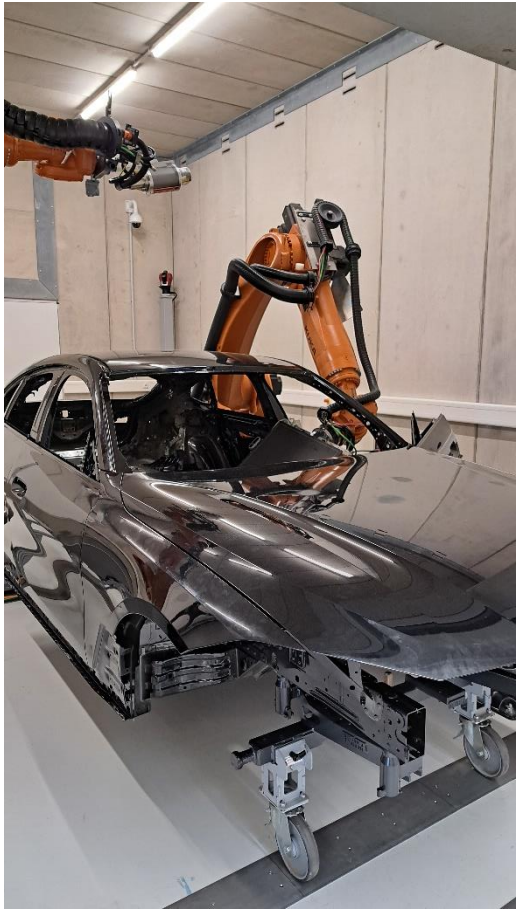
DEGGENDORF INSTITUTE OF TECHNOLOGY DIT

ROBOT-CT

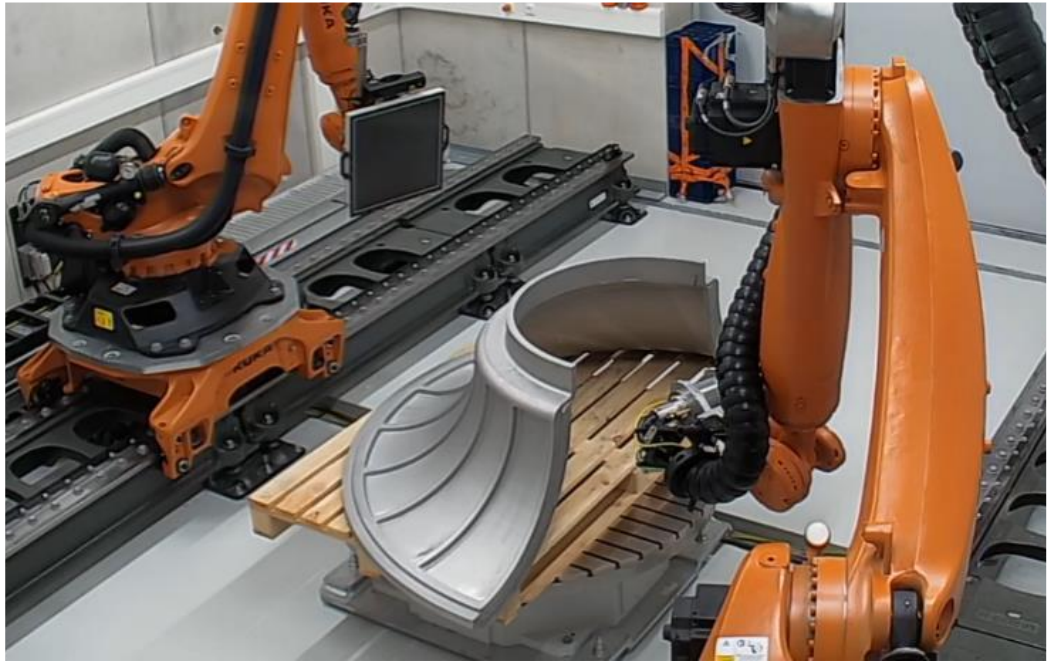
ROBOT-CT
MOTIVATION

- **Challenge:** The size of the objects being examined is significantly limited by the conventional industrial CT setup (<1m). Larger objects can only be scanned using specialized systems.
- **Innovation: Robot CT System**
  One robot carries the X-ray source, while another carries the detector.
- **Advantages:**
  - CT scans of large, complex objects are possible!
  - Flexible digitization of a wide range of inspection tasks with just one CT system!



