HEALTHCARE XPLORERS
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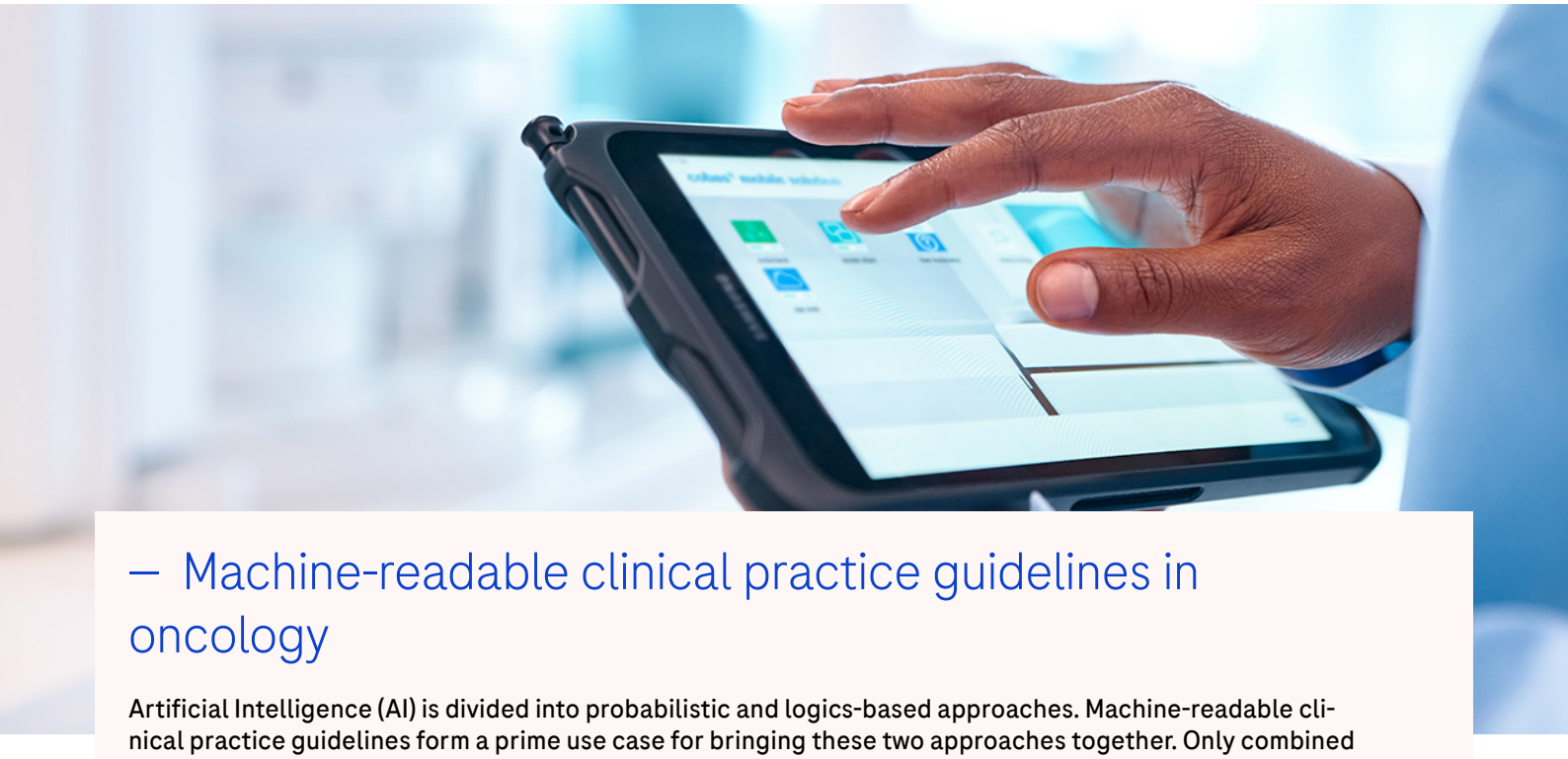

– Machine-readable clinical practice guidelines in oncology

Artificial Intelligence (AI) is divided into probabilistic and logics-based approaches. Machine-readable clinical practice guidelines form a prime use case for bringing these two approaches together. Only combined AI approaches enable us to understand, explain, and trust the hints and paths provided by the system which ultimately leads to better outcomes for patients.

Apply until **11 April 2022** / Xplorers Camp on **28 April 2022**

Question to be solved

How can we apply symbolic and sub-symbolic approaches in Artificial Intelligence for semantic parsing clinical oncology guidelines to ultimately make their contents actionable and to provide explainable decision steps?

General background

Clinical practice guidelines in oncology support doctors in their daily decision making. They include explanations and guidance along the key decision points in diagnostics and treatment options for patients with various cancer types. They are updated regularly to stay up to date with the latest research. In the US, they are published by the National Comprehensive Cancer Network – traditionally targeted towards a human audience.

Making these guidelines machine-processable, hence interpretable, and bringing them together with patient data can result in valuable outcomes. As a result, clinical decision-making can become more efficient and clinical algorithms can provide enhanced and more efficient clinical insights. However, it is currently unclear to which degree these clinical guidelines can be represented as a computational rule-based system and to which extent probabilistic interpretation needs to be incorporated. The definitive goal is to unlock the contents of the guidelines by applying rule-based and probabilistic methods with explainable processing steps (e.g. by using methods from explainable AI – xAI) so that a comparison to the patient's clinical record becomes possible.

Data types & technologies

- Unstructured and semi-structured data
- Natural Language Processing in particular parsing and named entity recognition
- Semantics and data modeling, machine learning
- Decision nodes paraphrased in natural language
- Non-strict relative order of possible events/decisions

- (Simulated) patients bring “axioms” clinical guidelines bring the “rule system” (neither the axioms nor the rules are static over the time dimension)n

Supporting material or links

The following concepts shall only serve as a starting point for the project but should not narrow it down:

- Computational logics and rule-based system/languages
- Constraint-based systems
- Configuration management
- Business Process Modeling Notation and according reasoning
- Natural Language Processing
- Fuzzy logic
- Explainable AI
- https://www.nccn.org/guidelines

Needed skills

- Good analytical/mathematical thinking
- Solid understanding of the declarative programming paradigm (logics, functional)
- Programming and data modeling skills (e.g. Python, RDF)
- At least on Master student level in quantitative science like computer science, computational logics, computational linguistics, mathematics, or statistics

Mentor

Dr. Ole Eigenbrod
Semantic Data Integration Scientist, Roche Information Solutions

Form of cooperation

Preferred scale: 6 months full-time internshipp
Possible format: Full-time internship, with potential to develop into Master Thesis or part of PhD research project

How to present your idea

Show us how you would approach the problem in 3 to 5 slides. We do not expect a bullet-proof solution to the problem. Be as creative as possible – Be aware you only have 10 minutes to sell your idea.