



2019 Germany Engineering Research Program Experience

By: Chun Chang

About me

- **School: Michigan State University**
- **Major: Electrical engineering**
- **Year: Senior**



Life in Germany

Three important things in Germany



Difference between Germany and US



The convenience of
public transportation



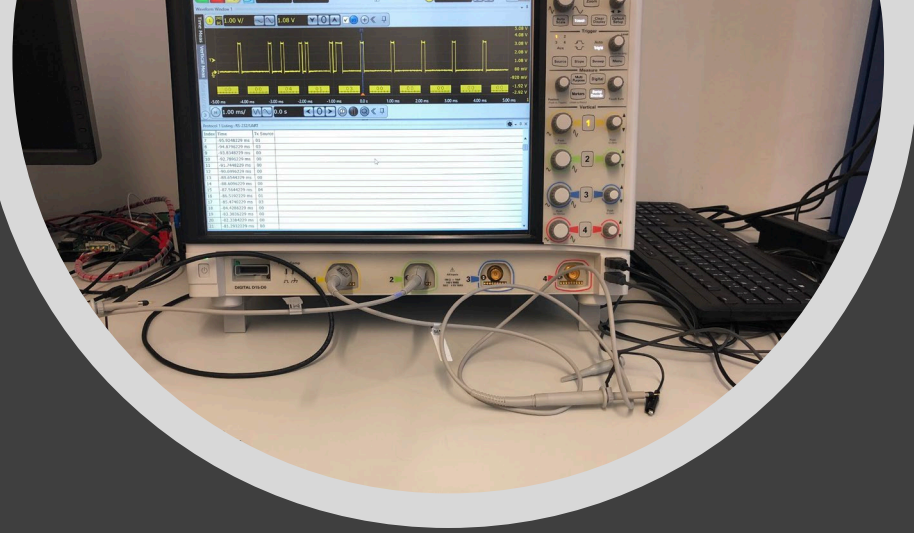
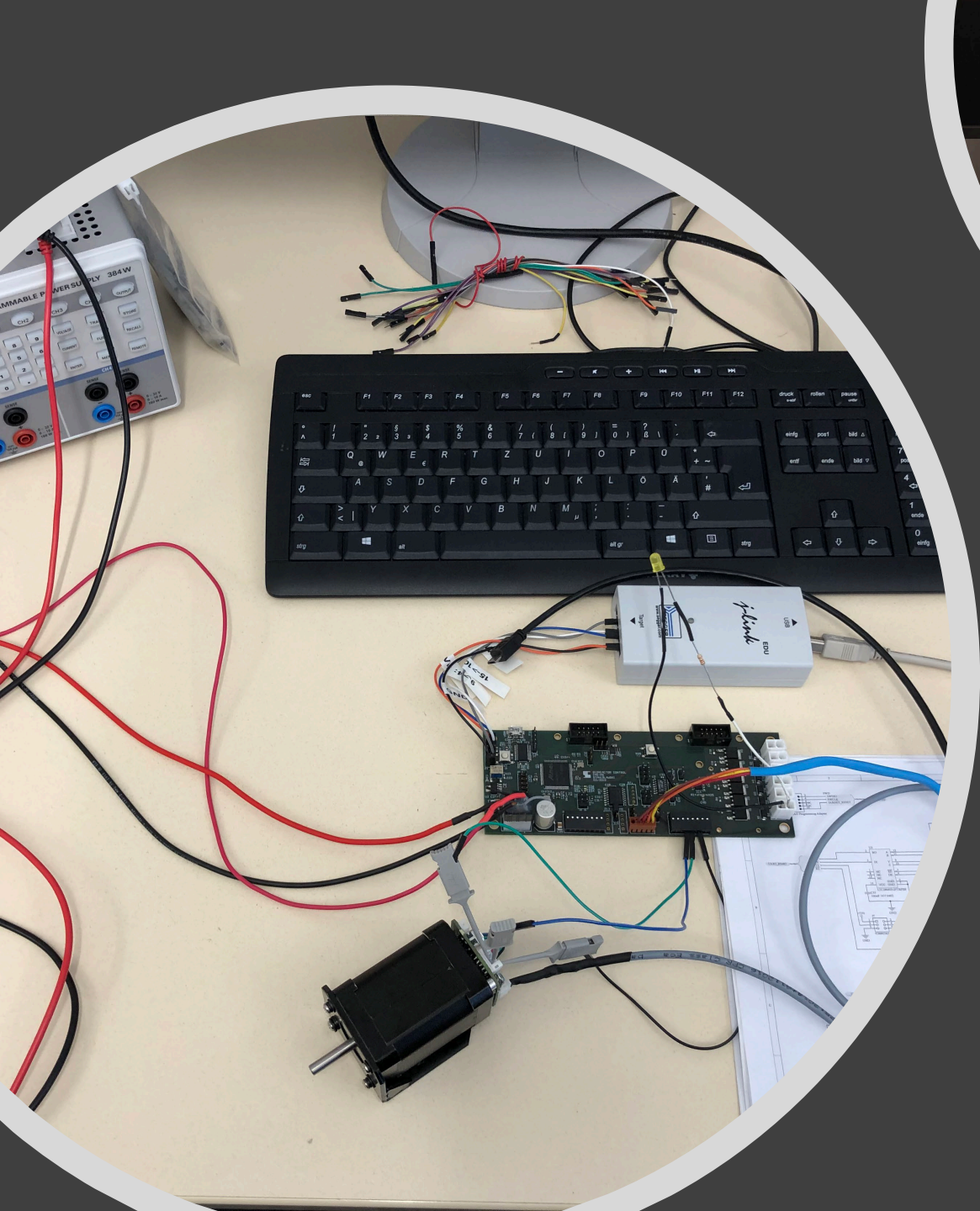
The amount of
plantation in the city



