Section for Software Systems Engineering at DTU Compute

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Software is an essential component of the digitalization of society, and its role is becoming increasingly critical.

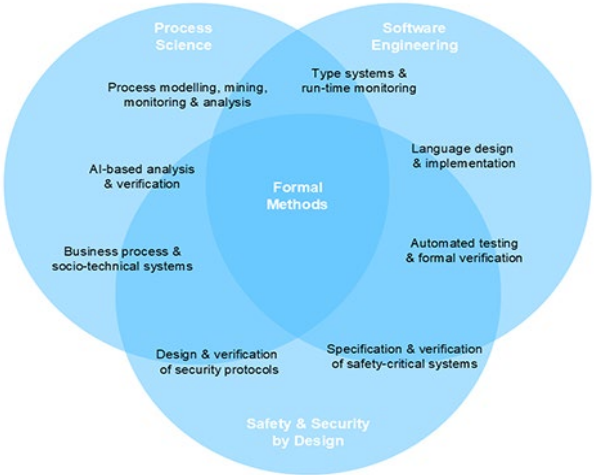
Our digital society needs software that is reliable, built on scientific and engineering principles, and aligned with societal values and expectations.

The section for Software Systems Engineering (SSE) advances and combines applied and foundational research in **Software Engineering, Process Science,** and **Safe and Secure by Design.**

We address security and formal methods to tackle current and future scientific and societal challenges.

We educate new generations of scientists and engineers in the foundations and in the state-of-the-art methods to build high-quality software systems.

And we share our expertise with scientists, researchers, educators, practitioners, and decision-makers.



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Software Engineering

Software Engineering is a broad field encompassing disciplines ranging from designing guidelines for code development, to building tools that validate and verify the software produced.

In SSE, we work on pushing the boundaries in every direction, from using program types to verify distributed processes and automatically generating and minimizing tests for programs, to asking fundamental questions about what code quality is in the age of generative AI.

Process Science

Should you add a new software/AI/technology component to your organisations?

The first rule of any technology used in a business is that automation applied to an efficient operation will magnify tits efficiency.

The second is that automation applied to an inefficient operation will magnify its inefficiency.

Process Science studies the nature of processes in the real world: how they are designed, executed, and how they evolve in a changing world.

For organisations, process science equips them with tools to understand behaviours across siloed departments, identify bottlenecks, and detect compliance violations.

Process analysis helps identify improvements and automation opportunities to achieve business goals.

At runtime, process engines integrate human and software components, so they comply with specifications.

Process streaming techniques help organisations with early error detection and recovery strategies.

Finally, process management gives insights into how process changes can be adopted by the organisation’s workforce.

Within the section, we have solid foundational and technical expertise covering the Process Science field in full, and we collaborate with both public and private organisations to improve their processes.

Safe and Secure by Design

IT systems have an impact or direct control over most aspects of everyone's lives.

Reactionary strategies – fixing what breaks down – is a luxury of the past.

Software systems must be robust, resilient, and free of errors from the drawing-board onwards.

This entails serious endeavour from society and authorities, who must guarantee the minimisation of software faults and the suppression of, and recovery from, cyberattacks.

For these goals, we pioneer safety and security research for the crucial early stages of IT systems design.

We devise formal languages, techniques, and tools, for the specification, modelling, analysis, and verification of software during all stages of its development.

Examples of our formal methods include compositional reasoning, model checking, theorem proving, rare event simulation, fault- and attack-tree analysis.

We apply and adapt our research to safety- and security-critical systems such as railway control, security protocols, and cyberattack kill-chains.

Our collaboration with industry provides solutions to real-world problems, also finding and fixing serious vulnerabilities and flaws.

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