SUCCESS STORY 2019

CBmed GmbH
Austrian COMET K1 Center for Biomarker Research

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CLINICAL DOCUMENT PROCESSING FOR BIOMARKER RESEARCH

DBM4PM AIMS FOR STANDARDIZED ONCOLOGY PATIENT PROFILES TO SUPPORT DECISION MAKING FOR PRECISION MEDICINE.

The CBmed project DBM4PM (Digital Biomarkers for Precision Medicine) builds upon the project **Innovative Use of Information for Clinical Care and Biomarker Research** (IICCAB), which was a crucial achievement of the first CBmed funding period which resulted in a clinical document processing solution. This so-called NLP (natural language processing) pipeline is tailored to clinical narratives from the Styrian hospital network KAGes, from which it extracts meaningful pieces of information, so-called "digital biomarkers" (mention of diseases, phenotypes, risk factors, scores, drugs in electronic health records) in a standardised form. The use of international terminology standards like SNOMED CT is a central asset.

NLP technology addresses the problem that large parts of clinical information are locked within free text, whereas precision medicine increasingly relies on the re-use of real-world clinical data for research and clinical care.

For the current funding period, Roche Diagnostics joined the project team as an industry partner. Roche acts as a provider of NAVIFY®, a platform for tumour boards. Tumour boards are meetings where clinicians review a tumour patient and determine the best treatment strategy. They crucially depend on an optimised, structured and selected presentation of decision-relevant facts about a tumour patient.

In contrast to proof-read publications, clinical narratives abound of specific language phenomena such as ambiguous acronyms and abbreviations, but also typing mistakes, negations or non-standardized numeric expressions. Clinical text is also characterised by sublanguages that are specific to professional groups, institutions, geographic regions and clinical specialties. All these aspects pose special challenges for adapting existing NLP solutions or implementing specialized information extraction modules for clinical narrative content. Here, our technology comes into play.

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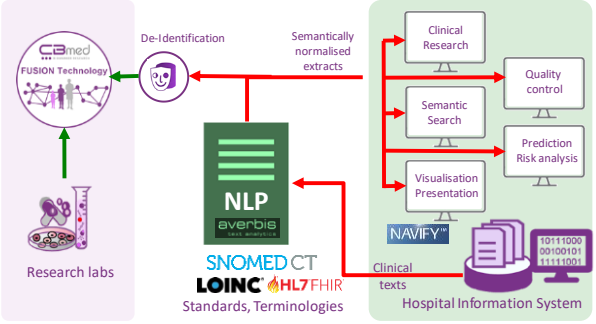

Figure 1. Clinical NLP as a service for research and development.

DBM4PM applies a combination of rule-based and machine learning methods with the goal to produce structured, interoperable profiles for oncology patients. For both strategies, access to a critical mass of de-identified and annotated training is crucial, e.g. for learning contextualized word embeddings and language models which support specific NLP and information extraction tasks. Exploiting these methods in combination with knowledge resources such as controlled vocabularies, terminologies and ontologies, e.g. the international terminology standard SNOMED CT, we are aiming at re-usable structured patient profiles for improved clinical data use in research and clinical care.

Impact and effects

Based on the work of the first funding period a basic information extraction toolbox, optimized for clinical narrative content in German language, is now being extended, with a special focus on information items that support information retrieval, presentation and visualization for tumour boards. It is being developed and tested in close cooperation with Roche DIS using NAVIFY® with the aim to optimise cancer treatment by improved clinical decisions. The computer-based re-structuring of raw clinical data constitutes an important step towards the application of FAIR (Findable, Accessible, Interoperable and Reusable) criteria, with an impact beyond the tumour board use case.

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