ROBOT-CT

TH DEGGENDORF – TECHNOLOGY CENTER PLATTLING



Specifications:

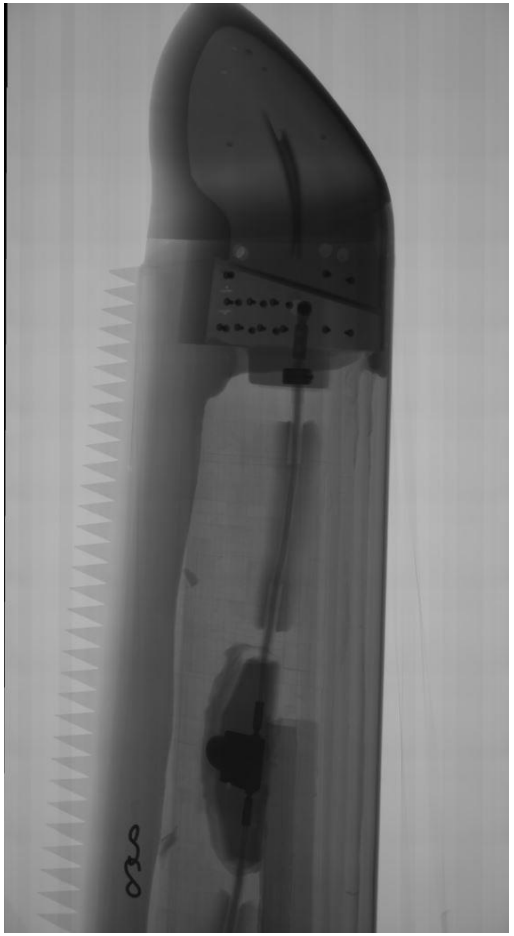
- 225 kV
- 3072 x 3072 Detector (139 µm)
- 15 Axes (2 robots, 2 axis, turntable)
- Radiation protection room:
  8m x 7,5m x 4,5m
- Optical scanner, Lasertracker

Software:

- Robots: ROS2
- X-ray: RosCT (Daniel Rauch, 2024)
- KUKA RSI
  (realtime positional interface)

