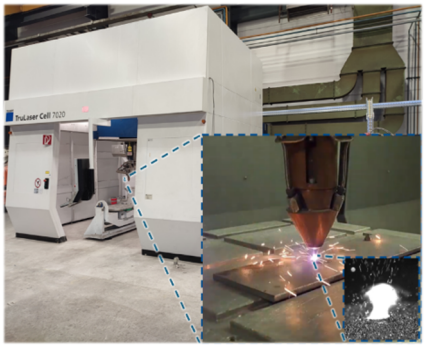
Chair of Materials Engineering of Additive Manufacturing
TUM School of Engineering and Design
Technical University of Munich

IDP/Semesterarbeit:
Transforming Laser-Based Additive Manufacturing Data: From Machine Logs to Smart Dashboards

1. Situation



At the Chair of Materials Engineering of Additive Manufacturing, we operate a laser-based Directed Energy Deposition (DED) machine equipped with basic data logging and OPC UA capabilities. The machine already produces a wealth of process data during operation – but raw data alone is about as exciting as a CSV file without a header. The good news is we're already one step ahead, with a clear path forward:

- A time-series database is up and running
- A server-side application stack is logging machine and process parameters
- All data is consistently linked via a unique process ID

The challenge now is turning this growing mountain of data into usable, understandable, and actionable information.

2. The Project goals

The goal of this interdisciplinary project is to design and implement a modern dashboard and data toolchain for live and historical machine data.

Milestones:

- **Live Data Dashboard**
  - Visualize real-time machine and process parameters
  - Aggregate and combine multiple data streams
  - Make complex industrial data readable at a glance
- **Alarm & Event System**
  - Define thresholds and conditions for process alarms
  - Visualize warnings, alerts, and anomalies clearly

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- **Smart Filtering & Analysis Tools**
  - Filter logged data by process ID, time range, or parameter sets
  - Enable quick analysis of individual build jobs
- **Structured Data Export**
  - Export selected process data in formats suitable for:
    - Data science workflows
    - AI / ML pipelines
    - Further external analysis tools
  - Clean data > Big data

3. Prerequisites

Required:

- Solid programming fundamentals (e.g. Python, Java or similar)
- Basic understanding of Databases (SQL or NoSQL) and Client–server architectures
- Pragmatic mindset (“done and useful” beats “perfect and never finished”)
- Good German or English skills

Nice to have (but not mandatory):

- Experience with:
  - Time-series databases (e.g. InfluxDB, TimescaleDB)
  - Dashboards or visualization frameworks
  - OPC UA, MQTT, or industrial data protocols
  - Docker and custom application stacks
- Interest in:
  - Industrial IT
  - Data visualization

If you are interested, please submit your CV and transcript to:

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