The quality of food



The people



Work and Research

Work and Research



**Institute: IMS, Institut für
Mikroelektronische Systeme**



**NIFE, Lower Saxony Centre for
Biomedical Engineering, Implant
Research and Development**

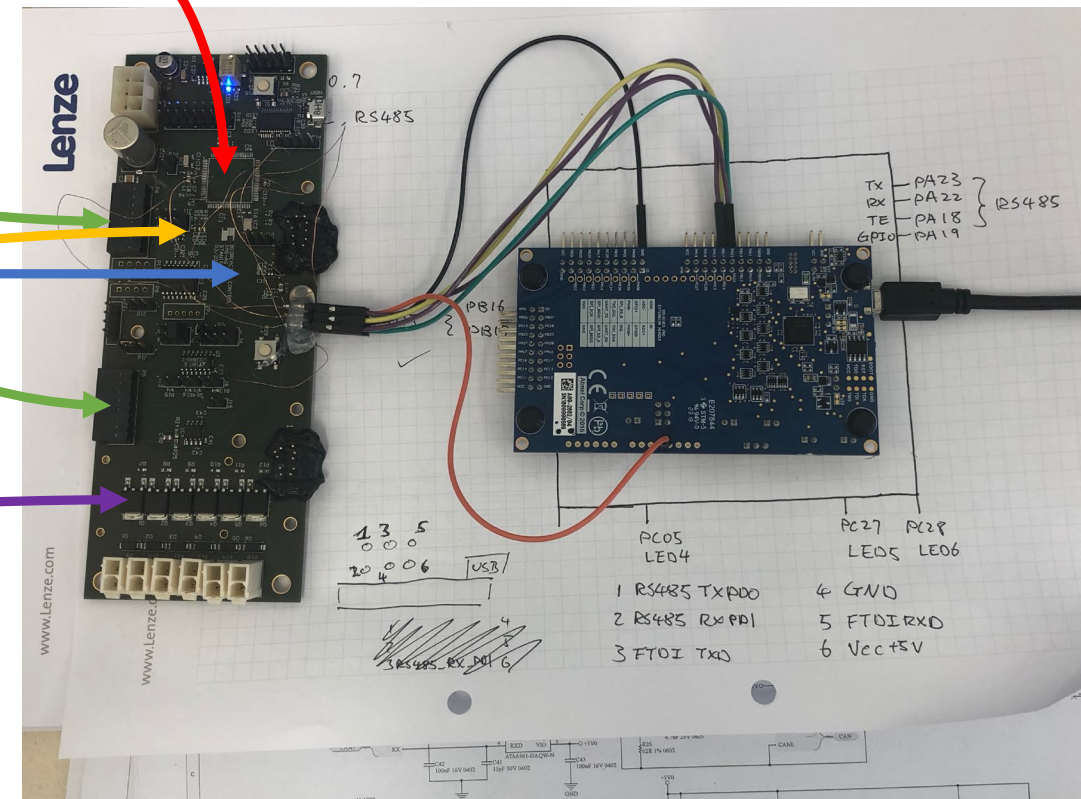


**Our Research: Intelligent
Bioreactor system for cultivation
of bioartificial vascular graft**

The Bioreactor PCB

What made up our Bioreactor control PCB?