ROBOT-CT

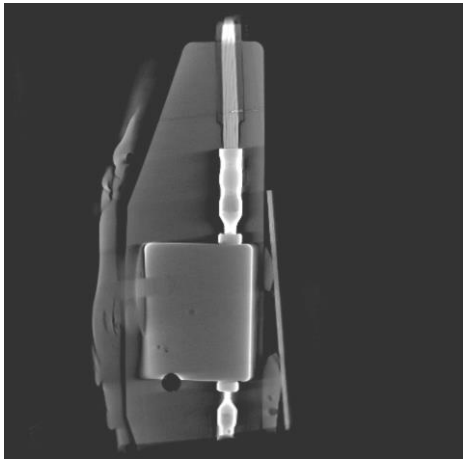
EXAMPLE: WIND ENERGY ROTOR BLADE

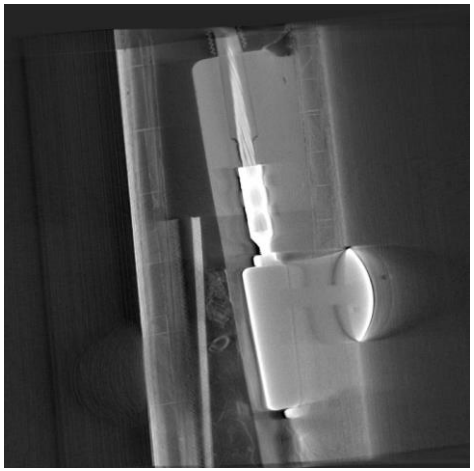


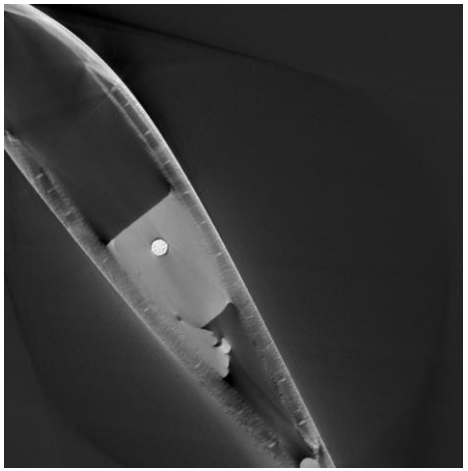
Stitched 2D projection

ROBOT-CT

EXAMPLE: WIND ENERGY ROTOR BLADE



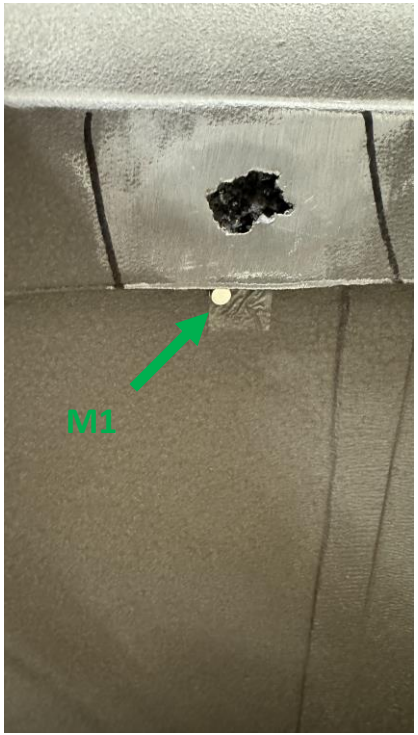




