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Report: Micro-project

Project Details

Title: From statistical inference to pattern recognition

TAIGA Focus Area: Understanding AI

Start date:2024-05-01 End date: 2024-12-30

Responsible person(s):
Dr. Polina Kurtser, Department of Computing Science (from April 2024)

Dr. Cedric Patthey, Department of Diagnostics and Intervention

Summary

With advancements in pattern recognition and machine learning (ML) the clinical research field faces a major challenge in bridging the gap between established statistical inference tools and AI. Hypothesis testing in life science and clinical research answers questions like “is there a relation between a certain parameter and the outcome?”. Established statistical tools can help researchers understand new phenomena, answering questions like “is this parameter what leads to this outcome?”. In contrast, AI and ML tools are designed to learn that relation but what is learned remains hidden, since the tools are primarily designed for prediction (“here is patient data, will this treatment work?”). This gap between statistical tools and classical AI prediction models can be addressed by practices of explainable AI visualizing the underlying models learned. This will ensure better understanding and usage of AI models by clinical and life-science researchers and support better design of such tools to address research needs.

Method

The project has started with the following 3 goals:

G1: Improvement of the understanding of AI. Specifically, explore the differences between the expectations made by both researchers employing and developing "classical" AI versus capabilities required for hypothesis testing.

G2: Identification and communication of suitable explainable AI-tools, to promote better understanding and employment of AI by clinical researchers and improved understanding of the needs by AI developers.

G3: Promote interdisciplinary collaboration between researchers developing AI-tools and researchers aiming to employ these tools.

The goals have been addressed through the following methods. First, a series of bi-weekly meetings held between August-November by Polina and Cedric with the goal of understanding the data types and the statistical tools currently employed by the researchers for the proposed use-case of pancreatic cancer subtyping (Goals G1 and G2). This is the first time these two research groups have been continuingly working together on a common research question. During the meetings a common understanding was formed on the different sources of data that could be proven useful for such analysis. During these meeting G2 has been addressed in the form of mutual discussions on the limitations of AI and setting realistic expectations from such analysis and its potential. Once the kind of data required has been identified, Cedric compiled a dataset which Polina was analyzing during December 2024-January 2025 with inputs from Cedric. Finally in January 2025 a multidisciplinary seminar was held for sharing the initial results and focusing on G3 – promotion of interdisciplinary collaboration between clinical researchers and AI developers. The seminar was composed of 2 parts, the first in which we shared our initial results and the 2nd an active round table discussion to promote a similar discussion between researchers from different departments and disciplines.

Results

- Initial results are being produced and seem promising as a base for a more extensive project application to funding agencies such as the Cancerforskningsfonden i Norrland.

- There is an interest to promote a number of Msc student projects to develop further the proposed ideas.

- The multidisciplinary seminar has attracted 30 registered researchers from a variety of departments (see attached list in appendix) and including a round table discussion session where the researchers were given an opportunity to establish new multi-disciplinary collaborations.

Resource allocation

1. **Personnel costs** (inc. Overhead): 45KSek for Polina's time
2. **Material costs**: 3,063 KSek for holding a seminar (lunch expenses). Planned 5KSek but the offer was cheaper than expected.
3. **Travel costs**: 0
4. **Other costs** (specify): 0

Evaluation

In the initial project description we have planned to devote about half of our time to goals G1-G3 and half of the time to analysing the specific presented use case. As the project was financed only partially compared to the initial submission the amount of time devoted to analysing the specific use-case was limited. Nevertheless, we believe that by focusing on the general discussion of AI in biomedical research and sharing our experience during the seminar we were able to learn and share further the takeaways from establishing a new cross-departmental collaboration focusing on this subject.

Responsible person(s) Date: Jan 30th, 2025

Polina Kurtser
Cedric Patthey

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Appendix. List of registered attendees of the seminar and their affiliation

1.	Pedro Ojeda	HPC2N, UMU
2.	Sonali Ranade	UPSC, SLU
3.	Shatrudhan Palsaniya	TFE
4.	Teresa Frisan	Molecular Biology
5.	Ola Ringdahl	CS
6.	Zuzana Ontkovicova	CS
7.	Tommy Löfstedt	CS
8.	Karlo Palenzuela	CS
9.	Arzu Guneysu	CS
10.	Charlotte Häger	Community medicine and rehabilitation
11.	Canruo Chen	TFE
12.	Ahmad Abdullah Nasir	DDI
13.	Nimisha Tiwari	DDI
14.	Canruo Chen	TFE
15.	Jinyan Liu	Applied physics
16.	Azam Mahmoudi-Aznaveh	MTB
17.	Zoe Falomir	Computing Science Department
18.	Preeti Moar	Department of Clinical Microbiology
19.	Cemal Erdem	Medical Biosciences
20.	Pengju liu	TFE
21.	Bokai Liu	TFE
22.	Ou Han	TFE
23.	Brendan Michael	CS
24.	Sanjanasri	CS
25.	Disi Lin	CS
26.	Vishnu Prasoodanan	Department of Molecular Biology
27.	César Rodríguez Gallego	Department of BioMedical Sciences
28.	Zahra Kharaghani	CS
29.	Ashish sharma	UPSC
30.	Hadrien Gourlé	Klinisk mikrobiologi

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