NLP course 2023

Homework 1

Event Detection

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Event Detection

An introduction

What is an Event?

- An **event** is a specific occurrence involving participants.
- Each event is labeled with an **event type**.
- An **event trigger** is the **key word or phrase** in an event mention that most clearly expresses the event occurrence.

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Event Detection

- Event Detection (ED) is the task of **locating** event triggers and **classifying** event types.
  - It is a sequence labeling task, i.e. every token must be tagged with some label.
  - **5** labels:

SEN: Sentiment

CHA: Change

ACT: Action

SCEN: Scenario

POSS: Possession

Event Detection

Class examples

Protests ended (SCEN) after the government promised (SEN) to permanently suspend the project.

Five people died (CHA) in an aviation accident.

Dante wrote (ACT) the divine comedy.

The tornado attained (POSS) category 2 strength.

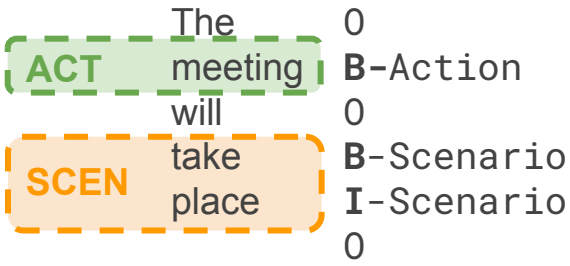
Dataset

The Dataset

- Each sample is a sentence annotated with **event triggers** and their **classes**.
- Data splits:
  - **`20,000`** training examples (`train.jsonl`)
  - **`2,000`** development examples (`dev.jsonl`)
  - **`2,000`** test examples (`test.jsonl`)
- An event trigger spans across one or more words:
  - This dataset adopts the BIO format to represent event trigger spans.

What is the BIO format?

- It is usually used to label spans of text through token-level tagging.
- **BIO:**
  - **B-** indicates that the tag is the **beginning** of a span
  - **I-** indicates that the tag is **inside** a span
  - **O-** indicates that a token is **outside** of any span



Dataset format

- JSONL, i.e. each line is a JSON object with three fields:
  - **idx**: progressive index of the sample, unique to each split.
  - **tokens**: the pre-tokenized sentence, i.e. a list of tokens that make up the sentence.
  - **labels**: a list with the same length of **tokens**, with the corresponding label for each token

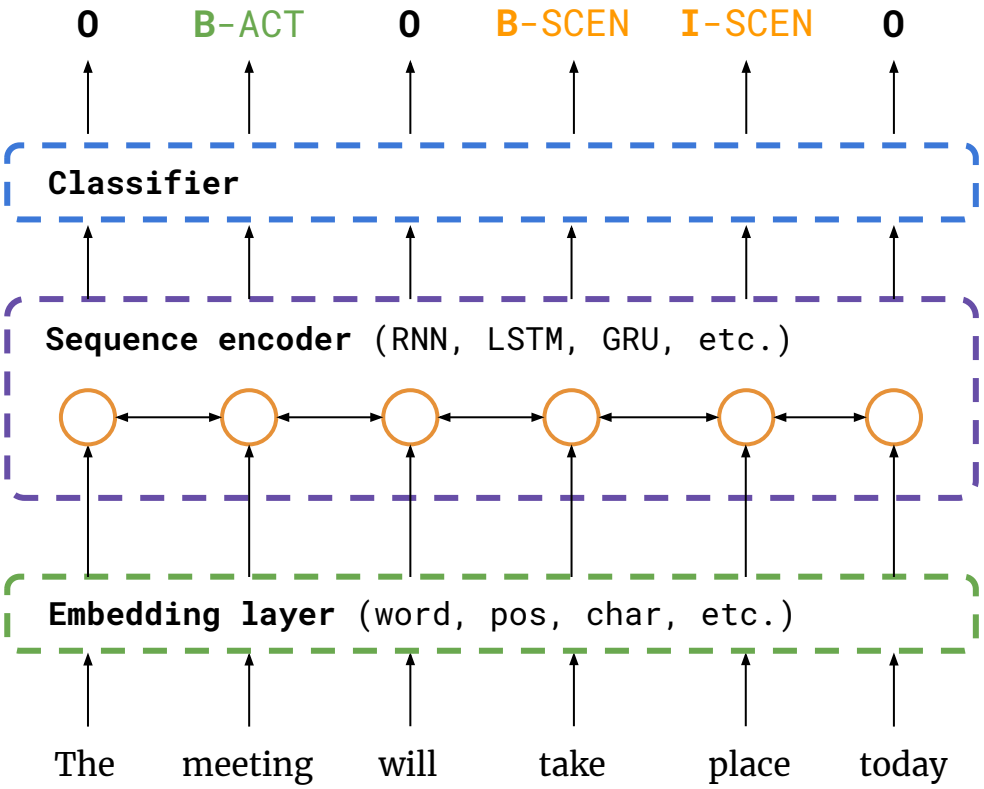
```
{
    "idx": 10,
    "tokens": ["The", "meeting", "will", "take", "place", "today"],
    "labels": ["O", "B-ACTION", "O", "B-SCENARIO", "I-SCENARIO", "O"]
}
```