Slices of the 3D volume

ROBOT-CT

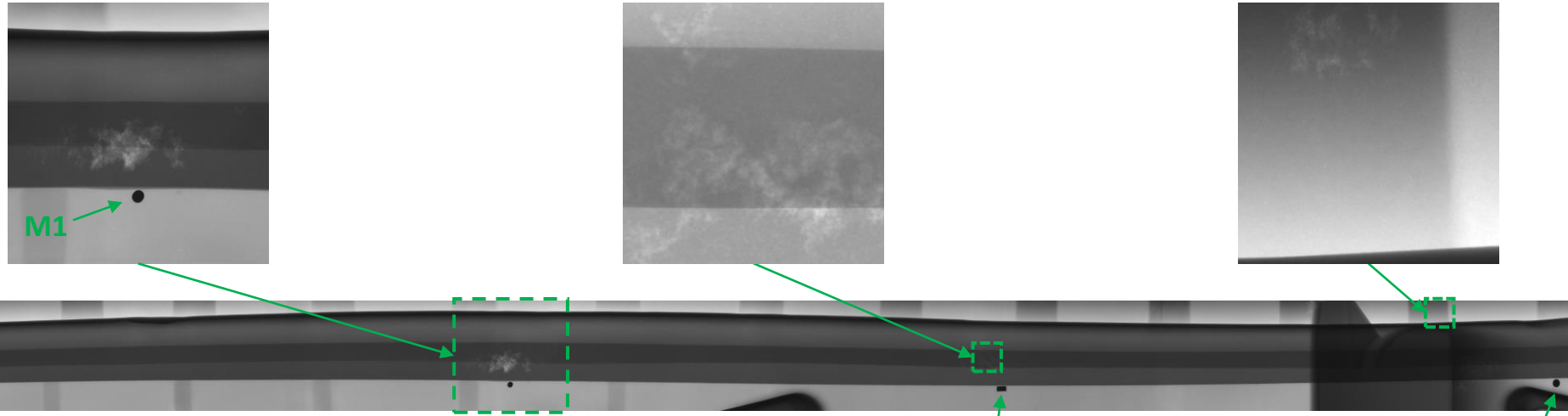
EXAMPLE: CASTED DIFFUSOR



Task: find cavities in the inner ring

ROBOT-CT

EXAMPLE: CASTED DIFFUSOR

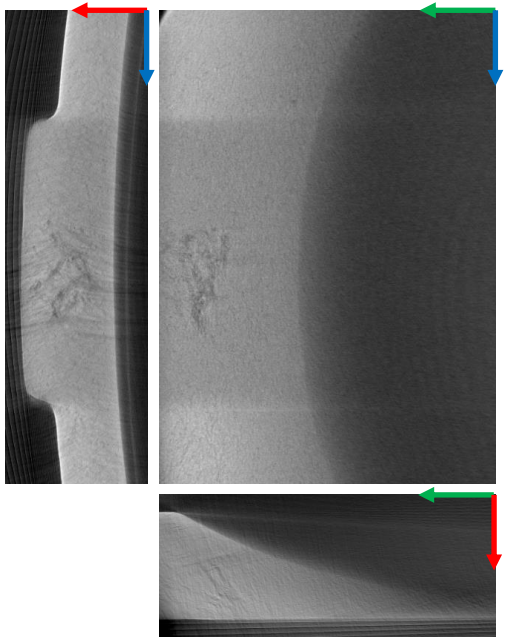


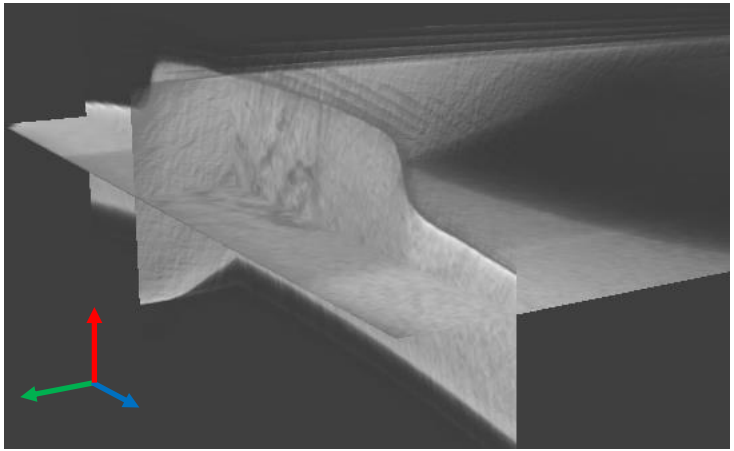
Stitched 2D projection (curved)

