Master Practical Course: Edge Computing and the Internet of Things

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Why are we here?

Learning by doing:

You can pass exams without ever learning anything;

you cannot design and build a system without learning.

Why are we here?

Idea: *Emulate a product/service development project.*

From an idea to a documented prototype.

From the bottom to the top of the tech stack.

Note well: *Corona places limitations to what we can do.*

We are learning how the virtual format works, so provide feedback – early and often.

Why are we here?

Key elements:

Team

People to work and learn with.

Equipment

Real devices to build with.

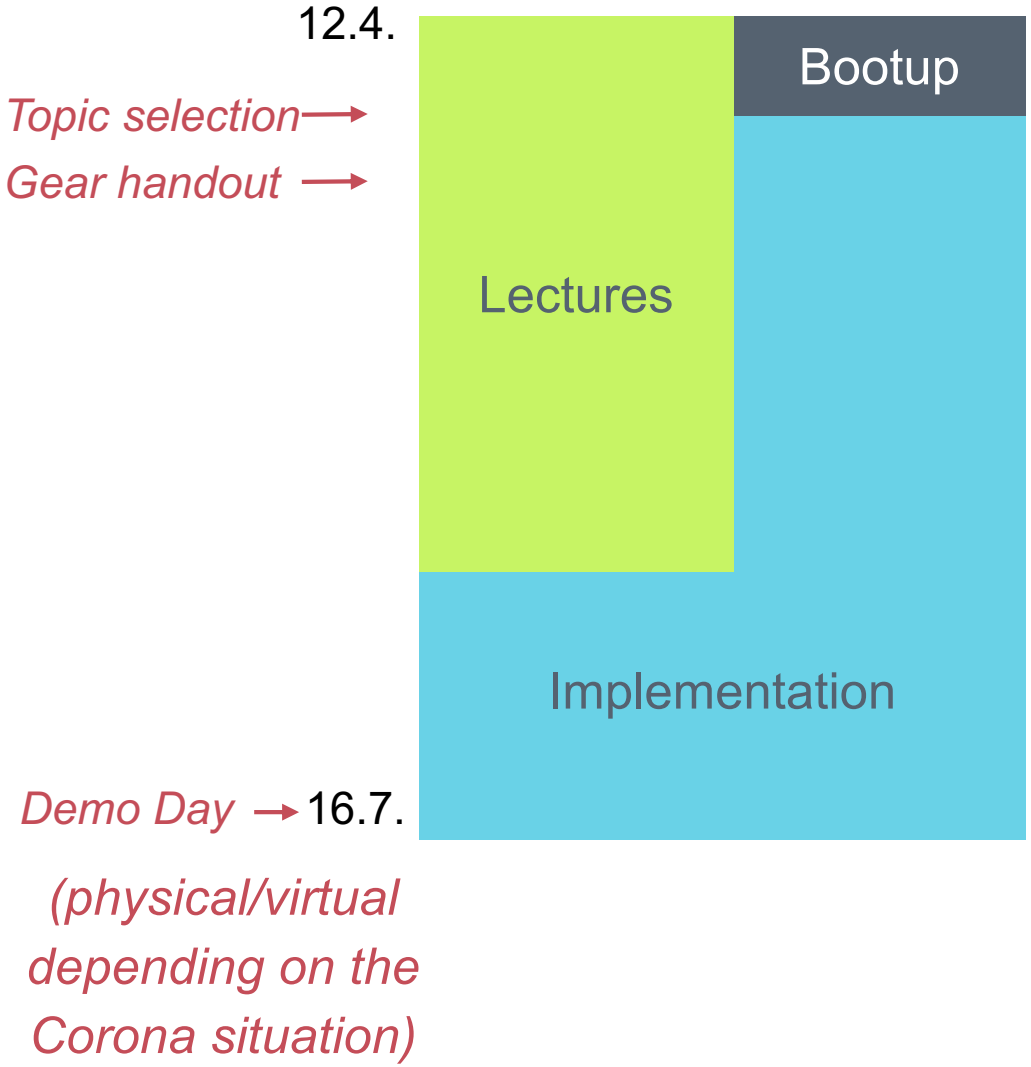
Goal

Clear tasks and a goal.

