

Edge Processing Unit

The Way to Efficient Edge Computing for Industry 4.0 Silvan Zahno ^{1,2}, Sharam Dadashnia ^{1,3,4}, Remo Schnyder ⁵

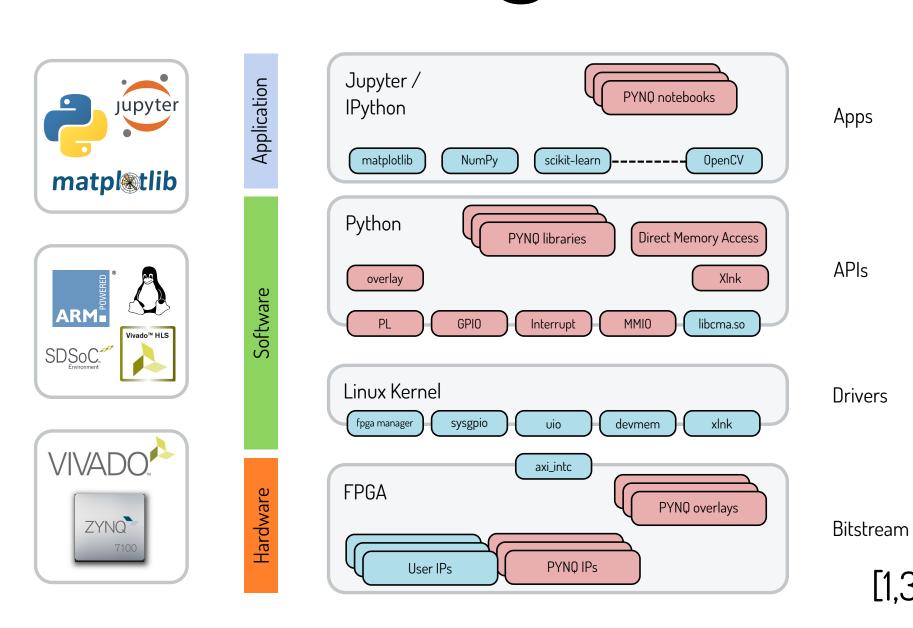
Industrie 112025

¹ Swiss Distance University of Applied Sciences, Brig, Switzerland; ² University of Applied Sciences and Arts Western Switzerland Valais, Sion, Switzerland; ³ Scheer GmBH, Saarbrücken, Germany; ⁴ Saarland University, Saarbrücken, Germany; ⁵ Syrto AG, Raron, Switzerland

Background

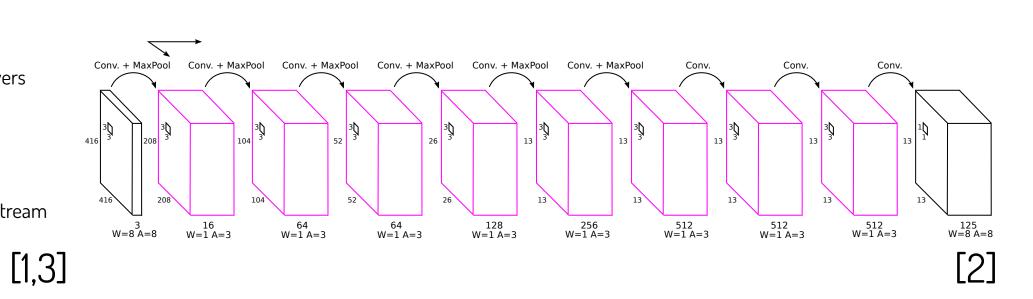
Edge computing has proven to be very valuable and is often needed in addition to cloud computing. Especially in areas such as image and video processing, where large amount of data is generated that cannot be transferred in their entirety to the cloud for processing, or in areas where security and real-time behavior are essential.