1. Microcontroller: Atmel, arm-cortex-m0+
2. Communication ports
3. DAC
4. LEDs
5. Switches



What can the
board do?

-

Communicate

What does communicate means?

- The imparting or exchanging of information by speaking, writing, or using some other medium.

What does communication means for us?

- Exchange digital information. i.e. 0xFFAA, 000011110101
- In other words...use digital signals to talk to peripheral devices.

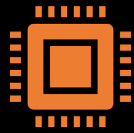
Some examples...

- Directly control peripheral devices. i.e. Step motor, pumps, sensors.
- Read data from peripheral devices and reacted accordingly.
- Allow user to read and write data through a council. For example:
PC

My job: Programming the bioreactor control PCB



EDITING THE API TO ADDED MORE
FUNCTIONALITIES IN



ESTABLISH ALL COMMUNICATIONS
DRIVERS INCLUDING USART, SPI,
I2C, CAN...



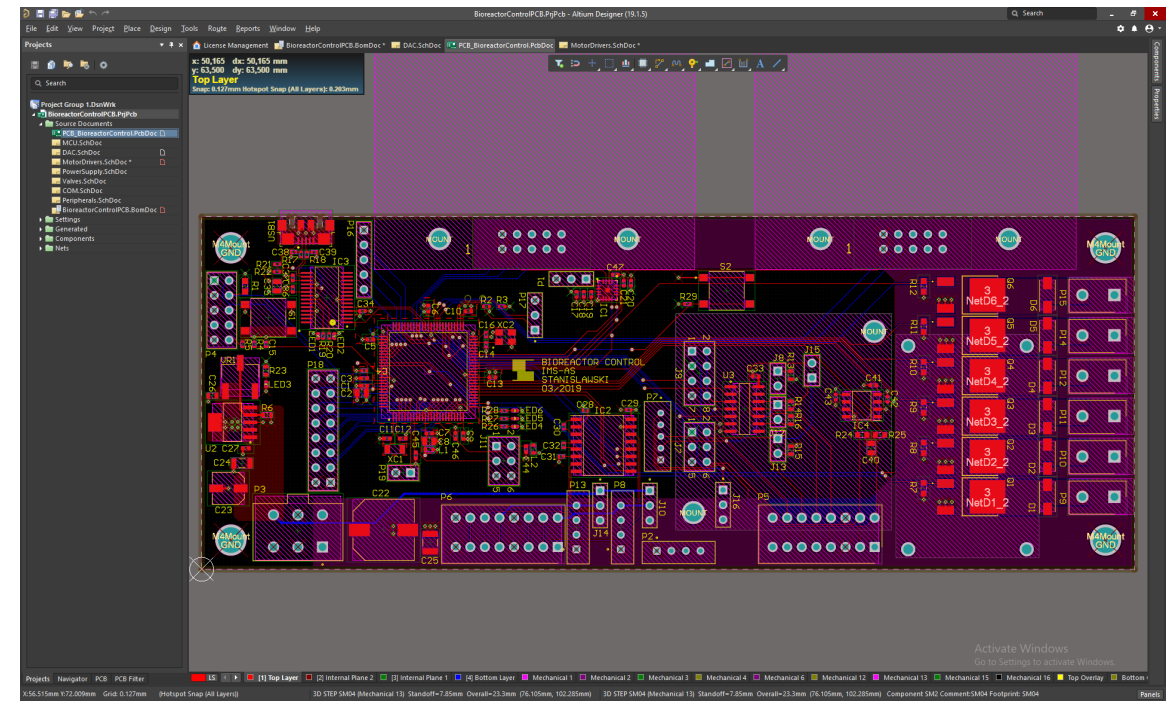
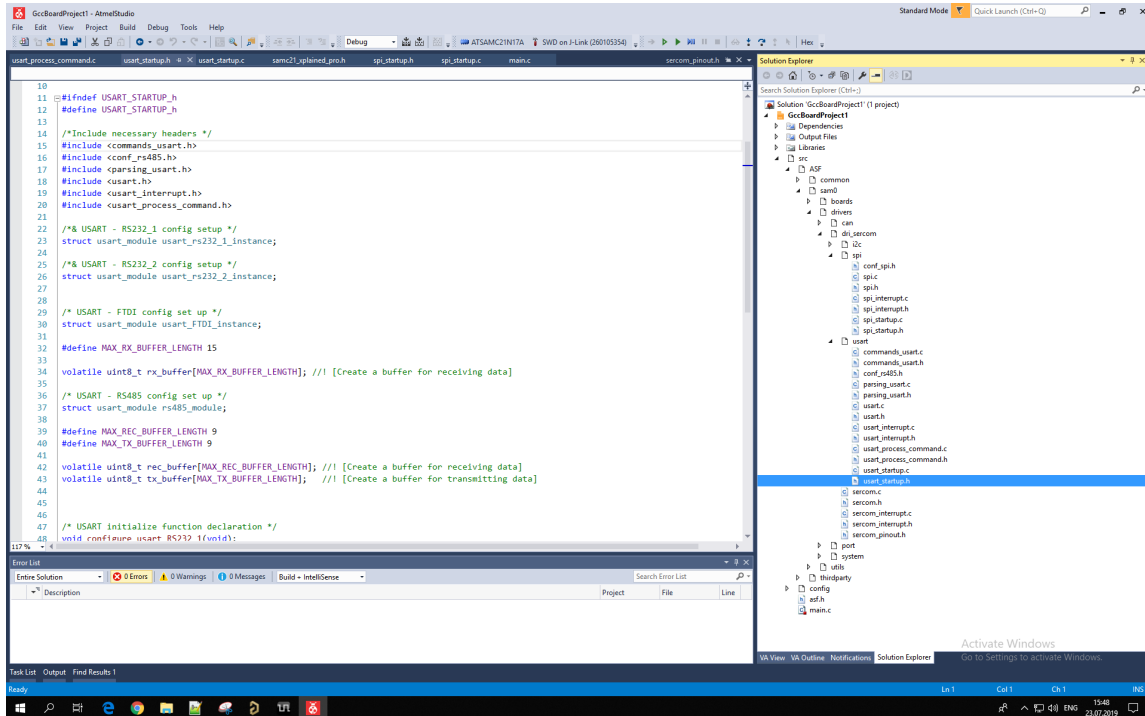
TROUBLE SHOOTING



