

# Development of a software library to support heterogeneous implementations in mixed-criticality systems

Bachelor Thesis

## Research field

Mixed-criticality systems are of central importance for safety-critical applications such as aviation, autonomous driving, and medical technology. In these systems, software components have different levels of criticality and thus different requirements in terms of safety, real-time capability, and reliability. Design Space Exploration (DSE) is frequently used to analyze hardware mapping in this area. Applications and hardware platforms are modeled so that optimization algorithms can determine a suitable mapping. However, existing approaches often consider only individual platforms or implementations, which means that a suitable solution is not always found. As part of the research conducted at this chair, a DSE method is therefore being developed that supports different platforms and implementation approaches to enable more flexible and robust solutions for mixed-criticality systems.

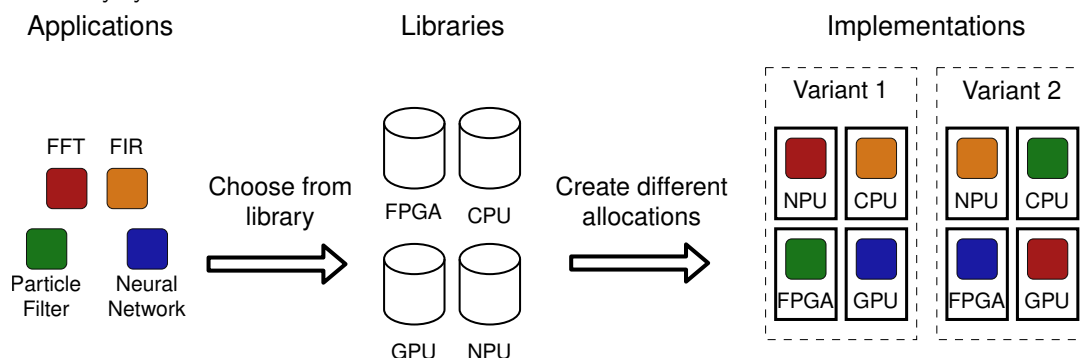


Figure 1: Example applications can be implemented directly over the libraries

## Research topics

The goal of this thesis is to design and prototypically implement a software library that contains different implementation approaches for the same application across various hardware platforms and allows them to be selected via a unified interface. The library is intended to serve as a foundation for future DSE methods capable of accommodating heterogeneous platforms and various implementation variants in mixed-criticality systems. As part of this work, selected applications will first be implemented on different hardware platforms such as CPUs, GPUs, or FPGAs. Subsequently, a suitable interface will be developed to unify these implementations and enable their shared use. If you are interested, please feel free to contact me for a more detailed discussion!

## Skills

Required:

- Knowledge in C++ or Python

Desired:

- Basic knowledge of Vivado
- Knowledge of FPGAs, GPUs, and NPUs

## Contact



Vincent Sprave  
vincent.sprave@ovgu.de  
G03-318



Scan the QR Code for  
Link to the Website