Motivation:
A novel FMCW radar principle operates without an explicit local oscillator signal in the receiver, but relies on self-mixing of the receiver. Thus, the receiver is electrically, as well as locally completely independent from the transmitter. In contrast to common radars, the information gained is not the absolute distance to the target object, but the relative distance between multiple surfaces. This allows numerous potential applications, particularly in the fields of production engineering, medicine, materials analysis and safety.

Goals:
Covered by the project MIRADOR (Self-mixing millimeter-wave radar based on multiple surface reflections) and in possible collaboration with Balluff GmbH, a digital signal processing (DSP) for a self-mixing radar based on FPGA should be developed.

- ADC and FPGA-based signal acquisition
- Implementation of DSP algorithms for processing relative distance information from a self-mixing mono or bistatic radar
- Real-time or quasi-real-time DSP
- Miniaturization towards handheld radar demonstrator solution (not part of this work)

Your possible Tasks (*):
- Investigate State-Of-The-Art Radar Signal Processing and understand the theoretical background
- Programming of FPGA and implement DSP
- Debugging and characterization with generic and real-life radar data
- Design of an interface / data display for demonstration purposes
- Examine possibilities to embed the FPGA-based DSP in a handheld radar demonstrator platform

Your Qualifications:
- Hands-on experience in developing FPGA algorithms
- Familiar with software development: VHDL and/or Verilog, Xilinx Vivado
- Passion for producing high quality DPS algorithms for challenging requirements with eventually limited space and power constraints
- Knowledge of Radar Signal Processing fundamentals is advantageous

Language: German/English
*Parts of the work can and will be split into suitable amounts for research-work/BA/MA topics