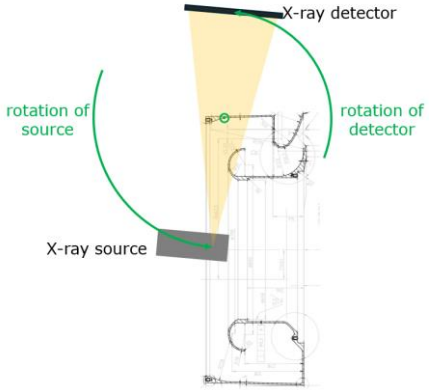
Task: find cavities in the inner ring

ROBOT-CT

EXAMPLE: CASTED DIFFUSOR



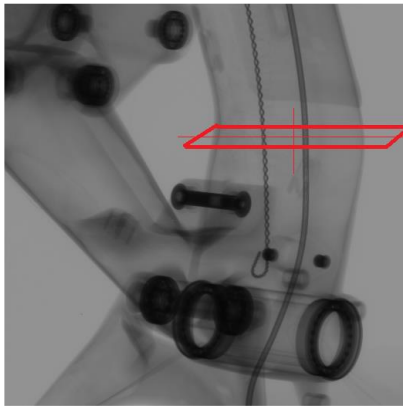




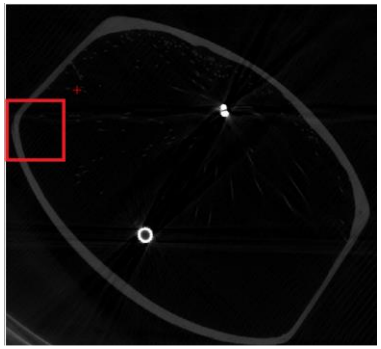
Limited Angle 3D CT scan of M2

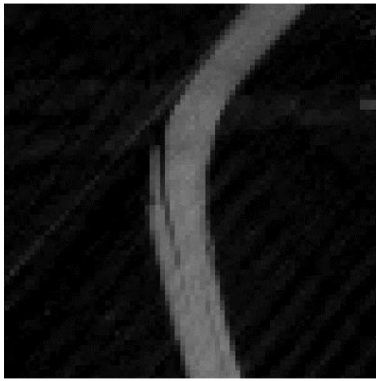
ROBOT-CT

EXAMPLE: BIKE – REGION OF INTEREST (BIKE FRAME)



Projection
(of the bike frame)





Slice of the 3D volume
(showing a crack)

