

AI4EU Robotics Pilot: Vibration sensor measurements in a robotic pump - Dataset Documentation

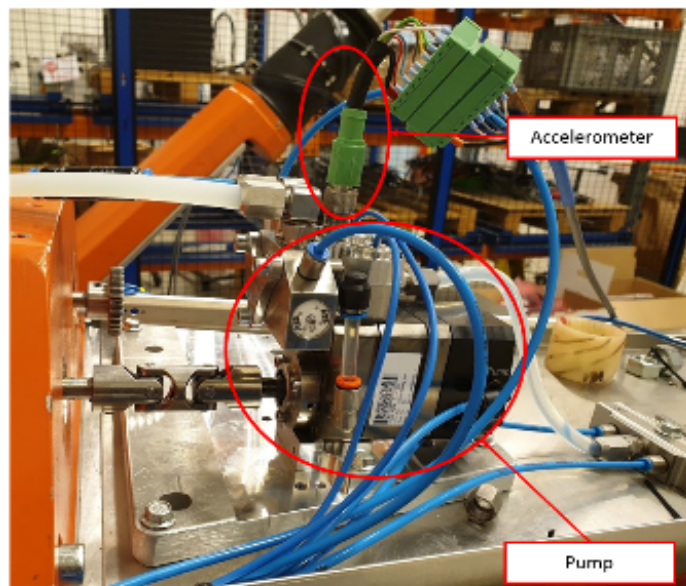
AI4EU¹ - AI4Robotics Pilot

Version 2021-11-26

Dataset DOI: [10.5281/zenodo.5729187](https://doi.org/10.5281/zenodo.5729187)

Contact: Helge Spieker (helge@simula.no)

The robotic pump demonstrator represents a hydraulic pump that can be mounted on an industrial robot, for example, to pump liquid paint for spray painting. On this pump, one accelerometer is mounted for vibration monitoring and recording. The pump can be controlled in terms of speed (rotations per minute, rpm), affecting the throughput of paint and the pressure in and out of the pump. The dataset consists of 380 million measurements of several sensor data of a pump system in 1-second intervals over two months in 2020.



The pump is controlled in repeated patterns (see column *pattern*), e.g. first there is a transition phase where the pump goes from one speed setting to another and afterwards there is an idle phase where the pump runs on the set speed. These patterns are repeated multiple times (see column *iteration*). During the 1-second intervals, the main sensor information is the vibration sensor (column *s1*, see figure for sensor location) that records the vibration of the pump at a high frequency (6.14kHz). There is additional sensor data (e.g. the voltage, torque, or pressure of the pump) which is sampled at a lower frequency and interpolated for the other timestamps. For the first measurements in a series, the columns *DrvSetPoint* and *DrvTemp* are NaN, because the information is not yet available and we do not want to extrapolate.

The unique identifier for one interval is *key + phase*.

The dataset consists of measurements of several sensor data of a pump system in 1-second intervals over two months in 2020. The file names are not continuous. For some dates there are no measurements due to instabilities in the recording environment and restricted access to the setup due to the COVID-19 pandemic.

¹ <https://www.ai4europe.eu/> (A European AI On Demand Platform and Ecosystem, EU Grant: 825619)

Dataset Column Description

Column	Unit/Domain	Observed Values	Description
time	Datetime with nanoseconds		Timestamp of measurement (includes constant timezone information (+00:00))
key	Key to identify series		Main identifier to split individual measurement intervals
phase	transition or stationary		transition: an acceleration phase going from one speed to another stationary: idling at a set speed
pattern	String		General pattern the pump demonstrator repeats, e.g. going from one speed to another
iteration	Integer		Repetition of the current pattern
s1	$\sqrt{x^2 + y^2 + z^2}$		Magnitude of vibration sensor reading
actPump	ml/min	[-62,06; 586,84]	Pump flow reported by the pump (actual flow)
DrvActual	rpm	[-130; 1238]	Current motor rpms reported (actual rpms)
DrvTorque	Nm	[-0,9521; 1,274]	Measured torque
DrvSetPoint	rpm	[0.0; 1055]	Target rpm set by the driver
DrvTemp	Degrees celsius	[29,6; 53,9]	Temperature in the pump
DrvVolt	Volt	[264; 285]	Measured voltage inside the motor
pressIn	bar	[-0,011; 0,533]	Pressure going into the pump
pressOut	bar	[-0,583; 15,223]	Pressure going out of the pump
temp	Degrees celsius	[19,56; 31,75]	Temperature outside the pump