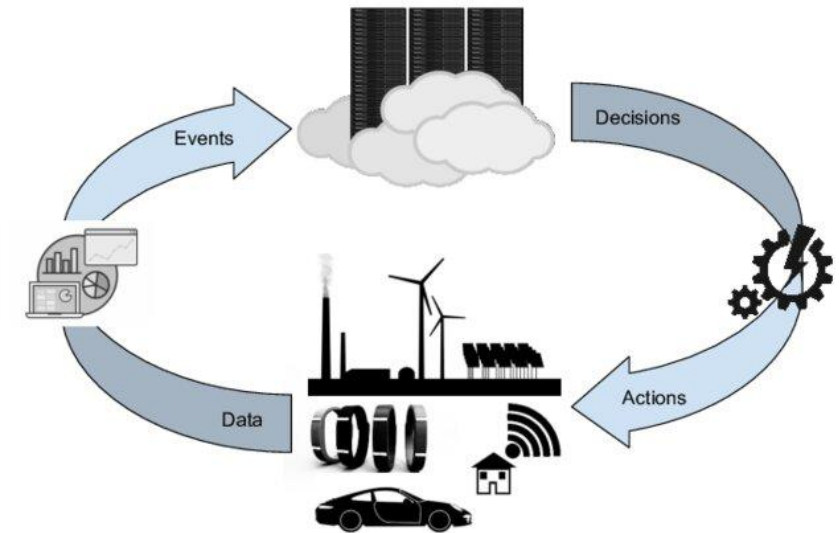


Study programs: Technische Kybernetik – Engineering Cybernetics

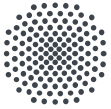
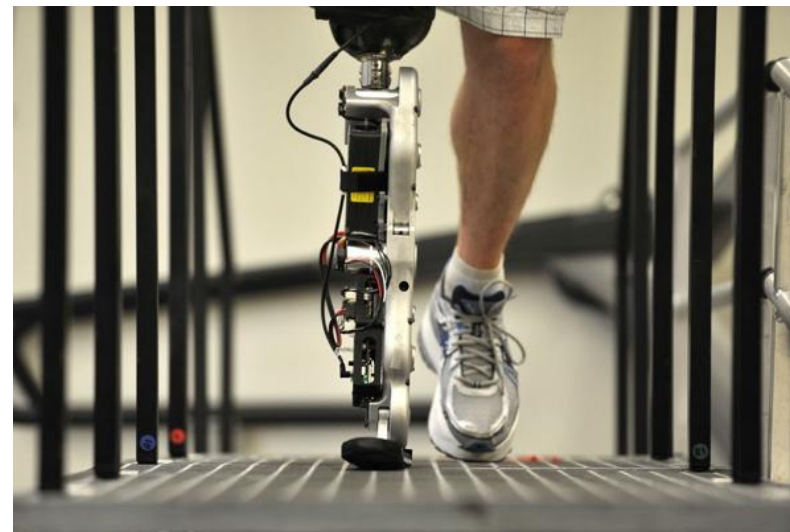
Autonome Systeme und Regelungstechnik - Autonomous Systems and Control

Presentation of the specialization
07/10/2026

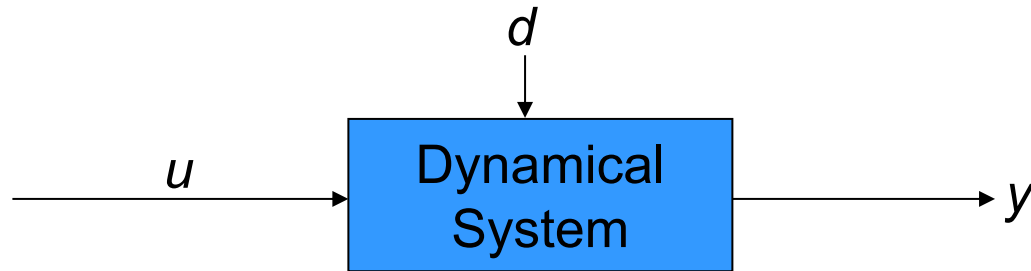


Prof. Dr.-Ing. Frank Allgöwer – Jun. Prof. Dr. Andrea Iannelli
Institute for Systems Theory and Automatic Control (IST)





