Argumentation Mining

Task Description

Argument/Structure Prediction

Intuitive Baseline

All teams

Use this only for the argument labels.

- Create a simple baseline based on exploratory data analysis.
    - Examine the data, e.g., labels distribution in abstracts, lexicons, etc. Utilize the insights to create a classifier that assigns labels to sentences.

1) Fasttext Approach

*You can use this for both the **argument** and the **structure** labels.*

Version 1

- Convert the dataset to the format that the fasttext model expects to read.
- Train a supervised fasttext model.
    - Experiment with the various input parameters of the model, e.g., epochs, learning rate, ngrams, vector dimensions, etc.

Version 2

- Extract context vectors (abstract, sentences) from a **pre-trained** fasttext model.
    - Input: sentence vector → MLP
    - Input: Concatenate (abstract vector, sentence vector) → MLP

2) Custom Approach

- Input: same as previous inputs (abstract, sentences) but with your own preprocessing (tokenization, lemmatization, bag of words, etc) → CNN / RNN (unimodal or multimodal models with shared embedding layer).

3) Transformer Network Approach

You can use this for the argument and for the structure labels. ***Note:*** *Only your dataset will have both structure and argument labels. You will get a dataset that doesn't has structure labels.*

Version 1

- Extract context vectors (abstract, sentences) from a transformer model. You can use the SBERT library to extract sentence embeddings. Experiment with the SPECTER model.
    - Use vectors to train a custom model

Version 2

https://huggingface.co/course/chapter3/3?fw=pt

- We will formulate the problem as a ***sentence pair*** classification task. The sentences can be combinations like the ones in the following table or any other you want to try. Two options are to approach the problem as
    - Semantic Textual Similarity
    - Natural Language Inference

Sentence 1	Sentence 2	Label
1. Always the title	**Each sentence of the abstract successively**	
Example		
Gender Differences in Anxiety and Depression before and after Alcohol Detoxification: Anxiety and Depression as Gender-Related Predictors of Relapse	Background/aims: The aim of this prospective study was to estimate gender differences in anxiety, depression, and alcohol use severity among patients with alcohol use disorder (AUD) before and after detoxification program and within 12 months after discharge.	Neither
Gender Differences in Anxiety and Depression before and after Alcohol Detoxification: Anxiety and Depression as Gender-Related Predictors of Relapse	Methods: AUD severity, state and trait anxiety, and depression were assessed in 187 patients entering an inpatient alcohol detoxification program.	Neither
...	...	...
Gender Differences in Anxiety and Depression before and after	Conclusions: In both genders, the psychopathological	Claim

Alcohol Detoxification: Anxiety and Depression as Gender-Related Predictors of Relapse	dimension that showed the most significant worsening at 6-month follow-up (i.e., anxiety in males and depression in females) was found to be a significant predictor of relapse at the 12-month follow-up.	
2. One sentence before	**Following sentence**	
Example		
Gender Differences in Anxiety and Depression before and after Alcohol Detoxification: Anxiety and Depression as Gender-Related Predictors of Relapse	Background/aims: The aim of this prospective study was to estimate gender differences in anxiety, depression, and alcohol use severity among patients with alcohol use disorder (AUD) before and after detoxification program and within 12 months after discharge.	Neither
Background/aims: The aim of this prospective study was to estimate gender differences in anxiety, depression, and alcohol use severity among patients with alcohol use disorder (AUD) before and after detoxification program and within 12 months after discharge.	Methods: AUD severity, state and trait anxiety, and depression were assessed in 187 patients entering an inpatient alcohol detoxification program.	Neither
...	...	...
Conversely, in females, depression level at the 6-month follow-up was a predictor of relapse at the 12-month follow-up.	Conclusions: In both genders, the psychopathological dimension that showed the most significant worsening at 6-month follow-up (i.e., anxiety in males and depression in females) was found to be a significant predictor of relapse at the 12-month follow-up.	Claim
3. n (n > 1) sentences before	**Following sentence**	
Example (n = 2)		
Gender Differences in Anxiety and Depression before and after Alcohol Detoxification: Anxiety and Depression as Gender-Related Predictors of Relapse	Background/aims: The aim of this prospective study was to estimate gender differences in anxiety, depression, and alcohol use severity among patients with alcohol use disorder (AUD) before and after detoxification program and within 12 months after discharge.	Neither
Gender Differences in Anxiety and Depression before and after	Methods: AUD severity, state and trait anxiety, and depression	Neither.

