

Profile

The interdisciplinary research focus of the Faculty of Computer Science and Electrical Engineering was founded in 2003 and consists of two research groups:

“Computer-aided Intelligence”

Head: Prof. Dr. rer. nat. Martin Golz

“Embedded diagnostic systems”

Head: Prof. Dr.-Ing. Andreas Wenzel

Previous research projects were dedicated to a wide range of tasks in the data and signal analysis and pattern recognition in medical and technical fields of application. In addition, various problem-specific software and hardware solutions have been developed. The research focus operates five laboratories where scientific studies can be made. The reference projects listed show the range of recent activities.

Research Areas

- Sensor Signal and Biosignal Analysis
- Image, Video and Audio Analysis
- Pattern Recognition: Classification, Cluster Analysis, Approximation, Prognosis
- Non-linear Optimisation
- Knowledge Representation, Expert Systems
- Data Mining, Big Data
- Data Visualisation
- Modelling and Simulation
- Embedded Systems, Embedded Intelligence

Contact

Research Focus
Adaptive Signal Analysis

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Staff and facilities

- 2 Professors
- 5 Doctoral candidates
- 2 Scientific staff
- 3 Post-Doc staff
- 2 Laboratory engineers
- Students, Interns

1. Laboratory for “Embedded Systems & Mobile Computing”
Hardware and software development for embedded systems
2. Laboratory for “Experimental signal analysis and pattern recognition”
Analysis / characterization of biological and technical signals
3. Laboratory for “Human factors: Driving simulation”
Studies on sustained attention of drivers; device tests
4. Laboratory for “Human factors: Usability / Eyetracking”
Suitability of user interfaces; gaze tracking
5. Laboratory for “Human factors: Vigilance tests”
Studies on vigilance and distraction; test comparisons

Transfer projects

- Characterisation of vehicle dynamics
Adaptive pattern recognition, sensor signal processing, expert system, validation
Clients and Partners: a medium-sized business
- Remote diagnostics of a compact water treatment plant
Prognosis, pattern recognition, embedded systems, modelling and simulation
Client: Federal Ministry for Economics and Technology
Partner: Three medium-sized enterprises, a research facility
- Mobile data collection for a purchasing system
Mobile computing, user interface, database systems
Clients and Partners: a medium-sized business
- Analysis of vehicle tracking based on outside camera recordings
Video analysis, pattern recognition, mobile computing
Clients and Partners: a medium-sized business, Singapur
- Surface and imprint inspection at production speed
Industrial image processing and real-time pattern recognition
Client: Federal Ministry for Economics and Technology
Partner: Two medium-sized enterprises, a research facility
- Optimisation of routing in transport infrastructure planning
Computer graphic modelling, non-linear and multi-criteria optimisation
Client: Federal Ministry for Economics and Technology
Partner: a medium-sized business
- Error diagnosis in a vehicle database
Big Data, Data Mining, Multi-classifiers, expert system
Clients and Partners: a medium-sized business

“Human Factors” research projects

- Analysis of biosignals at high driver fatigue
Biosignal processing, pattern recognition, computer-aided intelligence
Client: Federal Ministry of Education and Research
Partner: Two research institutions, a medium sized company, USA
- Development of a oculomotor vigilance test
Biosignal processing, pattern recognition, computer-aided intelligence
No client (self-financed)
Partner: A research facility
- Modelling of light influence on the circadian rhythm
Modelling and simulation, non-linear optimisation
No client (self-financed)
No partner
- Cardiovascular dynamics in several days of laboratory experiments
Biosignal processing, pattern recognition, computer-aided intelligence
No client (self-financed)
No partner
- Diagnostic support of fall risk of senior citizens
Posturography, gait analysis, biosignal processing, computer-aided Intelligence
No client (self-financed)
Partner: two research facilities
- Phonetic analysis for the assessment of human factors
Audio signal collection and analysis, pattern recognition, computer-aided Intelligence
No client (self-financed)
Partner: A research facility
- Analysis, optimisation and evaluation of layer deployment plans
Integer linear optimisation, evolutionary strategies
Clients and Partners: a medium-sized business, USA
- Recognition of driver's condition based on driving data
Adaptive signal processing, pattern recognition, computer-aided intelligence
Clients and Partners: a medium-sized business

Research projects

- Evaluation of driver assistance systems
Driving simulation, adaptive data analysis, expert rating, neurophysiological reference standard
Clients and Partners: Large enterprise, USA
- Innovative paradigms transfer in road construction
Computer graphic modelling and driving simulation, adaptive data analysis
Client: Federal Ministry of Traffic, Construction and City Development
Partner: Two medium-sized enterprises, a university institute, a University of Applied Sciences
- Detection of faults in fibre optic signals
Correlated, optical time domain reflectometry, adaptive pattern recognition, validation analysis
Clients and Partners: a medium-sized business
- Vehicle detection with a geomagnetic sensor
Sensor signal processing, pattern recognition, validation analysis, embedded systems
Clients and Partners: a medium-sized business

“Embedded diagnostic systems” project

- Research Group for Flexible Manufacturing Technologies (Power Moulds):
Condition diagnostics in injection moulding dies using embedded systems
- Automatic classification of sleep and anaesthesia EEG through self-learning processes
Polygraphics recording technique in the laboratory
“Experimental Signal Analysis”
- Model-based software design of an optimised control system for small electric drives
- Design and development of embedded test software for ultrasound therapy device
- Development of a module for expanding EEG classification for therapy support (Biostress)