NLP course 2021

Homework 3

WSD of Word-in-Context Data

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SAPIENZA
UNIVERSITÀ DI ROMA

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WSD of Word-in-Context Datasets

Word-in-Context Disambiguation (WiC)

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- The cat eats the **mouse**

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- The cat eats the **mouse**

In the above examples, the word **mouse** has different meanings, because it is used in different contexts.

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WiC is the task of addressing the disambiguation of polysemous words, without relying on a fixed inventory of word senses.

- The cat eats the **mouse**

=

- the **mouse** escaped from the predator

In the above examples, the word **mouse** has different meanings, because it is used in different contexts.

WiC: context sentences, target words

The mouse escaped from the predator

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$$\underbrace{\text{The mouse escaped from the predator}}_{\texttt{context sentence}}$$

WiC: context sentences, target words

The **mouse** escaped from the predator

context sentence

target word

The homework

WSD of Word-in-Context Data

The goal(s)

The task is formulated as a standard **Word Sense Disambiguation task**:

- Given each context sentence, determine the meaning of the each of the two occurrences of the target word.
- Evaluate the system in the Word-in-Context task too

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The cat eats the **mouse** → model →

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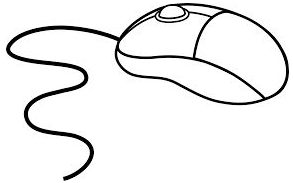
Click the right button of your **mouse** → model →



WSD: evaluation

The performance of your WSD system is usually measured in terms of F1 score

GOLD	True	**False**	True	True	**True**	False
PRED	True	**True**	True	True	**False**	False

F1 = 2PR / P+R = Accuracy if all answers are given

WiC: evaluation

The performance of a WiC system is usually measured in terms of accuracy.

GOLD	True	**False**	True	True	**True**	False
PRED	True	**True**	True	True	**False**	False

Accuracy = (CORRECTLY classified sentence pairs) / (TOTAL pairs) = 4/6 ~= 0.66

Evaluation Output

- For each sentence pair, we expect you to output the synset identifier for each sense following the input format

- You will get the WiC prediction “for free” as a result of WSD (i.e. a True/False if senses are the same or different for the two occurrences of the target word)

Practical tips

- Use NLTK WordNet API to obtain the synset information from the synset identifier, as well as the other synsets for that lemma:

Obtain the sense using the synset key:

```
sense = wordnet.lemma_from_key("filthy%5:00:dirty:01")
```

Obtain the synset:

```
synset = sense.synset()
```

Obtain the lemmas of a given synset:

```
all_senses = wordnet.lemmas(lemma, pos)
all_senses = wordnet.lemmas(sense.name(), sense.synset().pos())
```

Submission

What you will receive &
How to submit

Data for WSD

1) http://lcl.uniroma1.it/wsdeval - contains training data (SemCor) and benchmarks (SemEval, Senseval, etc.)
2) https://github.com/SapienzaNLP/ewiser/tree/master/res/corpora/training/orig - contains additional training data annotated with:
   a) examples
   b) glosses

What you will receive: data format for SemCor/Senseval data you will use for training

```
<sentence id="d0000001.s001">
      <wf lemma="it" pos="PRON">it</wf>
      <wf lemma="be" pos="VERB">was</wf>
      <wf lemma="full" pos="ADJ">full</wf>
      <wf lemma="of" pos="ADP">of</wf>
      <wf lemma="racket" pos="NOUN">rackets</wf>
      <wf lemma="," pos=".">,</wf>
      <wf lemma="ball" pos="NOUN">balls</wf>
      <wf lemma="and" pos="CONJ">and</wf>
      <wf lemma="other" pos="ADJ">other</wf>
      <instance id="d0000001.s001.h001" lemma="object" pos="NOUN">objects</instance>
      <wf lemma="." pos="PUNCT">.</wf>
 </sentence>
```

What you will receive: data format (WiC)

