Data-driven Surrogate Model Generation for Automated Directional Drilling

Baker Hughes

TECHNISCHE UNIVERSITÄT DARMSTADT

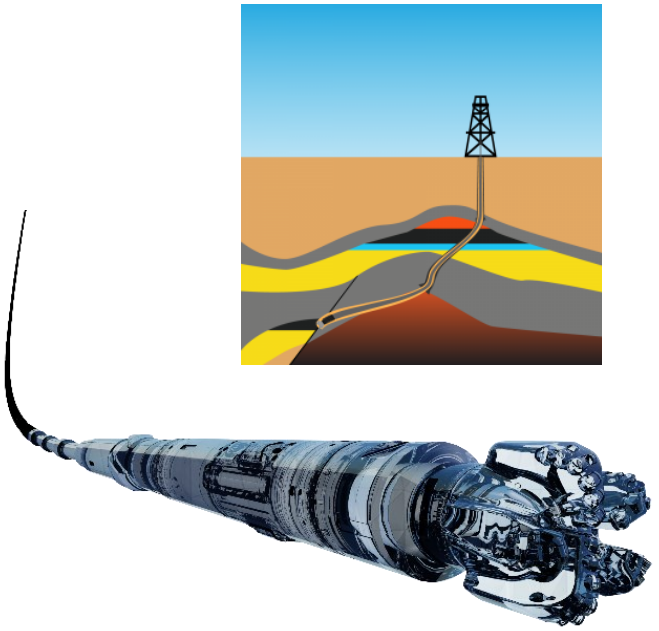
Proposal for a Master‘s Thesis Topic

Directional drilling is the art and science of steering a downhole assembly to adhere to a predefined 3d trajectory. Since the drilling industry increasingly moves towards full automation for safety, consistency, and cost reduction, an adequate drilling model is essential for automatic control at the surface drilling rig. The complexity of the drilling system necessitates the consideration of data-driven approaches, utilizing two types of data sources: a low-fidelity drilling simulation and real-world wellbore data, affected by noise and outliers.

This project entails a literature review on automated directional drilling and relevant machine learning techniques, focusing on (multi-fidelity) Gaussian processes. Subsequently, these techniques will be used to generate a data-driven surrogate drilling model for surface input control. While initial work can be conducted using the drilling simulation, at later stages real-world data are to be incorporated while addressing challenges such as noisy data and outlier detection. Ultimately, the objective is to construct a (multi-fidelity) surrogate drilling model leveraging both data sources effectively.

The project can be done in English or German, but proficient English skills are required. Background knowledge in control engineering and machine learning techniques, particularly Gaussian processes, are necessary alongside experience in MATLAB/Simulink and/or Python for algorithmic implementation. If you have any questions, feel free to contact us.

This project is done in cooperation with the Baker Hughes Company.





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CCPS Control and Cyber-Physical Systems