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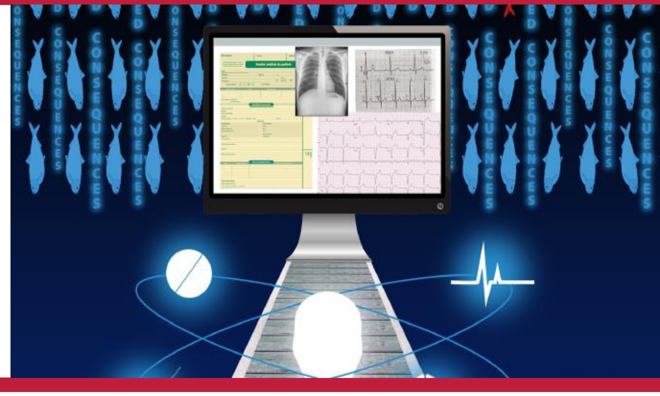

Ringvorlesung Medizinische Informatik

Time-frequency analysis of optical and electrical cardiac signals with applications in ultra-high-field magnetic resonance imaging

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Since the advent of magnetic resonance imaging (MRI) in clinical applications in the 1980s, it has evolved into a powerful imaging modality with particular value in soft tissue. The increasing number of scanners installed worldwide is accompied by a trend towards higher magnetic field strengths which is motivated by the demand for higher spatial resolution and higher temporal resolution. At the moment, there are approximately 70 “ultra-high-field” scanners with field strengths ≥7T.

However, the increased field strength introduces challenges, such as an increased risk of tissue heating, increased susceptibility to artifacts, or unpleasant biological side-effects such as dizziness. Another effect is the distortion of electrocardiography (ECG) acquisition due to the magnetohydrodynamic effect. It results in voltages superimposing the measured signal which impedes the usefulness of ECG for cardiac monitoring and MRI triggering severely.

In this talk, I will give an overview of two research projects for enabling accurate cardiac assessment despite high magnetic fields. The first project aims for evaluating to what extend the principle of photoplethysmography imaging (PPGi) can be applied within the MRI environment. The second project aims for developing robust algorithms for extracting information from ECG signals despite the magnetohydrodynamic effect.

Nicolai Spicher is a research assistant at the department of Computer Science at University of Applied Sciences and Arts Dortmund. Beforehand he finished his B.Sc. and M.Sc. in Medical Informatics at University of Applied Sciences and Arts Dortmund.

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