Approaches

Model: possible approaches

Note:

Transformer-based architectures are not allowed



Submission

What you will receive

- We will provide you with a folder organized as follows (some files are omitted):

```
- nlp2023-hw1/
  - data/
  - hw1/
    - model.py
    - stud/
  - model/
  - requirements.txt
  - test.sh
```

- You are allowed to edit **only** the items in bold!

What you will receive

- We will evaluate your work using Docker
  - You should be fine even if you don't know anything about it
- If **`test.sh`** runs on your side, it will run on ours as well
  - Just keep in mind: do not change any file but those we marked in bold as editable in the previous slide
- Additionally, we wrote a **`README.md`** to get you everything up and running
- You can find the code repository here!

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 **`hw1/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 and test for final testing of the model*)

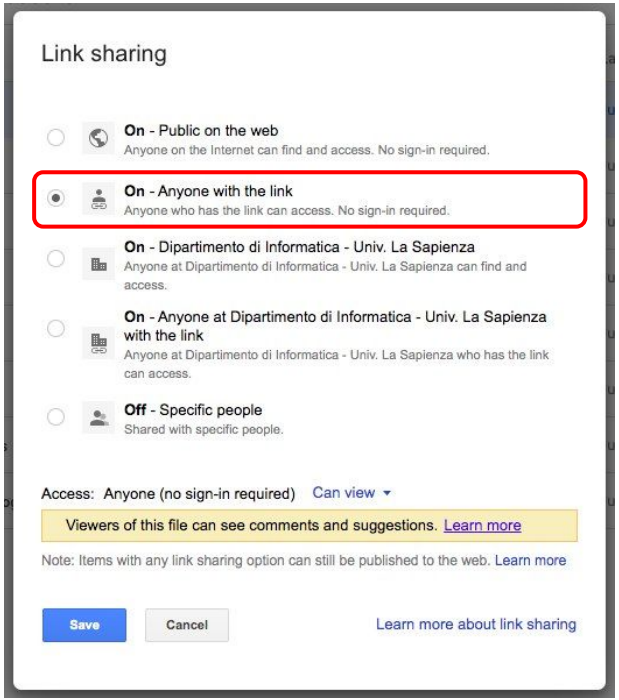
What we expect from you

- Put **everything** your model needs (vocabulary, weights, ...) inside the **`model/`** folder, and **be sure to properly load them** in your model
- In **`hw1/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)
- In **`hw1/stud/implementation.py`** implement the **`build_model`** function
  - It should initialize your **`StudentModel`** class.

What we expect from you

- Use **`test.sh`** to check that everything works
- Add your **`report.pdf`** to the folder (yes, export it in PDF even if you are using Word!)
- Name the zip folder **`lastname_studentid_hw1.zip`**:
  - Ex: Luigi D'Andrea will submit a file named **`dandrea_1234567_hw1.zip`**
  - If you are unsure which name to put, use the one in your institutional email account

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.

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Evaluation

Evaluation

- Use the **validation split** to select the **best model/hyperparameters** configuration
- Use the **test split** to evaluate your model and **estimate its performance**
- The final evaluation will be conducted on a **SECRET** test set
- The evaluation metric will be the **macro F1-score** obtained comparing your model's predictions with our golden labels
- We will use **`seqeval`**, a common Python package used to obtain **token-level classification metrics**, one of which is the F1-score

Evaluation

F1 explanation

- The **F1-score** for a single class C is defined as:

$$F_1 = 2 \cdot \frac{\text{recall} \times \text{precision}}{\text{recall} + \text{precision}}$$

$$\text{recall} = \frac{\text{“number of tokens labelled as } C \text{ that are truly part of class } C\text{”}}{\text{“number of all tokens that are truly part of } C\text{”}}$$

$$\text{precision} = \frac{\text{“number of tokens labelled as } C \text{ that are truly part of class } C\text{”}}{\text{“number of all tokens labelled as } C\text{”}}$$