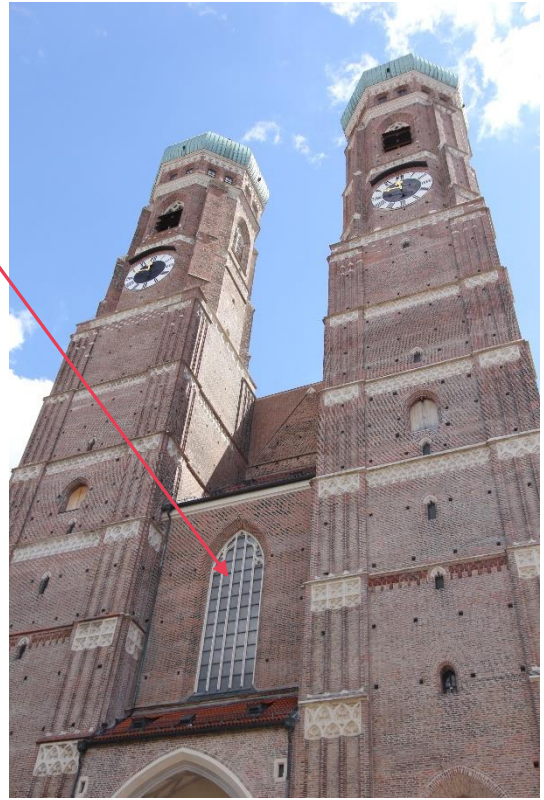
ROBOT-CT

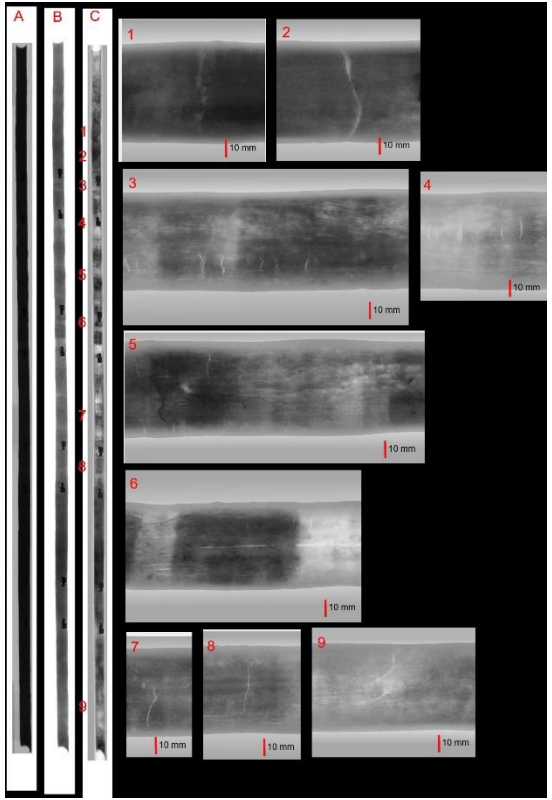
EXAMPLE: BIKE – STITCHED 2D PROJECTION

ROBOT-CT

EXAMPLE: HISTORICAL TIE RODS OF THE FRAUENKIRCHE

- **2D scans of a tie rod of a window of the Frauenkirche in Munich**
  (historical: 15th Century)
- Length: 3.70 meters, Cross-section: 20 x 50 mm
- Goal: Detection of cracks and air inclusions



