

# AHLT Laboratory Project

The lab project consists in building a system for *SemEval-2013 Task 9: Extraction of Drug-Drug Interactions from Biomedical Texts*.

We will proceed in guided step at each lab session, though you have some freedom to try your own approach at some points.

The DDIExtraction 2013 task concerned the recognition of drugs and extraction of drug-drug interactions that appear in biomedical literature.

Two subtasks were proposed for the challenge:

- 1) The recognition and classification of drug names.
- 2) The extraction and classification of their interactions.

Both tasks are independent and evaluated separately (that is, the second task is evaluated on the gold standard drug mentions, not on the output of the first task).

The participants were free to address either one the tasks, or both. However, for the lab project you are required to address **both** of them.

## 1. Task description and participant systems

The official site of the challenge is <https://www.cs.york.ac.uk/semEval-2013/task9.html>.

- A description of the results of the challenge can be found in [Segura-Bedmar et al, 2013]
- Also, papers describing each participant system are also available.

All papers can be found at <https://aclanthology.coli.uni-saarland.de/events/semEval-2013> or in the `papers` folder provided with the lab project material.

## 2. Challenge data

The corpus used for the task is the DDI corpus [Herrero-Zazo et al, 2013].

A short description of the DDI corpus provided by *SemEval-2013 Task 9* organizers can be found at <https://www.cs.york.ac.uk/semEval-2013/task9/data/uploads/the-corpus-ddi.pdf>. and in the `papers` folder.

A copy of DDI corpus is included in the attached material. Please follow the license constraints described in the above paper regarding distribution and use.

## 3. Project overview

The project will consist of solving both tasks in the challenge. For each task, the following developments will be required

1. **[Lab sessions 1 and 2]** NERC Task (Recognition and Classification of drug names)
  - a) Develop a simple rule-based baseline system to establish a lower bound for expected performance
  - b) Develop a CRF model to solve the task:
    1. Build a feature extractor to encode the data
    2. Train, tune, and test models with the obtained feature vectors

2. **[Lab sessions 3 and 4]** DDI Task (Drug-drug interaction detection and classification)
  - a) Develop a simple rule-based baseline system to establish a lower bound
  - b) Develop a ML-based model to solve the task
    1. Build a feature extractor to encode the data
    2. Train, tune, and test models with the obtained feature vectors
3. **[Lab Sessions 5 to 7]** Neural Network approaches
  - a) Replace the feature-based classifier for each task with a DNN solution, and evaluate the results.

Further details and guidance on each step will be given in the lab sessions.

## 4. Contents of the Lab package

The package for the Lab project contains the following folders and files

LabProjectAHLT.pdf	- This file.
data/	- Folder containing the training and test corpus
Train/	- Train corpus (the same data are used for both tasks)
Devel/	- Development corpus (the same data are used for both tasks)
Test-NER/	- Test corpus for task 9.1 (Drug name detection)
Test-DDI/	- Test corpus for task 9.2 (DDI detection)
resources/	- Folder containing knowledge extracted from external databases
papers/	- Folder containing papers about the task
Corpus/	- Folder containing papers about the corpus
SharedTask/	- Folder containing papers about the shared task and participant systems approaches.
Evaluation/	- Folder containing papers about evaluation metrics, and formats for evaluation scripts.
eval/	- Folder containing evaluation scripts

## References

- [Segura-Bedmar et al, 2013] I. Segura-Bedmar, P. Martínez, M. Herrero Zazo. **SemEval-2013 Task 9 : Extraction of Drug-Drug Interactions from Biomedical Texts (DDIExtraction 2013)**. *Second Joint Conference on Lexical and Computational Semantics (\*SEM), Volume 2: Proceedings of the Seventh International Workshop on Semantic Evaluation (SemEval 2013)*, pg 341--350, Atlanta, Georgia, USA, 2013.
- [Herrero-Zazo et al, 2013] M. Herrero-Zazo, I. Segura-Bedmar, P. Martínez, T. Declerck: **The DDI corpus: An annotated corpus with pharmacological substances and drug-drug interactions**. *Journal of Biomedical Informatics* 46(5): 914-920 (2013)
- [Raj et al, 2017] D. Raj, S. K. Sahu, A. Anand. **Learning local and global contexts using a convolutional recurrent network model for relation classification in biomedical text**. *Proceedings of 21th CoNLL 2017*, pages 311-321
- [Lim et al, 2018] S. Lim, K. Lee, J. Kang. **Drug drug interaction extraction from the literature using a recursive neural network**. *PLOS ONE* 13(1): e0190926. 2018
- [Asada et al, 2017] M. Asada, M. Miwa, Y. Sasaki. **Extracting Drug-Drug Interactions with Attention CNNs**. *Proceedings of BioNLP 2017*, pg 9-18. Vancouver, Canada, 2017

## Appendix: Resources

Apart from resources (software and data) suggested in each lab session, you are encouraged to experiment with alternative/additional tools (e.g. to obtain better features, or better performing algorithms)

Some recommended tools and resources:

- **Language processing**
  - NLTK: <http://www.nltk.org/>
  - FreeLing: <http://nlp.cs.upc.edu/freeling>
  - TextServer: <http://textserver.cs.upc.edu/textserver>
- **Machine Learning**
  - SciPy: <https://www.scipy.org/>
  - scikit-learn: <http://scikit-learn.org/>
  - Keras: <https://keras.io>
  - PyTorch: <https://pytorch.org/>
  - crfsuite: <http://www.chokkan.org/software/crfsuite/>  
<https://github.com/scrapinghub/python-crfsuite>
- **External Knowledge**
  - DrugBank: <https://www.drugbank.ca/>
  - HSDB: <https://www.nlm.nih.gov/enviro/hsdbcasrn.html>
- **Utility tools**
  - XML.dom: <https://docs.python.org/3.7/library/xml.dom.html>
- **Word Embeddings**
  - Word2vec: <https://code.google.com/archive/p/word2vec/>
  - FastText: <https://fasttext.cc/>
  - Glove: <https://nlp.stanford.edu/projects/glove/>