Alcohol Detoxification: Anxiety and Depression as Gender-Related Predictors of Relapse. Background/aims: The aim of this prospective study was to estimate gender differences in anxiety, depression, and alcohol use severity among patients with alcohol use disorder (AUD) before and after detoxification program and within 12 months after discharge.	were assessed in 187 patients entering an inpatient alcohol detoxification program.	
...	...	...
Both state and trait anxiety levels at the 6-month follow-up predicted alcohol relapse at the 12-month follow-up in males. Conversely, in females, depression level at the 6-month follow-up was a predictor of relapse at the 12-month follow-up.	Conclusions: In both genders, the psychopathological dimension that showed the most significant worsening at 6-month follow-up (i.e., anxiety in males and depression in females) was found to be a significant predictor of relapse at the 12-month follow-up.	Claim
4. The whole abstract	**Each sentence of the abstract successively**	
Example		
Gender Differences in Anxiety and Depression before and after Alcohol Detoxification: Anxiety and Depression as Gender-Related Predictors of Relapse. Background/aims: The aim of this prospective study was to estimate gender differences in anxiety, depression, and alcohol use severity among patients with alcohol use disorder (AUD) before and after detoxification program and within 12 months after discharge. … Conclusions: In both genders, the psychopathological dimension that showed the most significant worsening at 6-month follow-up (i.e., anxiety in males and depression in females) was found to be a significant predictor of relapse at the 12-month follow-up.	Background/aims: The aim of this prospective study was to estimate gender differences in anxiety, depression, and alcohol use severity among patients with alcohol use disorder (AUD) before and after detoxification program and within 12 months after discharge.	Neither
...	...	...
Gender Differences in Anxiety and Depression before and after Alcohol Detoxification: Anxiety and Depression as Gender-Related Predictors of Relapse. Background/aims: The	Conclusions: In both genders, the psychopathological dimension that showed the most significant worsening at 6-month follow-up (i.e., anxiety in males and depression in	Claim

aim of this prospective study was to estimate gender differences in anxiety, depression, and alcohol use severity among patients with alcohol use disorder (AUD) before and after detoxification program and within 12 months after discharge. … Conclusions: In both genders, the psychopathological dimension that showed the most significant worsening at 6-month follow-up (i.e., anxiety in males and depression in females) was found to be a significant predictor of relapse at the 12-month follow-up.	females) was found to be a significant predictor of relapse at the 12-month follow-up	

Citance Prediction (bonus points)

You will follow an approach similar to the Argument/Structure Prediction.

Sentence 1	Sentence 2	Label
1. The whole abstract	**Each citance successively**	
	Example	
The employment of continuous-flow platforms for synthetic chemistry is becoming increasingly popular in research and industrial environments. Integrating analytics in-line enables obtaining a large amount of information in real-time about the reaction progress, catalytic activity and stability, etc. Furthermore, it is possible to influence the reaction progress and selectivity via manual or automated feedback optimisation, thus constituting a dial-a-molecule approach employing digital synthesis.\nThis contribution gives an overview of the most significant contributions in the field to date.	In that study, both genders showed increased anxiety and depression symptoms at 6-month follow-up, with more anxiety symptoms predicting men's relapse at 12-month followup and more depression symptoms predicting women's relapse at 12-month follow-up.	Neutral
2. The Claim Sentence	**Each citance successively**	
	Example	
Conclusions: In both genders, the psychopathological dimension that showed the most significant worsening at 6-month follow-up (i.e., anxiety in males and depression in females) was found to be a significant predictor of relapse at the 12-month follow-up.	In that study, both genders showed increased anxiety and depression symptoms at 6-month follow-up, with more anxiety symptoms predicting men's relapse at 12-month followup and more depression symptoms predicting women's relapse at 12-month follow-up.	Neutral
3. The Argument (experiment with the order evidence/claim or claim/evidence)	**Each citance successively**	
	Example	
Trait anxiety and depression significantly increased 6 months after discharge in males and females respectively. Both state and trait anxiety levels at the 6-month follow-up predicted alcohol relapse at the 12-month follow-up in males. Conversely,	In that study, both genders showed increased anxiety and depression symptoms at 6-month follow-up, with more anxiety symptoms predicting men's relapse at 12-month followup and more depression symptoms predicting women's relapse at	Neutral

in females, depression level at the 6-month follow-up was a predictor of relapse at the 12-month follow-up. Conclusions: In both genders, the psychopathological dimension that showed the most significant worsening at 6-month follow-up (i.e., anxiety in males and depression in females) was found to be a significant predictor of relapse at the 12-month follow-up.	12-month follow-up.	

Abstract Clustering

Implement **one** of the following approaches.

k-Means (find the optimal number of clusters)

You will create embeddings:

- Document embeddings for the
  - Abstract;
  - Project objective (each abstract belongs to a project);
  - EU Call (each project belongs to an EU call).
- Sentence embeddings for the argument.
  - Claim only;
  - Claim and Evidence.

You can use any of the embeddings as features for the clustering.
Create clusters using

- Only DE from the abstract.
- Abstract DE and any combination of the other features (Project objective, EU Call).
- Abstract DE and any combination of the features and the argument (claim/evidence) embeddings.

Graph

- Extract argument embeddings
- Create an Undirected Graph (using NetworkX)

- For each embedding, extract top k closest arguments from other abstracts (for example check this)
- For each Ki closest distance between arguments create an Edge in this Graph between the Source Paper (abstract) ID and the target Abstract ID.
    - The edge can have as weight the sum/average/max similarity between the two Abstracts
- Extract Cliques or Communities from the Graph.