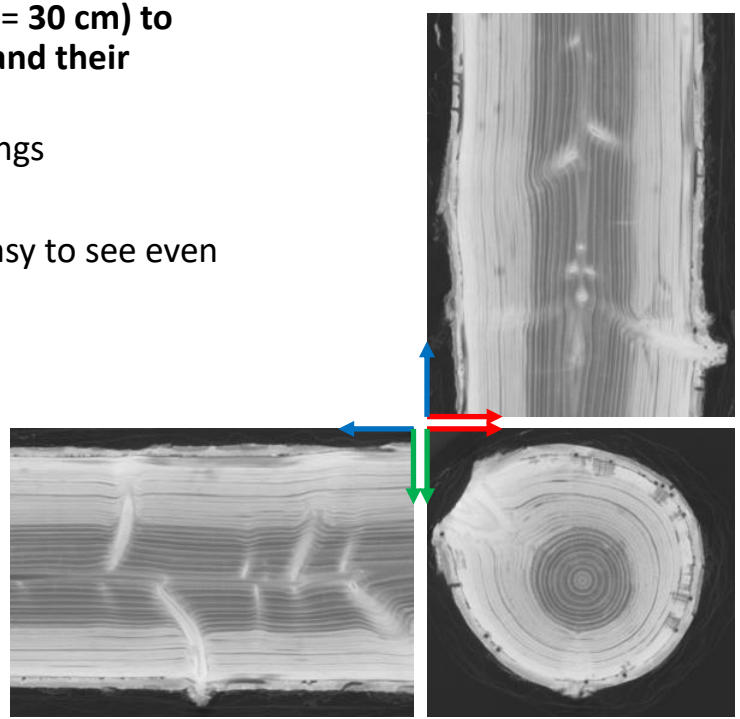


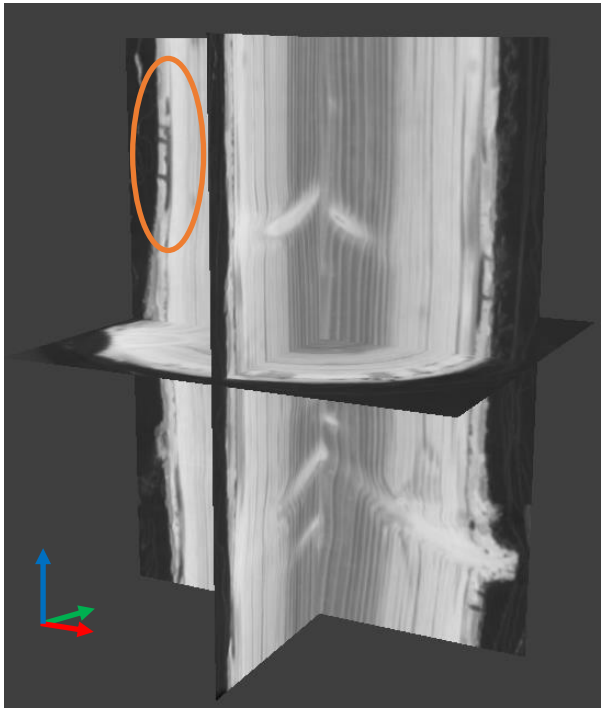
ROBOT-CT

EXAMPLE: INFECTED TREE

- **CT-Scan of a tree (∅ = 30 cm) to detect bark beetles and their impact in the tree**
- visibility of growth rings
- visibility of branches
- breeding galleries easy to see even at low resolution

cross sections through CT reconstruction





ROBOT-CT

EXAMPLE: INFECTED TREE

cross sections through CT reconstruction (86 µm voxel size)

breeding galleries

and

lower X-ray attenuation
(darker grey value)
underneath galleries

breeding galleries underneath the bark

and

their inhabitants

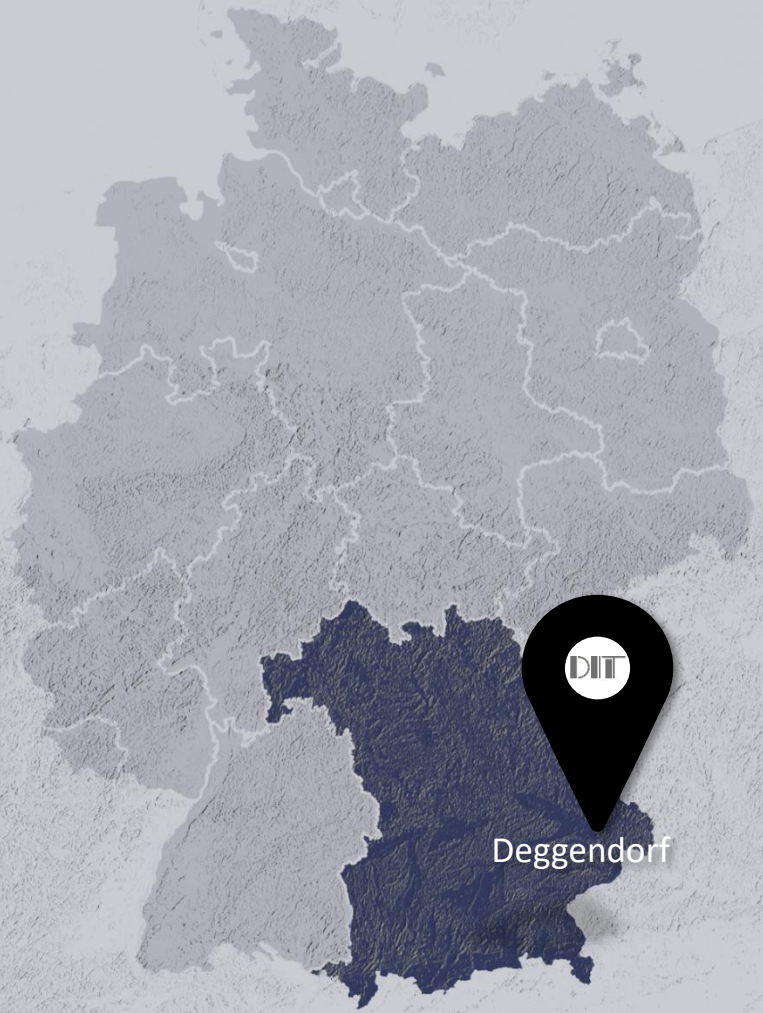
ROBOT-CT

CONTACT

Deggendorf Institute of Technology
Technology Center Platting
Werkstraße 17
94447 Plattling

Prof. Dr. Simon Zabler
simon.zabler@th-deg.de

Prof. Dr. Gabriel Herl
gabriel.herl@th-deg.de



Interested in a research collaboration or scans?
Contact us!