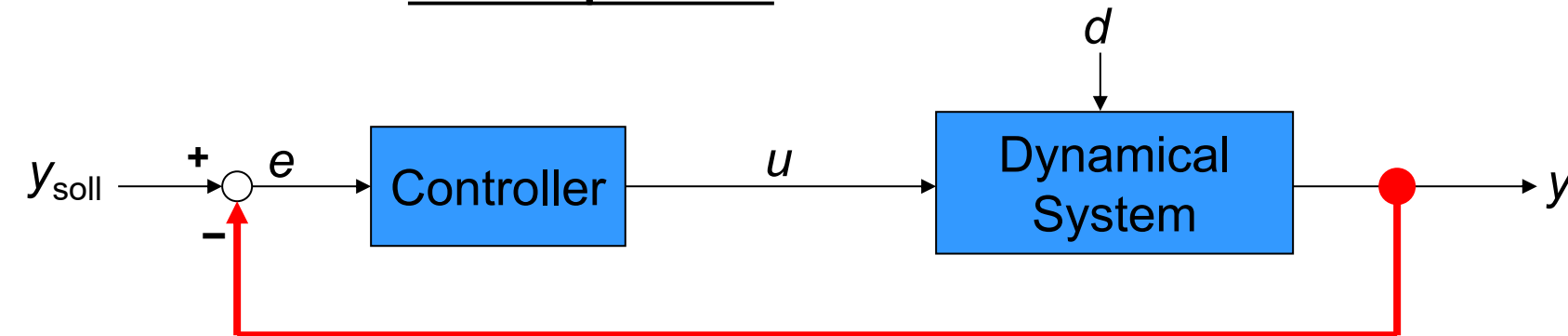
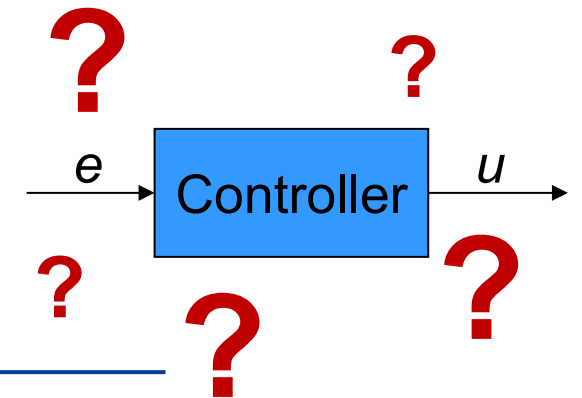
What enables them?

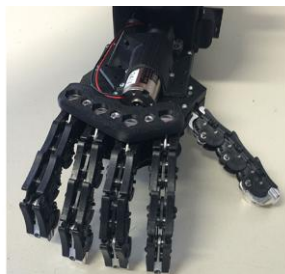
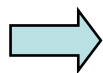


Forward problem: find output y for given input u ?

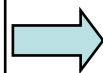
How to solve the
inverse problem?

Cybernetics:
the science of feedback

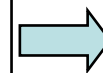




$$\begin{aligned}\dot{x} &= f(x, u) \\ y &= h(x, u)\end{aligned}$$



$$u = k(x)$$



Real System (uncontrolled)

