Argumentation-Driven explainable artificial intelligence for digital medicine (ANTIDOTE)

https://univ-cotedazur.eu/antidote

CALL CHIST-ERA 2019 - XAI

Coordinators:
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Consortium

Elena Cabrio, Serena Villata, Project Coordinators
Argument Mining and Generation (+ Medical school)

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Dialogues, conversational agents

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Information Extraction, Medical text mining (+ Medical school)

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Machine Learning for NLP

Marcin Lewiński
Argumentation theory

3/29/2022 CHIST-ERA Projects Seminar 2022
Motivations and objectives

• in neural architectures the correlation between internal states of the network and the justification of the network classification outcome is not well studied;

• high quality explanations are crucially based on argumentation mechanisms (e.g., provide supporting examples and rejected alternatives);

• in real settings, providing explanations is inherently an interactive process involving the system and the user.

• Focus: medical domain, where the need for high quality explanations for clinical cases deliberation is more critical than in other domains

General objective: providing a unified computational framework for jointly learning clinical predictions and the associated argumentative justifications, fostering a natural interaction with clinicians through explanatory dialogues.
Proposed methodology

We describe the case of a 21-year-old male, smoker and social drinker...

INPUT
(clinical cases)

ICD PREDICTION
MODEL

ARGUMENTATIVE EXPLANATION
MODEL

Yes indeed. Those of the microbiological culture to discriminate both cases. So, my final diagnosis is pyomyositis.

Mucormicosis can be rejected because ...

1. Deep vein thrombosis (ICD10 I80.2);
2. Erysipelas (ICD10 A46)
...7. Mucormycosis (ICD10 B46.5);
8. Pyomyositis (ICD10 M60.003);

So, do you think there should be any further test whose results should be considered?

EXPL1
EXPL2

Given the results of the blood test, can you come to any conclusion?

CLINICIAN

INTERACTION
MODEL
Y1: ongoing activities

• Collection, cleaning and structuring of **available medical resources** of diagnosis and explanations

• **Analytic statements** as argument-based explanation patterns

• **Extractive explanatory argument generation**

Clinical case: **[a 37-year-old woman is brought to the emergency department because of intermittent chest pain for 3 days].** [The pain is worse with inspiration], and she feels [she cannot take deep breaths]. [She has not had shortness of breath, palpitations, or nausea]. [She had an upper respiratory tract infection 10 days ago] and [took an over-the-counter cough suppressant and decongestant and acetaminophen]. [Her temperature is 37.2°C (98.9°F)], [pulse is 90/min], and [blood pressure is 122/70 mm Hg]. [The lungs are clear to auscultation]. [S1 and S2 are normal]. [**A rub is heard during systole**]. [There is no peripheral edema]. [An **ECG shows normal sinus rhythm and diffuse**, [upwardly concave **ST-segment elevation**] and [**PR-segment depression in leads II, III, and a VF**].

Diagnosis: the patient is showing a pericarditis **because [a rub is heard during systole]** and the ECG shows [**concave **ST-segment elevation**].
Y1: activities implemented

- PhD and Postdoc students hired by all partners
- Project meetings:
  - Kick-off meeting (23/04/2021, virtual)
  - Physical meeting (26-27 October 2021, in Nice, FR)
- Progress/Deliverables:
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