The dataset is a JSONLINES file where each entry contains the following fields:

```
{
    "id": "dev.24",
    "lemma": "filthy",
    "pos": "ADJ",
    "sentence1": "They were given food in a filthy toilet without even minimal sanitary arrangements.",
    "sentence2": "He spent a week in a filthy cell together with seven other detainees.",
    "start1": "26",
    "end1": "32",
    "start2": "21",
    "end2": "27",
    "label": "True",
    “sent1_sense_id”: “wic.dev.s24.w01”,
    “sent2_sense_id”: “wic.dev.s24.w02”
}
```

What you will receive: data format

The dataset is a JSONLINES file where each entry contains the following fields:

Input context sentences

```
{
    "id": "dev.24",
    "lemma": "filthy",
    "pos": "ADJ",
    "sentence1": "They were given food in a filthy toilet without even minimal sanitary arrangements.",
    "sentence2": "He spent a week in a filthy cell together with seven other detainees.",
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    "start2": "21",
    "end2": "27",
    "label": "True",
    “sent1_sense_id”: “wic.dev.s24.w01”,
    “sent2_sense_id”: “wic.dev.s24.w02”
}
```

First char (included) and last char (excluded) of target word in sentence 1

What you will receive: data format

The dataset is a JSONLINES file where each entry contains the following fields:

```
{
    "id": "dev.24",
    "lemma": "filthy",
    "pos": "ADJ",
    "sentence1": "They were given food in a filthy toilet without even minimal sanitary arrangements.",
    "sentence2": "He spent a week in a filthy cell together with seven other detainees.",
    "start1": "26",
    "end1": "32",
    "start2": "21",
    "end2": "27",
    "label": "True",
    “sent1_sense_id”: “wic.dev.s24.w01”,
    “sent2_sense_id”: “wic.dev.s24.w02”
}
```

First char (included) and last char (excluded) of target word in sentence 2

What you will receive: data format

The dataset is a JSONLINES file where each entry contains the following fields:

```
{
    "id": "dev.24",
    "lemma": "filthy",
    "pos": "ADJ",
    "sentence1": "They were given food in a filthy toilet without even minimal sanitary arrangements.",
    "sentence2": "He spent a week in a filthy cell together with seven other detainees.",
    "start1": "26",
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    "end2": "27",
    "label": "True",
    “sent1_sense_id”: “wic.dev.s24.w01”,
    “sent2_sense_id”: “wic.dev.s24.w02”
}
```

Gold label of this sample

What you will receive: data format

The dataset is a JSONLINES file where each entry contains the following fields:

```
{
    "id": "dev.24",
    "lemma": "filthy",
    "pos": "ADJ",
    "sentence1": "They were given food in a filthy toilet without even minimal sanitary arrangements.",
    "sentence2": "He spent a week in a filthy cell together with seven other detainees.",
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    "label": "True",
    “sent1_sense_id”: “wic.dev.s24.w01”,
    “sent2_sense_id”: “wic.dev.s24.w02”
}
```

This is the instance Id. They are used to indicate the prediction in the output file.

Output format

TSV file with:

```
wic.dev.s24.w01   filthy%5:00:dirty:01
wic.dev.s24.w02   filthy%5:00:dirty:01
wic.train.s02.w01 ...
```

Predictions for dev set sample 24.
If the two senses are different, it will show a different synset, i.e.:

```
filthy%5:00:dirty:02
```

What you will receive: data format

We will provide you a folder with the following structure:

```
nlp2021-hw3/
    data/
    hw3/
        model.py
        stud/
    model/
    requirements.txt
    test.sh
```

You are allowed to edit **only** the items in bold.

We will use Docker for evaluation. As far as you **do not change** any file but those we marked in bold, **if test.sh runs** on your side, it will run on ours as well.