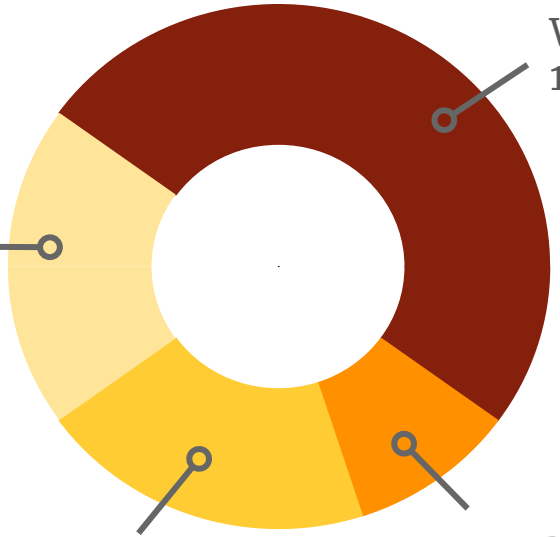
- The **macro F1-score** is simply the average of the F1-score for each class
- We use “strict” mode in `seqeval`, i.e. tags must adhere correctly to the BIO format

`B-SCEN` `I-SCEN` **O**

`I-SCEN` `I-SCEN` **O**

Evaluation

We will take into account the following criteria:



TOTAL: 35/30 POINTS

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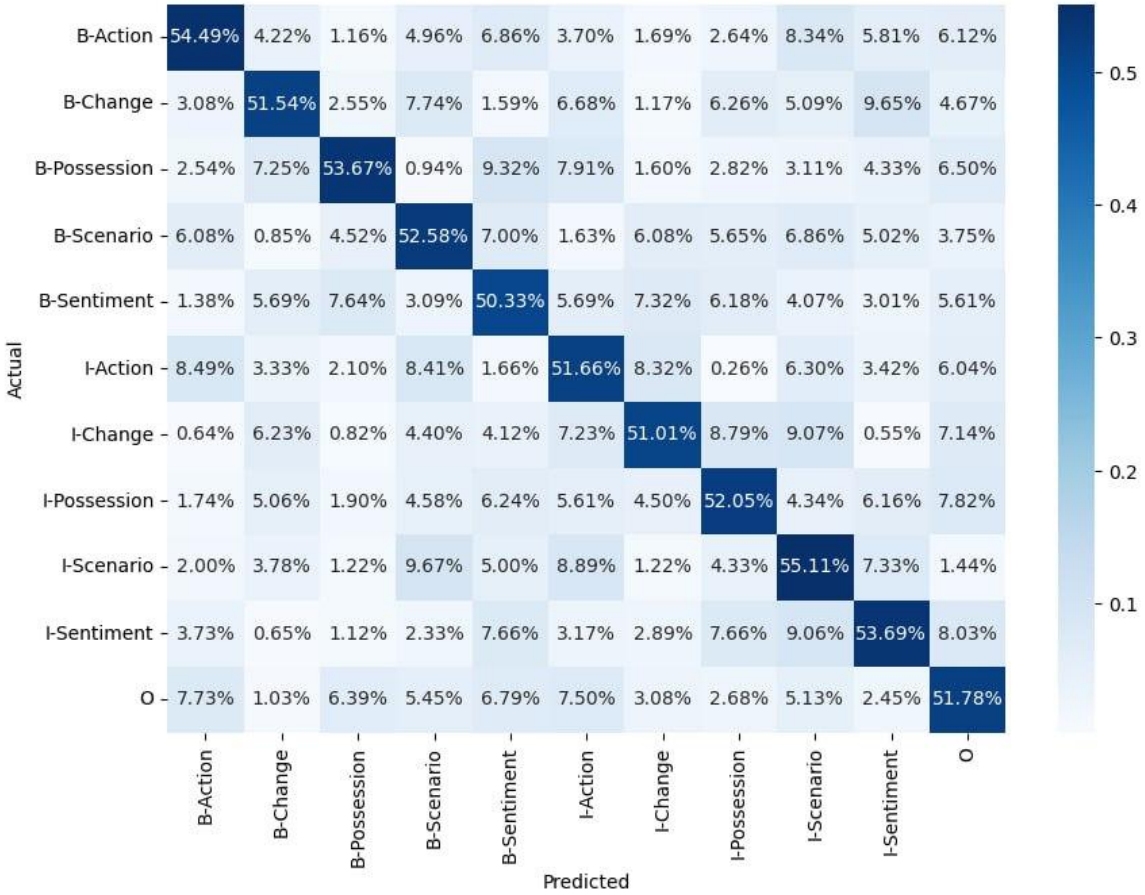
Report: dos and don’ts

- **ACL 2023 paper template**
  - Freely available: LaTeX, Word or Overleaf
  - 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**
  - Be sure to **include** and properly **comment** a confusion matrix, visualized as heat map
  - Every image and table must have a caption (don’t abuse them please :))
  - Tables and images must be referenced in the report

Confusion Matrix



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 **pseudocode** 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.