**Mathematical
model**

Controller

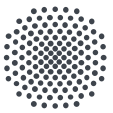
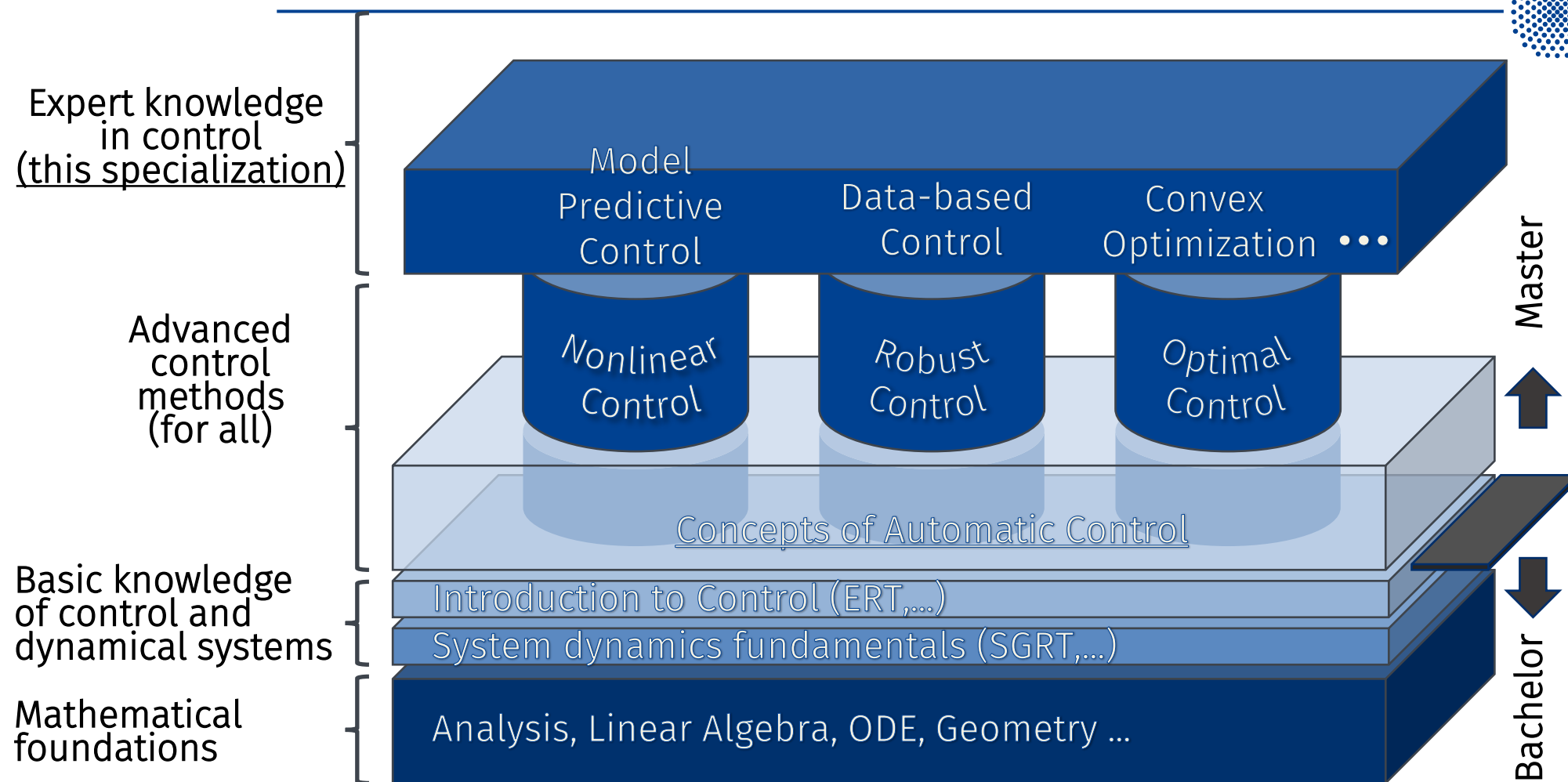
Controlled system