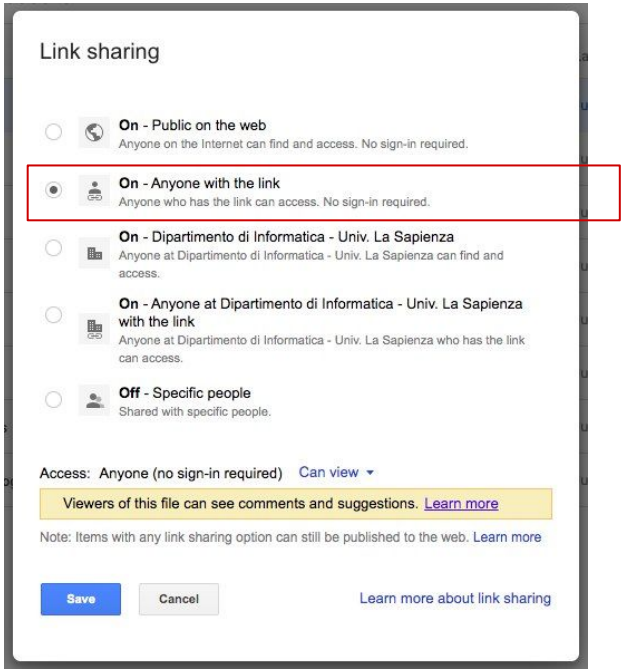
What we expect from you

- The zip folder we gave you (but populated :))
- Put your training code (if you used Colab, download the notebook **.ipynb** and place it) in **`hw3/stud/`**
- If you use any additional library, modify the requirements.txt file as needed (click here for info)
- Use the data (train, dev and test) in the data folder; **use each file as defined in the standard ML conventions** (train for training, dev for model selection, …)
- Put everything your model needs (vocabulary, weights, …) inside the **model/** folder, and be sure to properly load them in your model

What we expect from you

1. In `hw3/stud/implementation.py` implement the `StudentModel` class
   - Load your model and use it in the `predict` method
   - You **must respect** the **signature** of the `predict` method
   - You can add other methods (i.e. the constructor)
2. In `hw1/stud/implementation.py` implement the `build_model` function, initializing your `StudentModel` class.
3. Use `test.sh` to check that everything works
4. Add your `report.pdf` to the folder (yes, export it in pdf even if you are using Word!)
5. Name the zip folder `lastname_studentid_hw1.zip`:
   - Ex: Luigi D'Andrea will submit a file named `dandrea_1234567_hw1.zip`