FABRICATING PCB BOARDS AND
COMPONENT ATTACHMENT

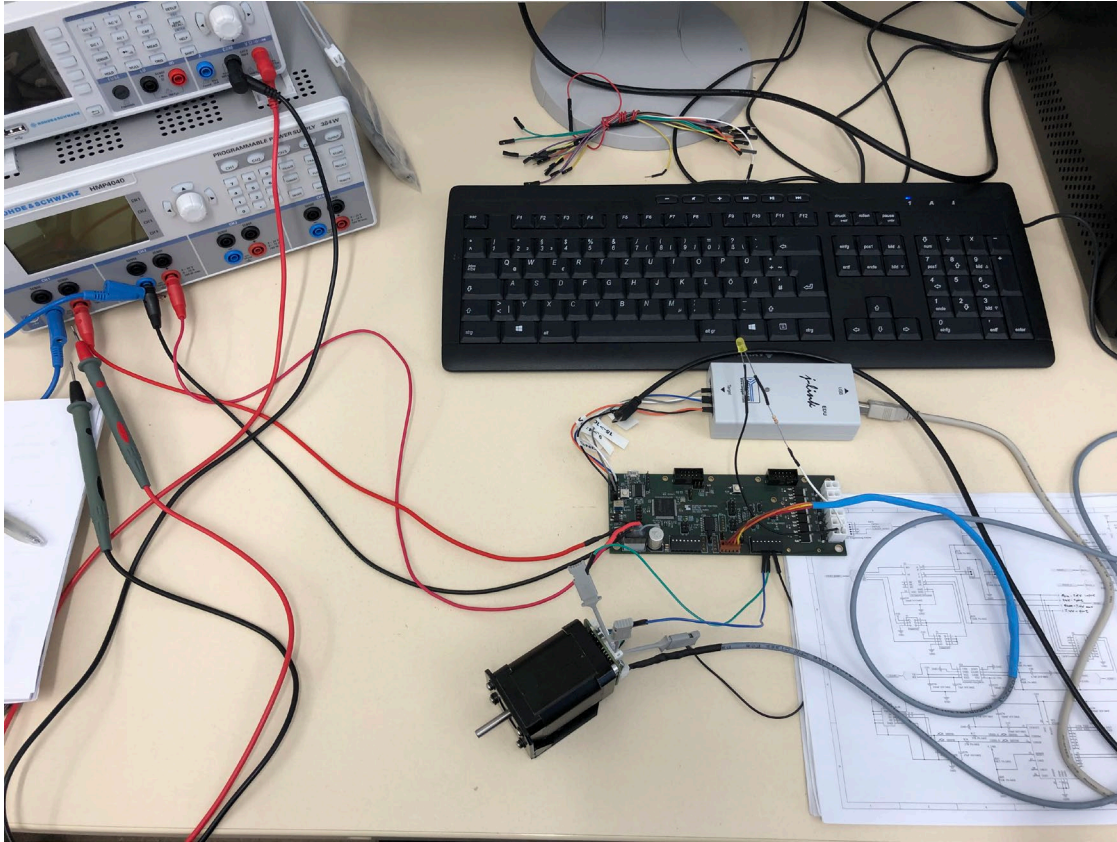
Typical setup during a work day

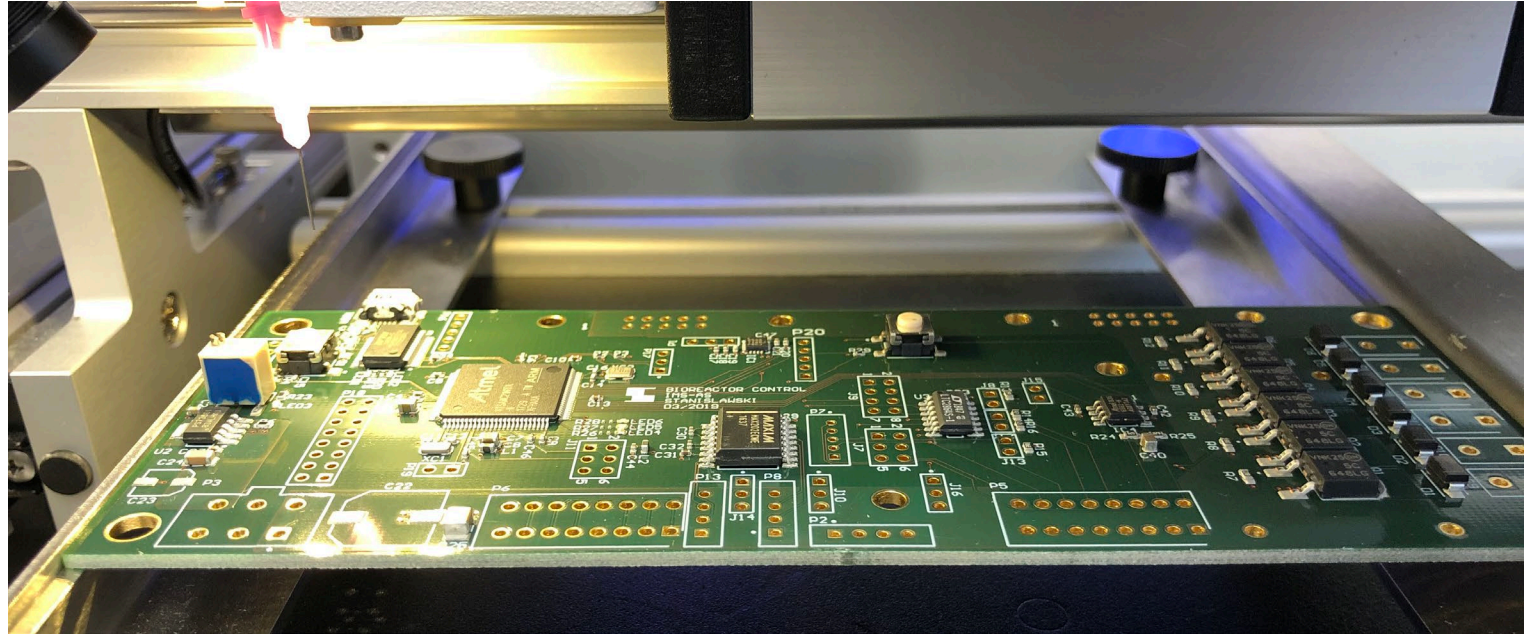
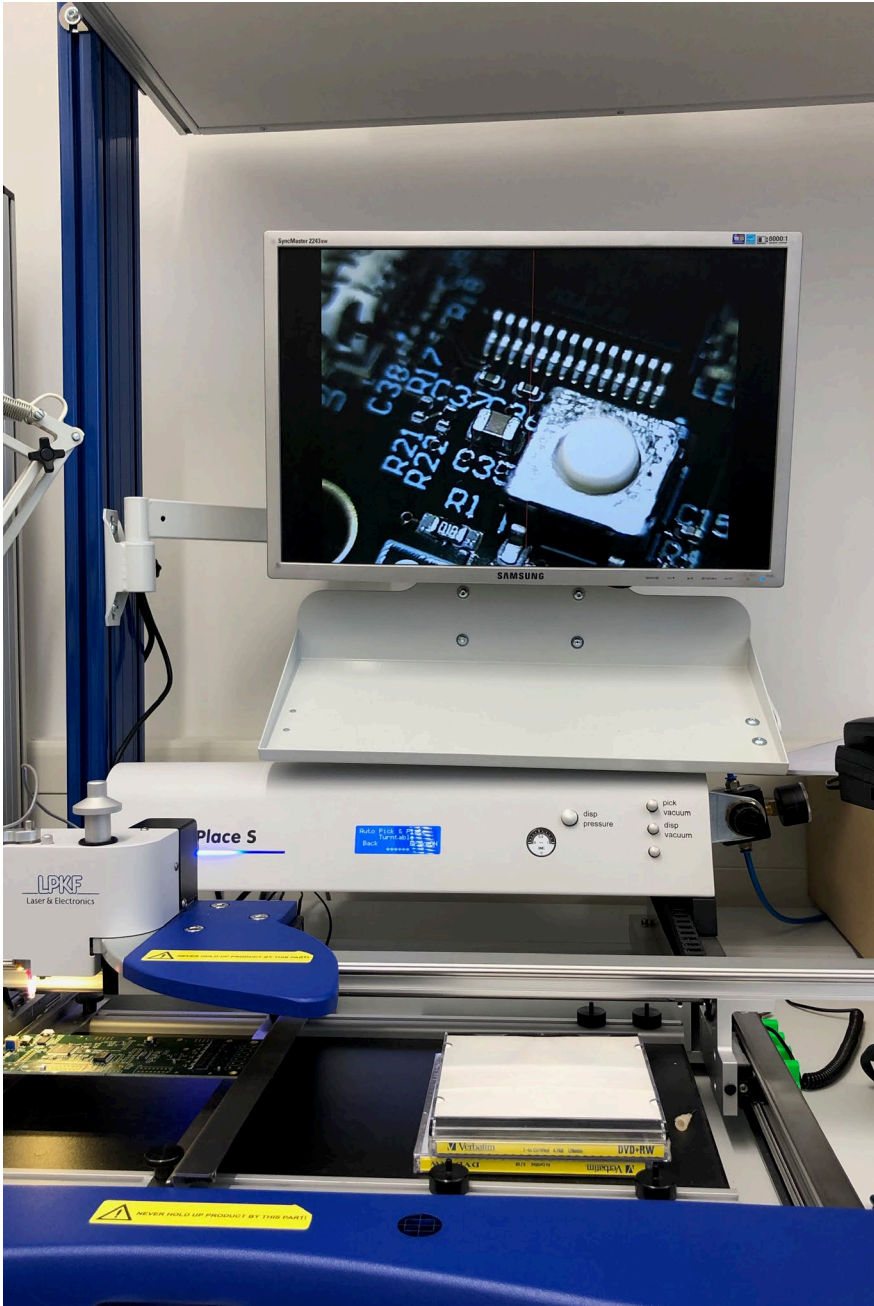
Coding



Typical setup during a work day

Testing





Typical setup during a
work day

Attaching PCB Components

Our vision of this board

- In the future, PCB should be able to take care of most of the control of the whole system and requires minimum human resources looking after the Bioreactor.



A group of nine young people, likely students, are posing for a photo in what appears to be a laboratory or industrial facility. The background features prominent yellow and blue structural beams and metal grates. The group is arranged in two rows: five people standing in the back and four people sitting or kneeling in the front. They are dressed in casual attire, including hoodies and sweatshirts. One hoodie in the front row clearly displays "MICHIGAN STATE SPARTAN" with a logo. Another hoodie in the back row has "MICHIGAN STATE" visible. The overall atmosphere is professional yet friendly.

Thank you!
Leibniz University Hannover