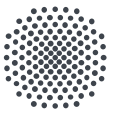
Modelling

Control design

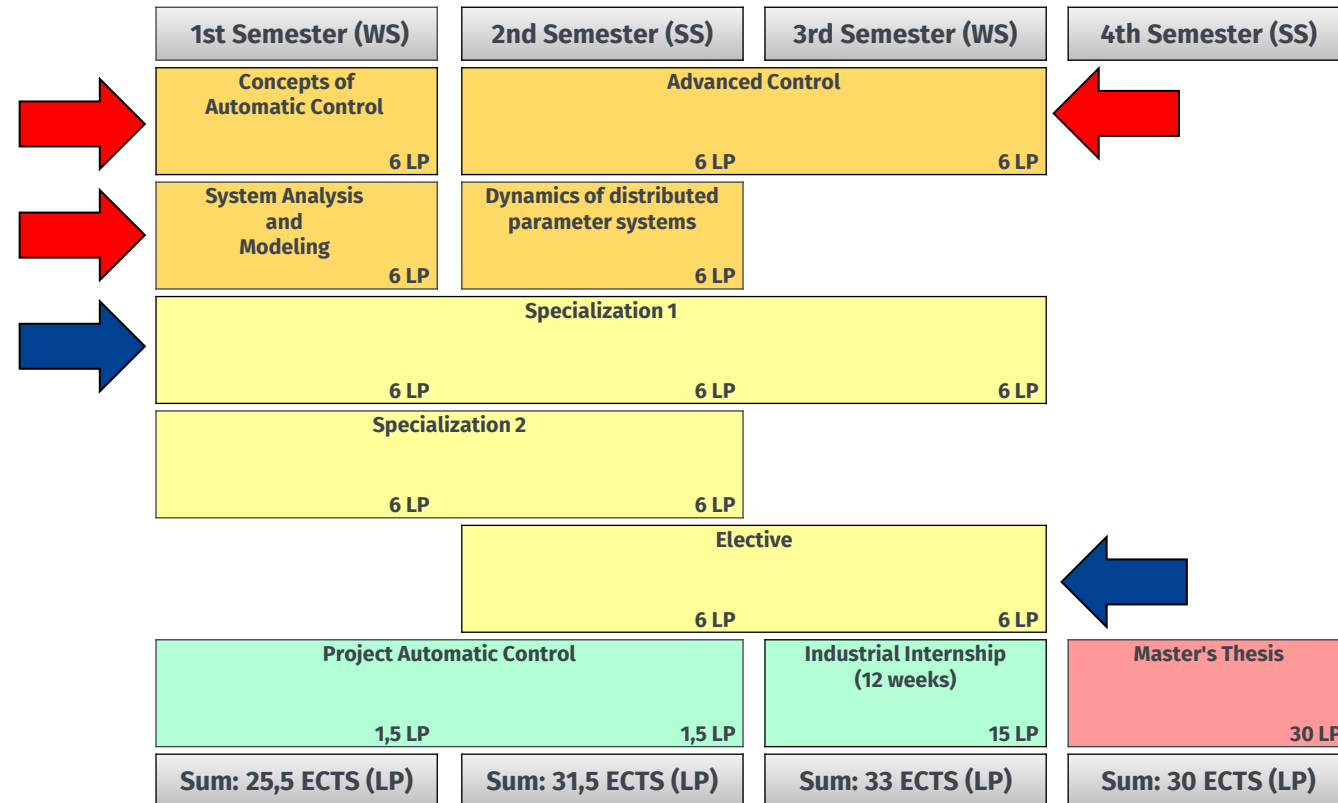
Implementation

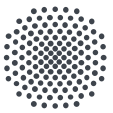
The focus of the specialization is on system-theoretical
analysis and controller design (ABSTRACTION).