Submission instructions

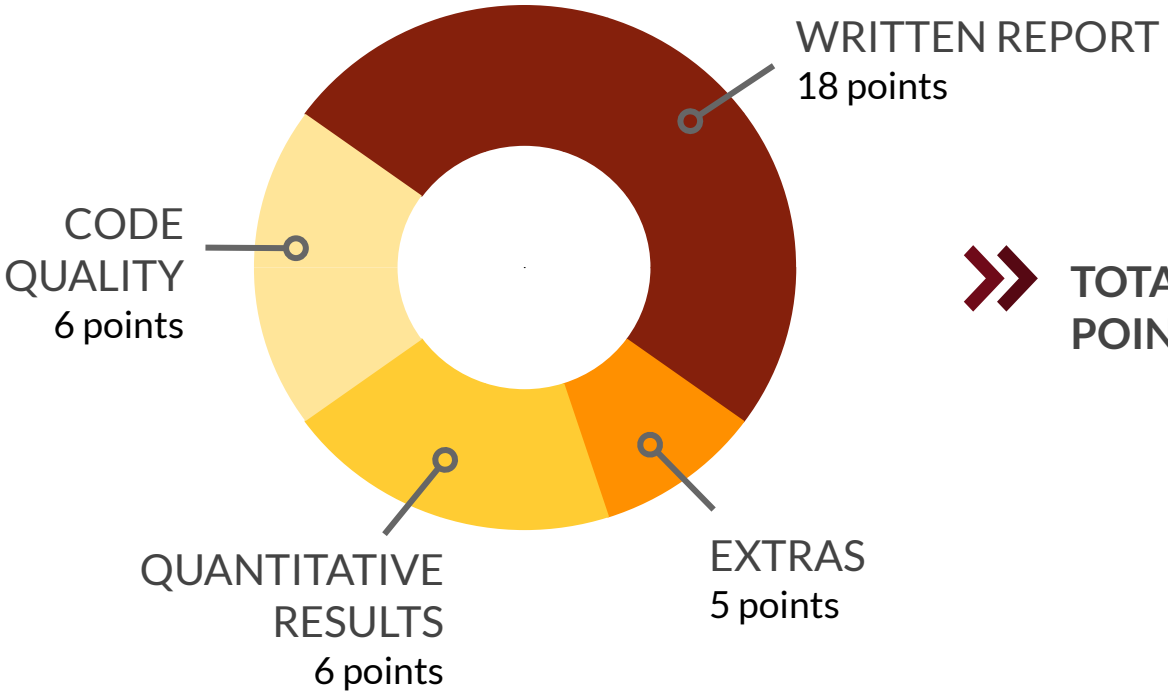


- Upload the zip on your **institutional** Drive and make it **link-shareable** and **public to anyone** (an automatic script will download it).
- Make sure it is accessible via an incognito page of your browser!
- Do **NOT modify** the folder structure
- You have to submit the homework through the submission form on Google Classroom. You will be asked to fill a form with the requested information and the **link** to the zip you uploaded on Drive.

Evaluation

How your work will be evaluated

Evaluation Overview



TOTAL: 35/30 POINTS

Report: dos and don’ts

- **ACL 2021 paper template**
  - Available here (Word and LaTeX direct download) or here (Overleaf LaTeX template)
  - You can use either the LaTeX or the Word template, your choice
  - **DO NOT MODIFY** the template (margins, spacing, font size)
  - Use the non-anonymous flag, so you can enter your name
- **Max 2 pages**
  - For the report, including title, subtitles, etc.
  - This is a **STRICT RULE!**
- **Unlimited extra pages for images, tables and references**
  - Every image and table must have a caption (don’t abuse them please :-))
  - Tables and images must be referenced in the report

Report: what you are expected to do

We expect a good report to be:

- **Readable** and **understandable**
  - We will not give penalties for English errors, but we expect the report to follow a clear flow. We don't want to read just a sequence of statements on what you did without showing the reasoning behind your choices
- **Well-structured** and **organized**
  - Take inspiration from the many papers available online and organize your report in well-defined sections (e.g. method, setup, experiments, results…)

Report: what you are not expected to do

We expect a good report **NOT** to include:

- Unnecessary **task** or **dataset descriptions**
  - just focus on your solution to the problem.
- **Code** copy-paste
  - Your code should be self-explanatory, so no need to show it in the report. You can add **pseudo-code** to show some particular algorithm, but **no code or screenshots** please!

Report: what you are not expected to do

We expect a good report **NOT** to include:

- Unnecessary **low-level implementation details**
  - Avoid any **low-level implementation/technical details** like “I used a dictionary to store these values”, “I had to use configuration X to solve this exception”, “I could not use Y because there was a dependency issue with Z”, etc.
  - Instead, **we are interested in high-level abstractions/strategies** you decide to use to tackle the homework, as well as the **intuitions behind your choices**.

    E.g. use and description of a particular model, explanation of how and why an architecture works, etc.

Code and code Quality

Your project should conform to the following rules:

- You must **MUST** use PyTorch Lightning
  - TensorFlow and other deep learning frameworks are **NOT** allowed.
- **Any additional framework is allowed** (but needs to be documented in the report)
- Use of sense embeddings is allowed
- For any doubt, please ask the TAs on Google Classroom.
- **Comment** your code, please!

Quantitative Results

We will evaluate the **performance of your model** on a SECRET test set.

You can get **from 0 to 6** points according to the following **thresholds**:

- `P < 0.52 => FAIL`
- `0.52 < P < 0.55 => 0`
- `0.55 < P < T2 => 1`
- `T2 < P < T3 => 2`
- `T3 < P < T4 => 3`
- `T4 < P < T5 => 4`
- `T5 < P < T6 => 5`
- `P > T6 => 6`

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- T2 < P < T3 => 2
- T3 < P < T4 => 3
- T4 < P < T5 => 4
- T5 < P < T6 => 5
- P > T6 => 6

Thresholds will be defined based on an internal reference model and the **normalized distribution of YOUR scores**!

