

# Master's thesis

## Multirate State Estimation and Parameter Identification of Agricultural Biogas Plants



### BACKGROUND:

The more than 9000 agricultural biogas plants in Germany need to be operated dynamically in the future in order to balance demand peaks in a fluctuating renewable energy grid. To ensure safe operating conditions, the dynamic state of the reactor needs to be known at all times. For this purpose, different state estimation methods are investigated in this research thesis. In particular, moving horizon estimation and an extended Kalman filter should be applied to real measurement data which contain both online measurements and delayed offline lab analyses.

### YOUR TASKS:

- Get familiar with topic and methods: modelling of anaerobic digestion, multirate state estimation with Moving Horizon Estimation (MHE) and Extended Kalman Filters (EKF)
- Apply state estimators to existing lab-scale measurement data
- Implement parameter estimation to update model parameters iteratively

### YOU HAVE:

- Foundational knowledge in numerical optimization and state estimation
- Elementary knowledge in programming with Matlab/Python
- If possible: Elementary knowledge in modelling and identification of biological systems

### WE OFFER:

- A good introduction to the topic as well as close and competent supervision for successfully achieving the tasks
- A family-friendly, modern working environment in a collegial working atmosphere
- A well-equipped workplace and advanced lab infrastructure
- Good public transport connections

### BEGINNING:

February 1, 2024

### DURATION:

6-7 months

### LOCATION:

Deutsches Biomasseforschungszentrum, Torgauer Straße 116, 04347 Leipzig

### CONTACT:

Simon Hellmann  
Phone: +49-341-2434-357

### APPLICATION DOCUMENTS:

Please submit your compelling application (only in a single attachment, preferably as pdf, max. 5 MB)  
**e-Mail: [bewerbung@dbfz.de](mailto:bewerbung@dbfz.de)**

For an encrypted transmission of your application you can use the upload form Cryptshare.

[www.dbfz.de/stellen](http://www.dbfz.de/stellen)