

Data-Driven Production via the Internet of Things

Relevance to the Automotive and Autonomous Systems Industries:	To use data more effectively, data must be shared between the participants in the product life cycle, including that of the automotive industry. This data must be collected and uploaded to an <i>Internet of Things</i> (IoT) platform from where it then can be analyzed and shared with other system participants.	
Research Location:	Technische Universität Darmstadt Institute for Product Life Cycle Management (PLCM)	
Homepage (Engl.):	http://www.maschinenbau.tu-darmstadt.de/plcm	
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Project Description:	<p>The Technische Universität Darmstadt Institute for Product Life Cycle Management (PLCM) is participating in the <i>dataPro</i> project, which is investigating the potential for data-driven production. This NSF REU project will be concerned with the data-driven production via IoT. The objective for the NSF REU student is to connect a 3D-printer to an IoT-platform and display collected data in a dashboard and in a developed graphical user interface (GUI). This includes running a 3D-printer and collecting data via the attached sensors. The successful outcome will be a 3D-printer that is connected to an IoT platform and that displays collected data in a dashboard and GUI.</p> <p>PHASE A (2 weeks): During this introduction phase, the NSF REU student will (1) review relevant research; (2) investigate existing software and hardware in terms of the Prusa 3D-printer and its sensors, as well as the documentation of the IoT platform; and (3) develop a detailed work plan for the duration of the NSF REU summer project.</p> <p>PHASE B (3 weeks): Next, the student will connect the 3D-printer to the IoT platform, start collecting data from the sensors attached to the 3D-printer, and upload them to the platform. The student must identify whether additional sensors should be added. If that is the case, additional sensors will be provided. At the end of this phase, the student will document this work.</p> <p>PHASE C (3 weeks): Then, the student will create a dashboard using the provided tools of the IoT platform to display the data in the dashboard. The student can decide how to display the data. Additionally, a graphical user interface (GUI) should be created to provide the user with feedback about whether the printer is running and if the print job is finished. Additional information can be integrated into the GUI depending on the student's preferences. At the end of this phase, the student must test and validate the individual components, and then, the integrated system.</p> <p>PHASE D (2 weeks): Finally, the NSF REU student will document the research performed, prepare a written report, and deliver an end-of-summer presentation on the research performed.</p>	
May 22 - Jul 28, 2023 (10 weeks, 40 h/week)		
Target publications:	<ul style="list-style-type: none"> • IEEE Internet of Things Journal • Fraunhofer Direct Digital Manufacturing Conference 2025 	
Necessary Skills/ Knowledge:	<ul style="list-style-type: none"> • Basic programming skills (e.g., MATLAB, C, C++, Java) 	
Desirable Skills/ Knowledge:	<ul style="list-style-type: none"> • Experience with Python 	
Additional Online Resource(s):	https://www.ptw.tu-darmstadt.de/forschung_ptw/mip/projekte_mip/datapro_2/index.en.jsp https://youtu.be/G7kJ9CNmb4 -- Video: 6 minutes, German language	

NSF REU Students must have completed at least two semesters of engineering studies prior to the proposed summer research, and they must have at least one semester remaining before they can earn their BS in Engineering.