Time

Full semester, lots of credits.

Course Structure



Developing a project idea.

Implementation **sprints**.

Presentation meetings:

Every other Friday 15:00, virtual

Rough Schedule

*10 ECTS / 60 days = 10 ECTS * 25 h/ECTS / 60 days*
= ~*4* h/working day

Lectures

Monday 15:00–17:00, virtual

Covers technologies and approaches needed for successful projects.

Strong **SHOULD** attend (email the lecturer if you will miss a lecture).

Grade bonus for attendance.

Practical Sessions

Every other Friday 15:00–17:00, virtual

Progress update for all teams + discussion.

Implementation

Continuously updating repository

Corona Concept

Virtual Teaching

All meetings held by the course staff are virtual (lectures, Friday progress meetings, advisor meetings).
Using TUM BBB: https://bbb.in.tum.de/tee-aar-cvc

Team Work

Teams (3 students) are free to organize the implementation work in any way.
All equipment can be taken away from campus and distributed between members.
We do not provide physical working space (let us know if this is a problem).

General

We may need to adapt to changing rules and regulations during the course.
Please follow the latest guidance from TUM:
https://www.in.tum.de/en/current-students/coronavirus/
https://www.tum.de/corona

Equipment

We provide a list of equipment available.

Range of consumer devices available today.

Each team will choose their needed equipment.

Based on the project.

We will provide sets of equipment to the teams.

Within reason and availability.

Teams are responsible for the equipment.

You sign for it and return it after the course.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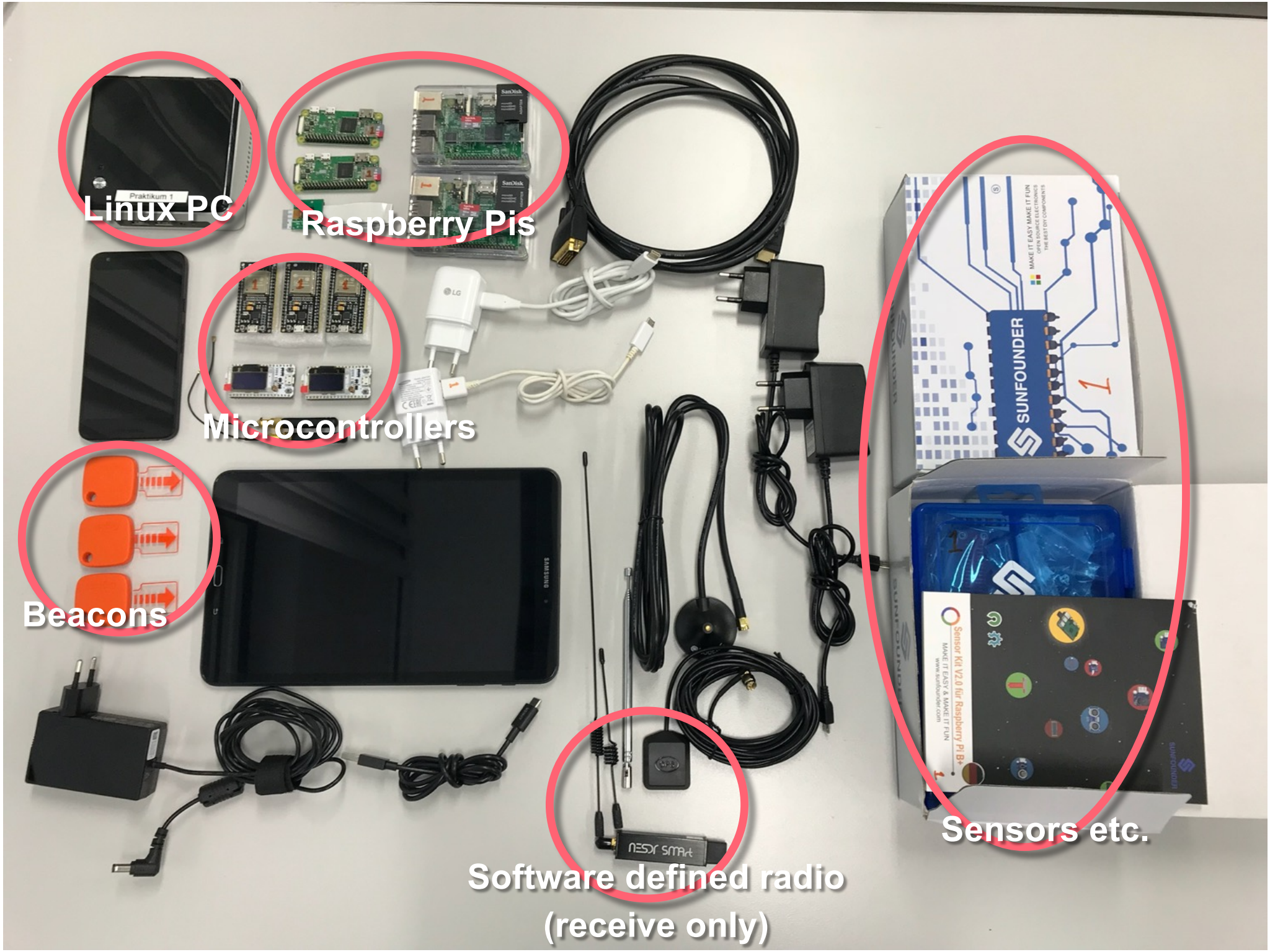