Exemplary timeline

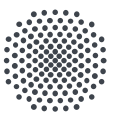




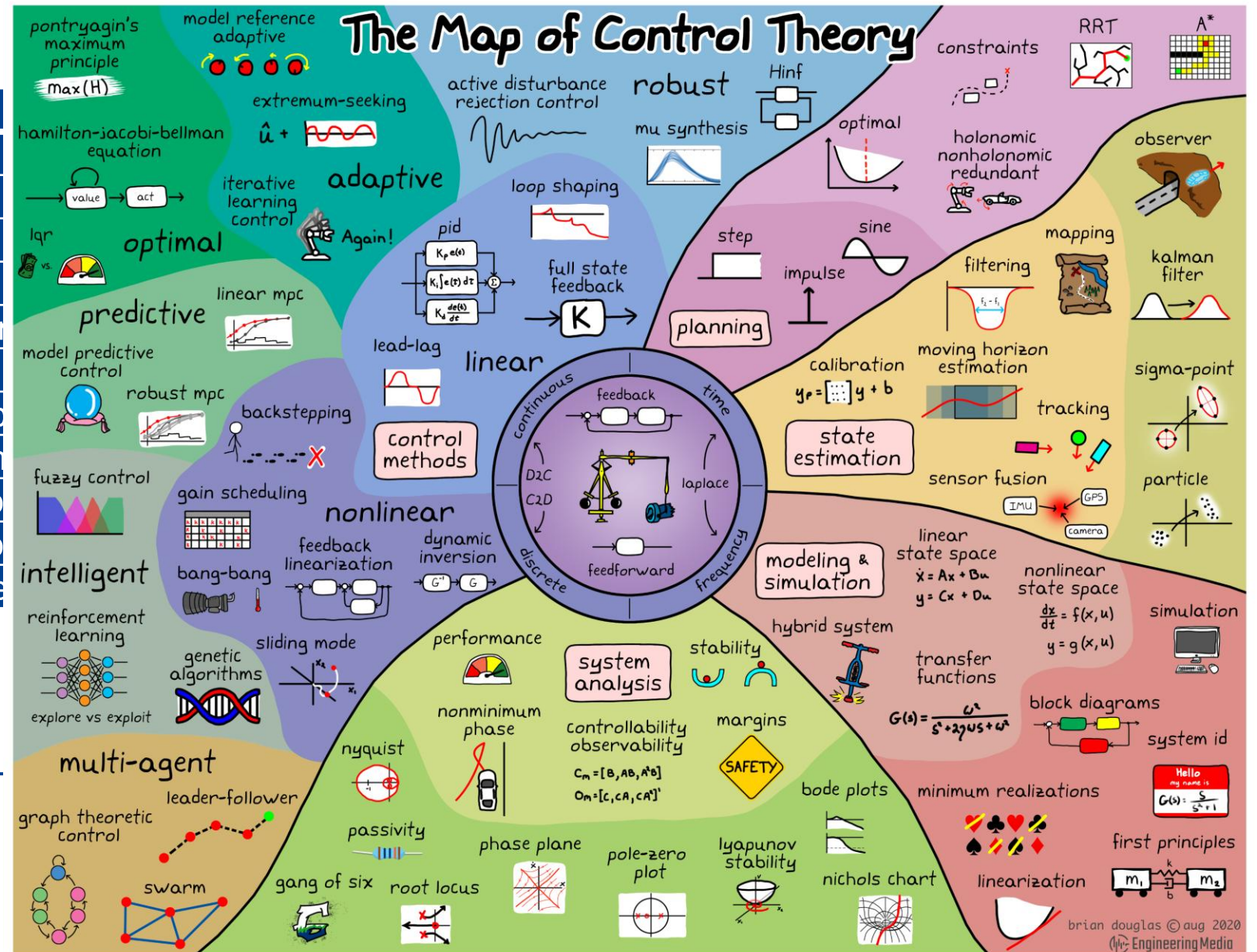
Lecture	Semester	ECTS	Language
Optimal Control	WS	6	English
Robust Control	WS (27/28)	6	English
Nonlinear Control	SS	6	English
Model Predictive Control	SS	6	English
Introduction to Adaptive Control	WS	3	English
Data-Driven Control	WS	3	English
Advanced Topics in Convex Optimization	SS	6	English
Quantum Computing for Engineers	WS	6	English
Nonlinear Dynamics and Chaos Theory I	SS	6	English
Nonlinear Dynamics and Chaos Theory II	WS	3	English
Dynamics of Nonsmooth Systems	WS	3	English

