

# DISTRIBUTED, EMBEDDED AND INTELLIGENT SYSTEMS



## THE DEIS GROUP AT AALBORG UNIVERSITY

DEPARTMENT OF COMPUTER SCIENCE  
TECHNICAL FACULTY OF IT AND DESIGN

The group covers mathematical foundation, verification tools, validation methodologies, probabilistic graphical models and machine learning focusing on distributed, embedded and intelligent systems.

## RESEARCH

### KEY RESEARCH AREAS

The DEIS research group targets the overall challenges:

- › Mathematical and logical theory for modelling and specifying concurrent processes, including quantitative and security aspects
- › Tools, algorithms and datastructures for model checking, performance analysis and synthesis for complex systems
- › Model-based methodologies for embedded and cyber-physical systems
- › Analysis and construction of services and protocols for networks
- › Inference and learning of probabilistic graphical models
- › Machine learning using statistical as well as logic and relational-based methods
- › Applications in a variety of domains, including transport, energy, water-management, and health

## EDUCATION

### STUDY RELATED ACTIVITIES

The DEIS staff teaches 15-20 courses including mathematical foundations, distributed and embedded systems, machine learning and several MSc specialization courses.

DEIS staff also organizes several PhD courses, e.g. on model-checking and machine learning.

## COLLABORATION

### WHO BENEFITS FROM OUR RESEARCH

Our research benefits companies and organizations that work with safety critical software systems where requirements on monitorability, predictability, security as well as safe and intelligent decision making are crucial. The several academic and industrial users of our world-class tools, e.g. [UPPAAL](#) and [TAPAAL](#), benefit.

### EXAMPLE PARTNERS

INRIA Rennes, TU Wien, TU Eindhoven, Strathclyde University, Oxford University, Northeastern University, Trento University, NTNU, Grundfos, City of Aalborg, Aarhus Vand, Huawei, Nilfisk, Neocortec, ATS, Ambolt, Neogrid, Har-di, Seluxit, GOMSpace.

## PUBLICATIONS

### IMPORTANT PUBLICATIONS

- › [Probabilistic Bisimilarity Distances for Probabilistic Automata](#)
- › [Abstract Dependency Graphs and Their Application to Model Checking](#)
- › [Uppaal Stratego](#)
- › [20 Years of Real Real Time Model Validation](#)
- › [P-Rex: Fast Verification of MPLS Networks with Multiple Link Failures](#)
- › [Online Learning of Controllers with Application to Floor Heating](#)
- › [AMIDST: toolbox for scalable probabilistic machine learning](#)



**AALBORG UNIVERSITY**  
DENMARK

## KEY PROJECTS

### LASSO

ERC Advanced Grant on Learning, Analysis, Synthesis and Optimization for CPS.

### DICYPS

Center for data-intensive cyber-physical systems.

### DONUT

Innovation Fund Denmark Grand Solution on online monitoring of urban water.

### CLAIRE

Villum-Synergy project on Intelligent Water Management.

### BE0-COVID

Poul Due Jensen Foundation project on evaluation and optimization of measures against COVID-19.

### MULTICORE SAFETY, QASNET

DFF projects on embedded safety and software defined networks.

### INFINIT

Danish Innovation Network on ICT.

## VIDEO PRESENTATION



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