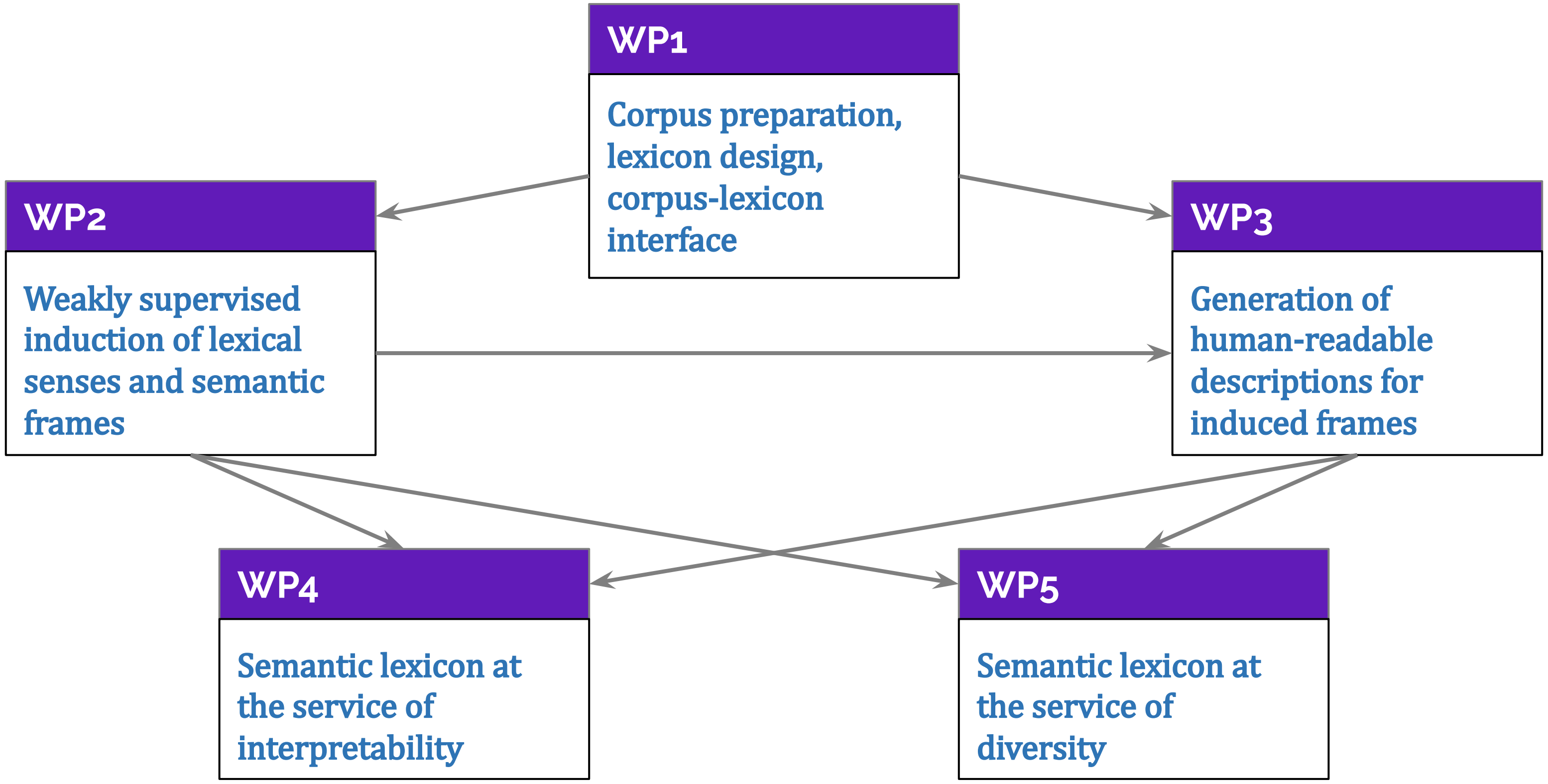
- Lexical unit embeddings provide intermediate representations:
  - Static word embeddings: one vector per ambiguous lexical unit such as *voler*
  - Contextual word embeddings: a different vector for each occurrence of word *voler*

Why lexicon induction?