Linux PC
Raspberry Pis
Microcontrollers
Beacons
Sensors etc.
Software defined radio
(receive only)

Equipment (tentative)

Computing

Raspberry Pi 3
Raspberry Pi Zero W
ESP32 microcontroller
ESP32 + LoRa

Communication etc.

RFID reader + bacon/card
GPS receiver
Software defined radio receiver
433 MHz simple link kit

Components

Breadboards
Connectors
Passive electronics
Active electronics

Sensors + Actuators

PIR motion sensor
Ultrasonic distance sensor
Temperature sensor
Temperature + humidity sensor
Volatile gas sensor
Sound sensor
Buzzer (active/passive) module
Capasitive touch
LCD character display
Relay switch
Force sensing resistor
Infrared line tracker
Triple axis accelometer + gyro
Capacitive touch switch
Raspberry Pi camera
Servo motor
Stepper motor
RGB LED module
RG LED module
Auto flash LED module
Laser module
Button module
Tilt-switch module
Mercury switch module
IR receiver module
Reed switch module
Photo interrupter module
Rain detector module
Joystick module
Potentiometer module
Hall switch module
Analog temperature module
Thermistor module
Sound sensor module
Photoresistor module
Flame sensor module
IR remote controller
Rotary encoder module
IR distance module
Pressure sensor module
Real-time clock module
Speakers

Additional Resources

Basic electronics workstation

Soldering, lab power supply, oscilloscope, etc.

Basic 3D Printing

Prusa i3 MK3, basic filaments

Limited resources

If you need them, email us for an appointment

What to do with the equipment?

Each individual piece has limited usefulness,

but become valuable as a *networked system*.

Big providers build *centralized systems* to which every device connects,

but we want to build the system ourselves by having the *devices communicate directly*.

This is an *advanced* course, we expect you have learned a lot already. This is your chance to put it in action, and fill the gaps.

Challenge yourself, try something new and challenging.

(i.e., don't run PHP+MySQL on a PC and connect to it with a phone's web browser, and don't just connect everything to a cloud service etc.)

Grading

Combination of a **team** and an **individual** grade.

The **process** is evaluated (25%).

Idea creation, implementation, presentations.