Application: what you are expected to do

Your project should conform to the following rules:

- You **MUST** use PyTorch.
  - TensorFlow and other deep learning frameworks are **NOT** allowed.
  - PyTorch Lightning is **NOT** allowed (at this stage)
- **Frameworks** that use PyTorch (e.g. AllenNLP, torchtext…) are **NOT** allowed.
- Libraries (such as tqdm, sklearn, NLTK) are fine, but since the line between a framework and a library is sometimes blurred, please ask in the Google Classroom group before using any external library: **any other** library **MUST be agreed with the TAs**.

Application: what you are not expected to do

Your project should conform to the following rules:

- **You are not allowed** to use tools/architectures that have not been explained **yet** in the course, in particular:
  - word embeddings (Word2Vec, GloVe, etc.) **are allowed**,
  - contextualized word embeddings (ELMo, etc.) **are NOT allowed**,
  - Transformer-based models (BERT, BART, RoBERTa, etc.) **are NOT 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**:

- `F1 < 0.15 => FAIL`
- `0.15 < F1 < 0.30 => 0`
- `0.30 < F1 < T2 => 1`
- `T2 < F1 < T3 => 2`
- `T3 < F1 < T4 => 3`
- `T4 < F1 < T5 => 4`
- `T5 < F1 < T6 => 5`
- `F1 > T6 => 6`

Quantitative Results

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- `F1 < 0.15` => `FAIL`
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- `T2 < F1 < T3` => `2`
- `T3 < F1 < T4` => `3`
- `T4 < F1 < T5` => `4`
- `T5 < F1 < T6` => `5`
- `F1 > 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, PoS embeddings, N-grams, char embeddings, CRF, ...
- use of NLP best practices,
- comparative analysis of results in your report,
- informative plots in your report,
- **new ideas** (including using other approaches in a clever way)

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.pt`
  - **OK:** `model/weights.pt`

Warnings

Things you should be aware of

Please be aware that

This is an **individual exercise!** 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.
- Use ChatGPT or similar systems for report writing.
- Copy from online resources (StackOverflow, GitHub, Medium, Kaggle and so on).

You are also allowed to use the **SOME** parts of the presented class notebooks. However, you **MUST** explicitly specify these parts in your code comments.

WARNING if a notebook uses torchtext or pytorch-lightning you cannot use it

Data policy

- For your experiments, **use <u>ONLY</u> the provided 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 and test for testing).
- If you train it on dev or test set, it will be a **FAIL**.

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 simple neural network, there is a good chance that adding other things won't make your model perform better
- 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: **May 1st, 2023 (Monday)**
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.

Late submission policy

Late Submission date: until **May 7th, 2023 (Wednesday)**
23:59:59 Italian time (UTC + 1)

1 point penalty will be applied for each day of delay, e.g.:

- A student delivers their homework on May 4th -> max possible grade 35 - 3 = 32
- A student delivers their homework on May 8th -> **FAIL**!

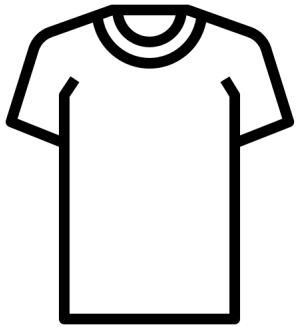
Awards

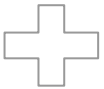
Get a **Sapienza NLP™** t-shirt

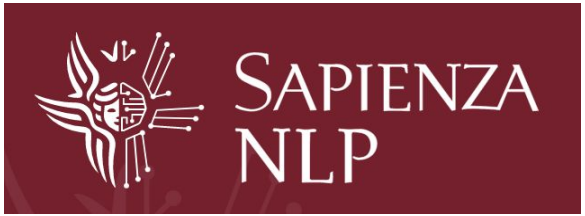
Win a Sapienza NLP t-shirt!

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 extend 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, email **ALL** of us (but please, only reach for things that can't be asked on the Google Classroom).

Our emails are:

{bonomo, ghonim, martinelli, molfese, perrella,lproietti}@diag.uniroma1.it

Good Luck!!