Invitation to the Oral Examination – Department Computer Science

For the occasion of his/her examination for a Doctoral Degree,

Mr. Florian Leiser

will present his dissertation entitled

“Improving Human-Centered Medical Machine Learning Through Knowledge Inclusion and Hallucination Mitigation”

on **30.04.2026** at **14:00 h (2:00 pm)**

Attendance to the presentation is open to the public. The presentation will be in English.

The candidate, all members of the Examination Committee, and authorized examiners of the TUM School of CIT are invited to the presentation and subsequent oral examination.

The presentation and subsequent examination will take place in room **A.01.100, first floor, Hip building, Edisonstraße 15, 74076 Heilbronn**.

Examination committee:

Chair: **Prof. Dr. rer. nat. Luise Pufahl**

First Examiner: **Prof. Dr. rer. nat. Ali Sunyaev**

Second Examiner: **Prof. Ph.D. Chunyang Chen**

Heilbronn, the **25th of March 2026**

Mailing list:

Members of the examination committee

Doctoral candidate

Abstract:

With the ever-increasing data availability, artificial intelligence (AI) agents and machine learning (ML) models are employed across all domains, including high-risk sectors like medicine. In these high-risk

sectors, AI agents need to balance performance, fairness, and privacy. To achieve this balance, high levels of human control and of computational automation are required, resulting in human-centered AI agents. However, the perspectives of multiple stakeholder groups differ when developing domain-specific ML models. For example, domain experts have knowledge that can help ML models in their assessment and improve predictive performance. User desires should be leveraged early in the design to inform ML model development. Researchers might focus on performance instead of other human-centered perspectives like explainability when developing novel ML models.

Following the human-centered design perspective, this dissertation sheds light on the perspectives of multiple stakeholder groups including domain experts, users, developers, and researchers for improving human-centered ML models in medicine. To that end, this publication-based dissertation includes seven research articles to gain a comprehensive by following a multi-method research design. Across the seven articles, I turn to qualitative research methods like think-aloud and interviews, user studies like participatory design and Wizard-of-Oz studies, and to literature-informed development of artifacts.

From an expert perspective, I investigate how the available medical domain knowledge can be leveraged in ML models building on concepts of hybrid intelligence and informed ML. To that end, research articles I, II, and III investigate what types of knowledge are incorporated in medical ML models, how domain experts come to their conclusions, and how different knowledge sources impact the predictive performance of ML models. From a user perspective, I turn to user studies and extract user desires for mitigating the effects of incorrect predictions in ML in research articles IV and V. Research article V also builds on the developer perspective by instantiating a prototypical hallucination identifier. This prototype is again extended in research article VI by providing personalized explanations. Research article VII provides a perspective on how researchers use emerging ML models like large language models in medicine.

Based on the findings in the seven research articles, this dissertation contributes to an improved development of human-centered ML models in medicine. By investigating the medical sector, this dissertation sheds light on domain-specific constraints for humancentered ML and the relevance of including multiple stakeholders in the development of ML models. Highlighting the benefits that experts, users, and developers bring to the table, this dissertation strengthens the collaborative perspective when developing ML models.