} **Advanced Control**

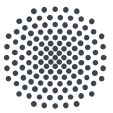
} **System analysis and Modeling**



Lecture
Optimal Control
Robust Control
Nonlinear Control
Model Predictive Control
Introduction to Adaptive Control
Data-Driven Control
Advanced Topics in Convex Optimization
Quantum Computing for Engineers
Nonlinear Dynamics and Chaos
Nonlinear Dynamics and Chaos
Dynamics of Nonsmooth Systems



We cover almost everything ☺



Lecture

Optimal Control

Robust Control

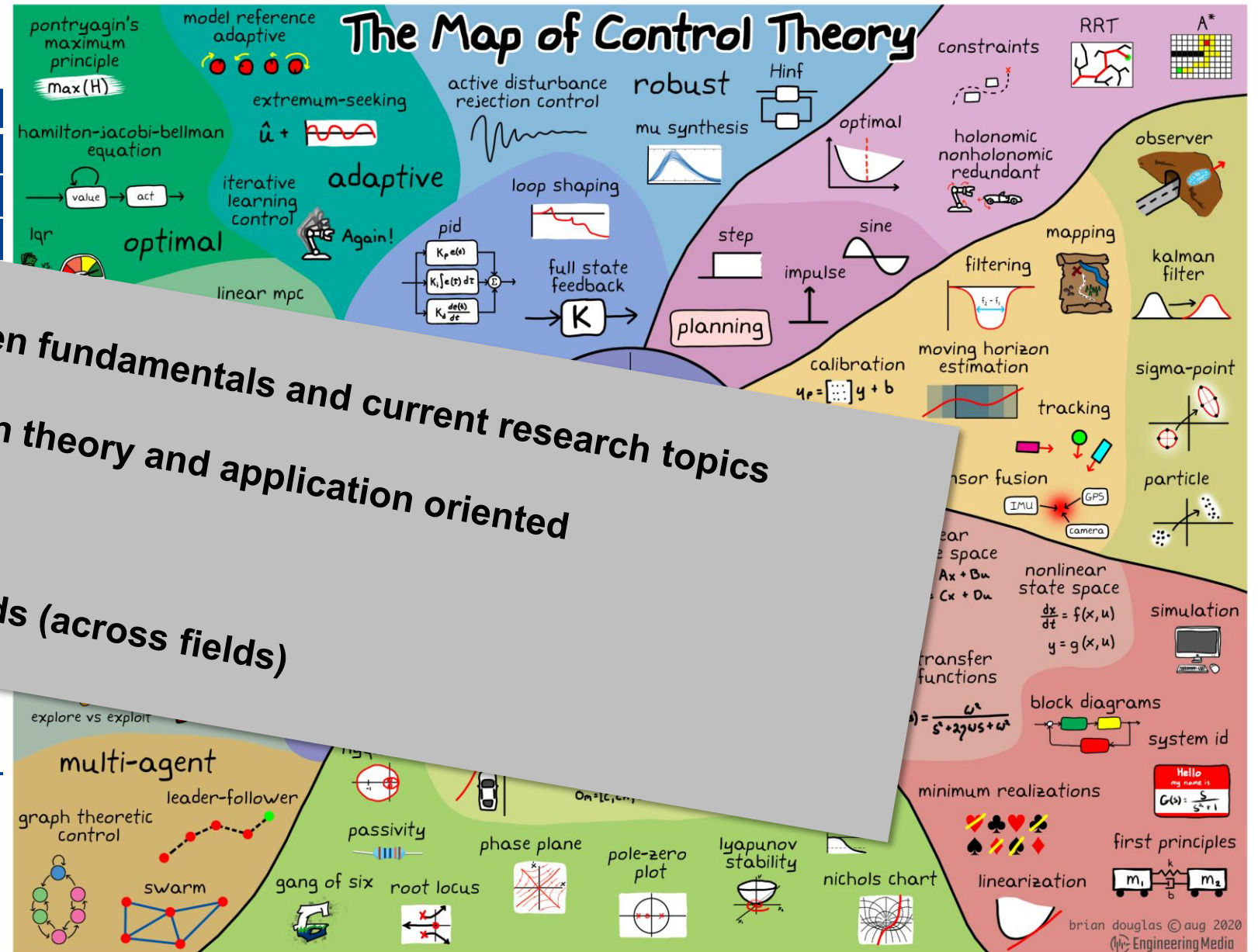
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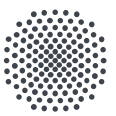
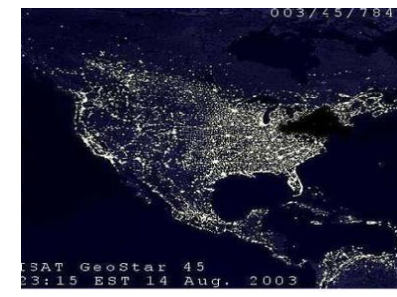
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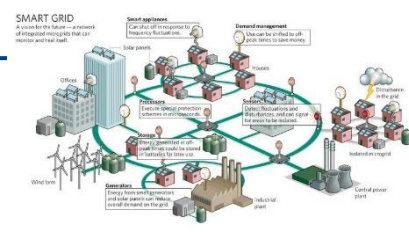
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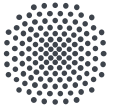
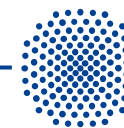
- Good balance between fundamentals and current research topics
- Good balance between theory and application oriented
- Several choices
- Interdisciplinary methods (across fields)