Extras

You can achieve **up to 5 points with some extras!**

An “extra” is whatever you decide to add to your model to make it better. For instance:

- use of pre-trained embeddings or contextualized embeddings,
- use of NLP best practices,
- comparative analysis of results in your report,
- informative plots in your report,
- **new ideas**

and more, according to internal baselines. Don’t forget to **explain your choices** in the report! Extras that are not explained in the report will not be considered for evaluation.

Evaluation

- `test.sh` is identical to what we will be using
- **If it does not run on your side, we will not correct your homework**
- Note that, if you use **any kind of hard-coded paths**, this script **won't work**
- Use **paths relative to the project root folder**, e.g.:
  - **NO**: `/home/pincopallino/my_folder/model/weights.th`
  - **OK**: `model/weights.th`

Warnings

Things you should be aware of

Please be aware that

This is an **individual homework!** Collaboration among the students is **not** allowed.

We will check for **plagiarism** both manually and automatically.

It is **not allowed** to:

- Copy from other students
- Share your code with other students
- Copy from online resources (StackOverflow, GitHub, Medium and so on).

However, you are allowed to use material from **external sources** as long as it is **not central** to the homework.

- In this case, it is **MANDATORY to cite such resources** in the report

Please be aware that

- If we find out that you breached any of the above rules, you will **automatically FAIL** this homework and you will have to pass a **FULL EXAM.**
- **Plagiarism will imply further consequences at the Faculty level.**
- While we release the homework on GitHub, **DO NOT FORK THE PROJECT.**
- If you want to continue using GitHub for versioning, clone the project and re-upload it.
- If we realize you shared your code in any way (forking or otherwise), even without the intention of letting others copy, you will be failed automatically.

Use of external data

- You are free to use any additional resources you might need, but **they need to be declared in the report**
- E.g. **XL-WSD** or other knowledge resources like SyntagNet

Tips

A few tips to organize your work:

- Start **as soon as possible**!
  - Training a neural network requires time, possibly hours, depending on your hardware
- Start **small**!
  - If you don't get decent results with a very very simple neural network, there is a good chance that adding other things won't make your model perform better
  - Leave the "extras" as the last thing!
- Leave some time for **hyperparameter** tuning!
  - Sometimes good hyperparameter combinations can do wonders for your neural network
- Use **Google** Colab (free GPUs!)

Deadline

When to deliver what

Deadline

Submission date: 7 days before the exam date
(e.g. for the first session **June 15, 2021**
23:59:59 Italian time (UTC + 1))

Submit the homework through the submission form on Google Classroom. You have to fill the form with the requested information and a link to the zip folder of the homework on Google Drive.

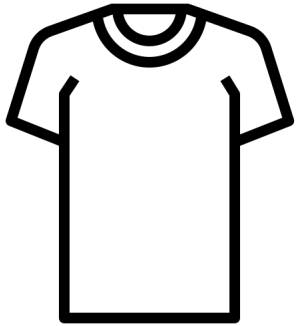
Awards

Get a **Sapienza NLP™** t-shirt

Win a Sapienza NLP t-shirt!

We will hand out amazing Sapienza NLP t-shirts to the **overall top-5** students!

The final ranking will be computed according to the scores on our **secret** test set.



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That’s not all

If your work is novel, interesting and original, we will gladly invite you to work together with us to extended on a fully-fledged paper for **TOP-TIER INTERNATIONAL CONFERENCE**!

Just over the last 12 months, the Sapienza NLP group published more than a dozen of papers!

Questions?

If you have a question that may interest your colleagues, **please ask it on Google Classroom**.

Otherwise, for personal or other questions, send an email to **ALL** of us (but please, only reach for things that can't be asked on the Google Classroom).

Our emails are:

campagnano@di.uniroma1.it

huguetcabot@babelscape.com

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