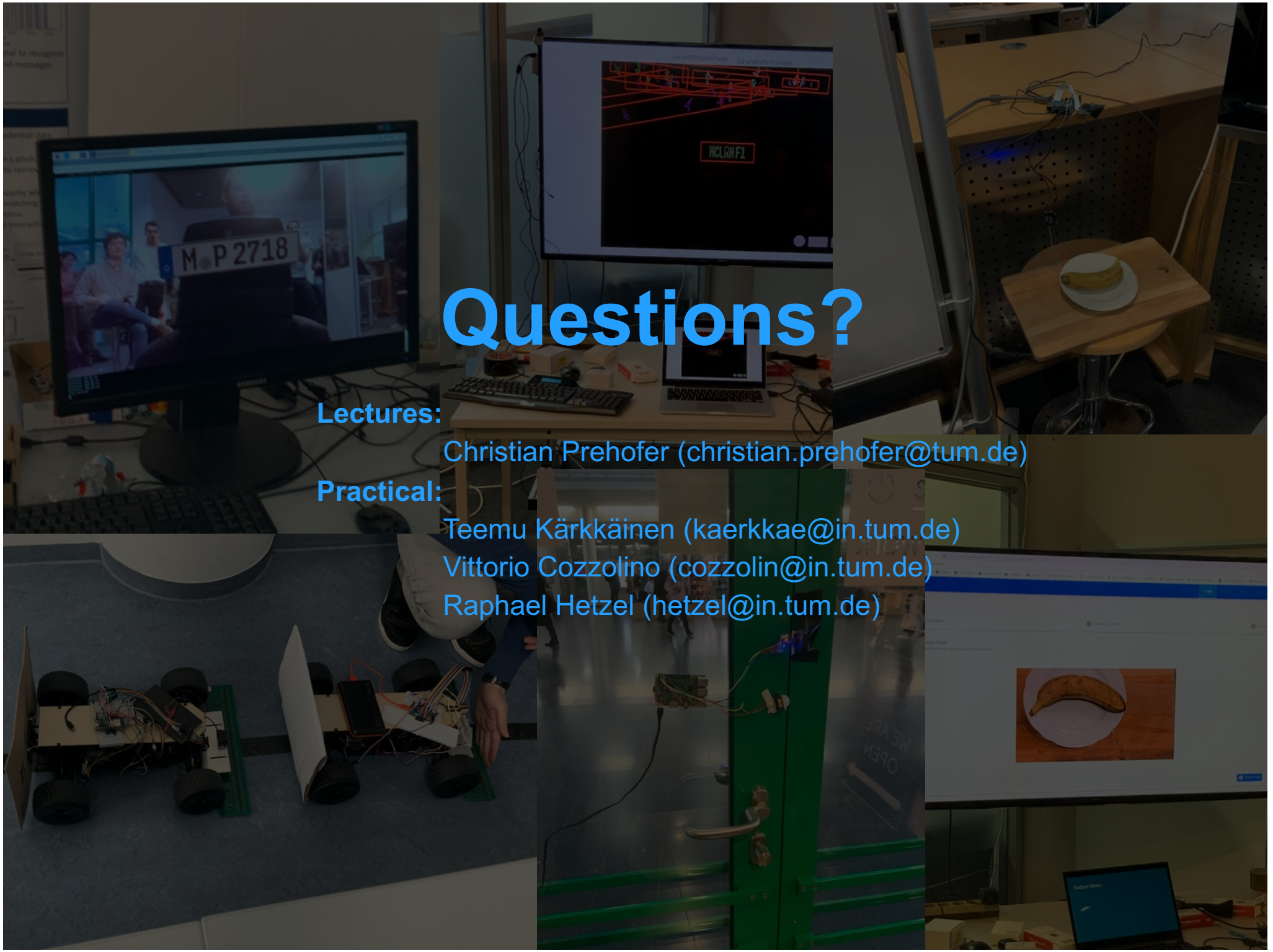
The **end result** is evaluated (50%).

Product (demo), documentation, quantitative evaluation.

Individual contributions are evaluated (25%).

Peer evaluation, standup meetings, repository activity.

***Bonus** for **lecture attendance**.*



Questions?

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