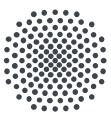
- Autonomous systems
- Multi-agent systems
- Intelligent Systems



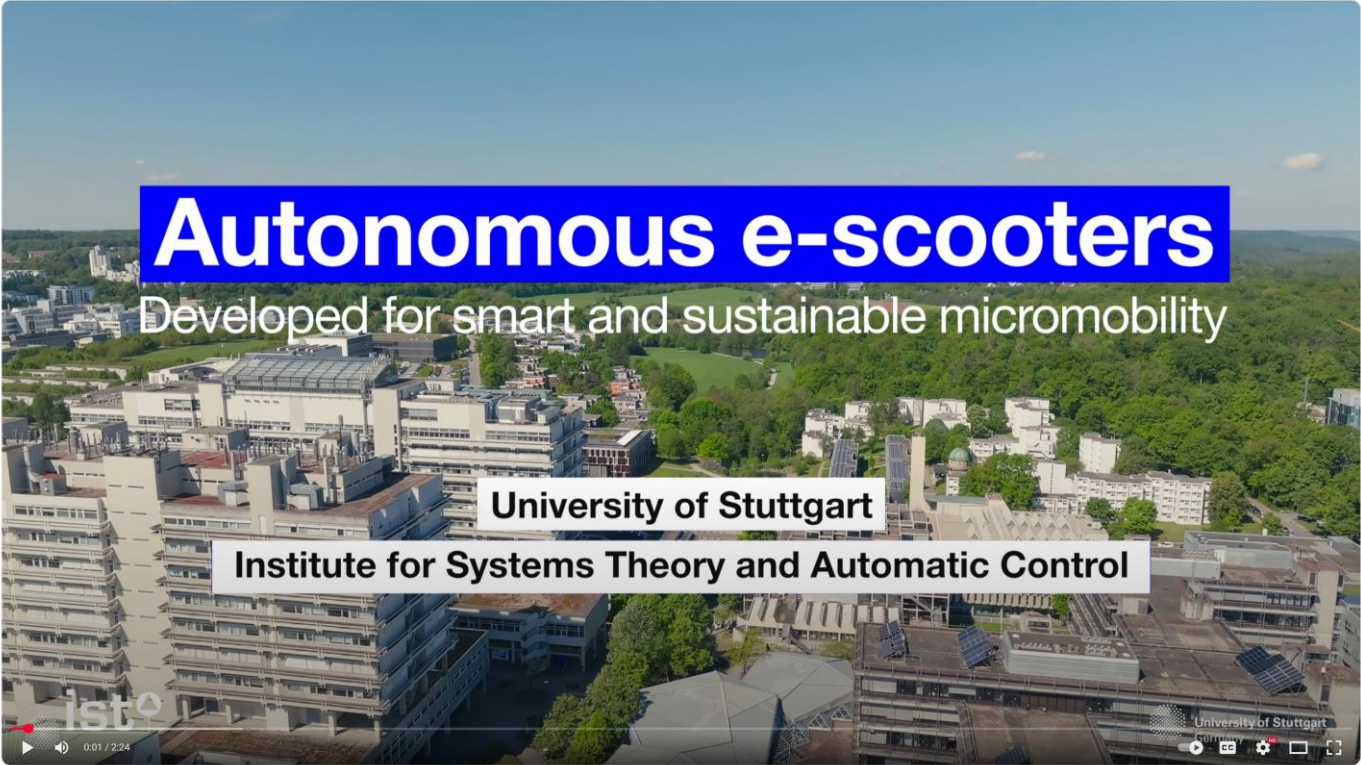


**Self-driving cars, reusable launchers,
Advanced robotics..**





VIDEO

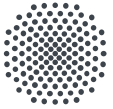


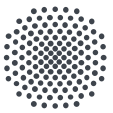
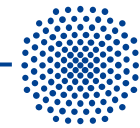
The autonomous e-scooter

Auto-dubbed
Universität Stuttgart
30.2K subscribers

31 Share Download Clip







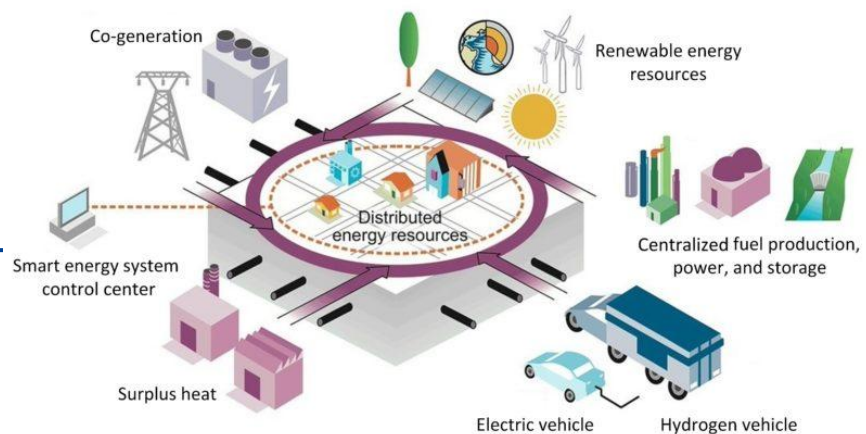
Auslieferzentrum Amazon



Industry 4.0/5.0 – Intelligent manufacturing



Smart energy systems



Autonomous mobility on demand

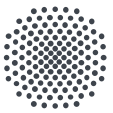


Internet of things



Big data -> Big feedback loops

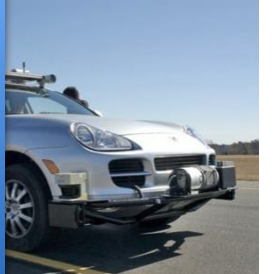


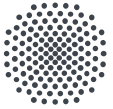
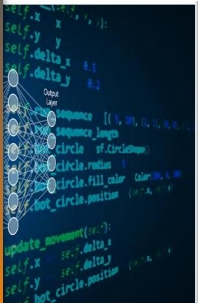


The M.Sc. Specialization

Autonomous Systems and Control

provides the methodological skills needed to
understand the feedback mechanisms
enabling these systems

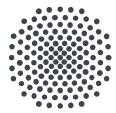




AI Specialization

This is a method-oriented specialization, not an application-oriented one.

provides the methods to understand the feedback in enabling these systems



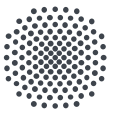
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Best of luck with your Master in Engineering Cybernetics



... from the whole IST