- Interpretability "by construction"
    - Hybrid continuous-symbolic model
- Large semantically annotated corpus as by-product
    - Lacking for many languages, including French
- High coverage with respect to manually constructed resources
    - Although potentially noisy
- Rely on freely available resource: Wiktionary
    - Large coverage and decent quality across many languages

Work packages



WP1

Corpus preparation, lexicon design, corpus-lexicon interface

WP2

Weakly supervised induction of lexical senses and semantic frames

WP3

Generation of human-readable descriptions for induced frames

WP4

Semantic lexicon at the service of interpretability

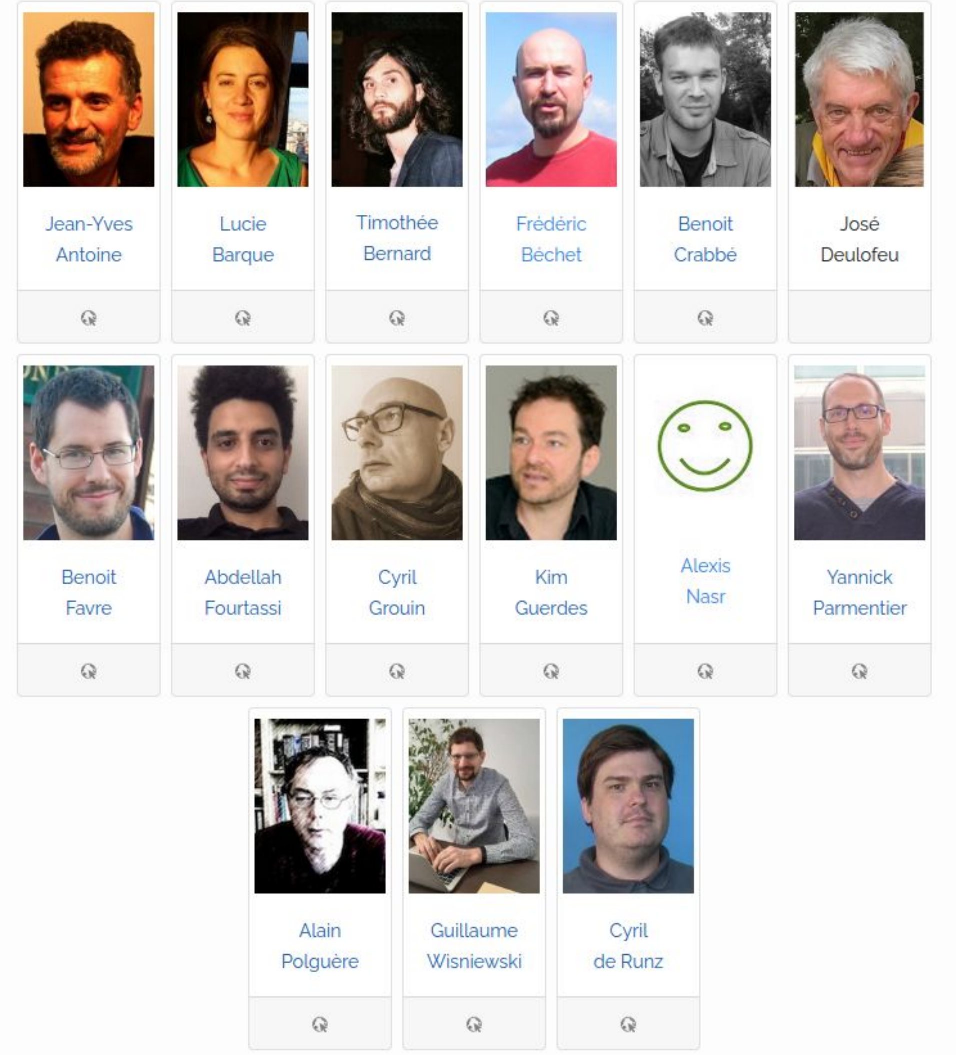
WP5

Semantic lexicon at the service of diversity

Consortium

- LIS - Aix Marseille Université (**C. Ramisch - PI**)
  LLF - Université de Paris (M. Candito)
- ATILF - CNRS Grand Est (M. Constant)
- LISN - Université de Paris-Saclay (A. Savary)
- LIFAT - Université de Tours (A. Soulet)

Participants



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Benoit Favre

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Cyril Grouin

Kim Guerdes

Alexis Nasr

Yannick Parmentier

Alain Polguère

Guillaume Wisniewski

Cyril de Runz

Project infrastructure (WP0)

- Website
  - https://selexini.lis-lab.fr/
- Mailing lists
  - Selexini-all@lisn.upsaclay.fr
  - Selexini-core@lisn.upsaclay.fr
- Processing node
  - Part of LIS cluster, node "selexini-1"
  - 2 GPU Nvidia A100-80GB
  - Access upon request (create invited LIS account)
  - Priority for jobs of project members
- Comics version
  - Work in progress in collaboration with artist Marion Cluzel
- TODO
  - Logo suggestions
  - Project management (gitlab, agile tools…)
  - Social media presence

People

- Engineer WP1 - Marseille
    - Tithir Kumar Saha
- PhD thesis WP2 - Paris
    - Anna Mosolova
- Post-doc WP3 - Nancy
- Phd thesis WP4 - Marseille
- Post-doc WP5 - Saclay/Blois
- Internships
    - Wiktionary-based WSD for French: Ioana Ivan & Nathan Chometton - Marseille
    - …

Tour de table

A few words on your background?

What are your research interests?

Why are you here? What do you find interesting in SELEXINI?

How would you like to make a contribution (if any)?