Technologies



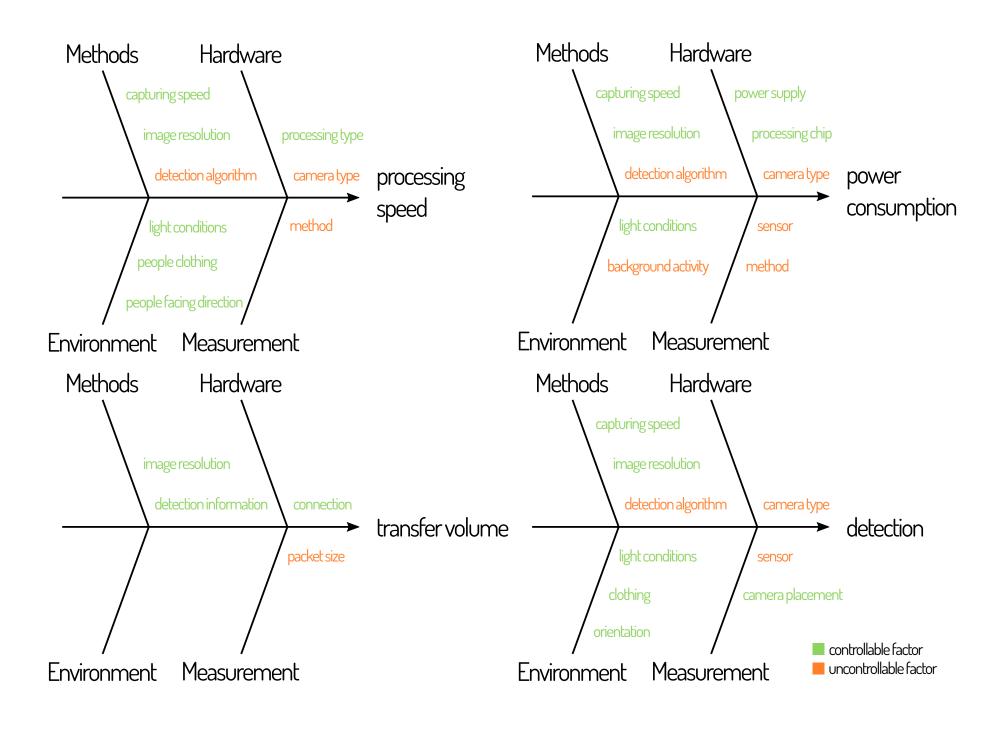
Implementation

- Streamlit Frontend Dashboard
- Python Backend Application
- Tiny Yolo v3 CNN Hardware Accelerated
- MQTT Broker and Communication



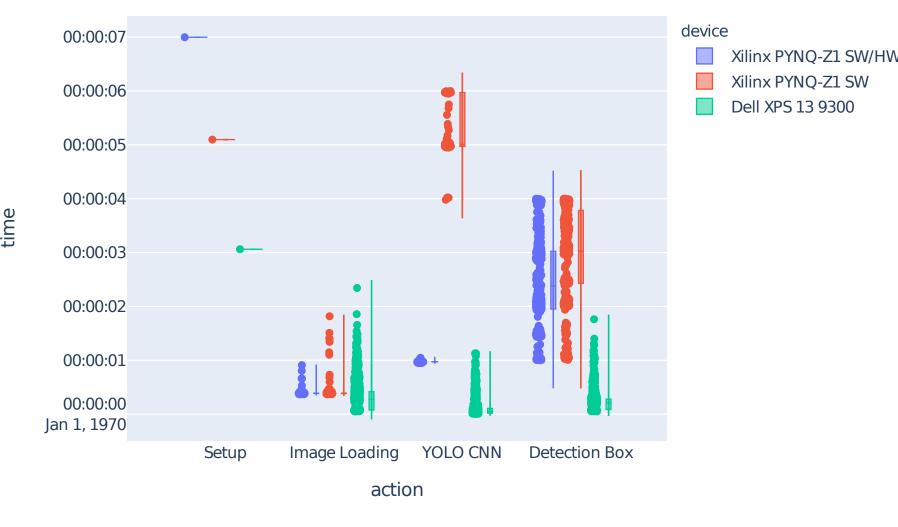
Methods

- Proof of concept (POC) system developed for data collection.
- Three industrial usecases were identified and evaluated across four criteria.
- Experiments allow to fix and interchange predefined parameters.
- 28 evaluated scenarios.
- 790 selected images processed.



Results

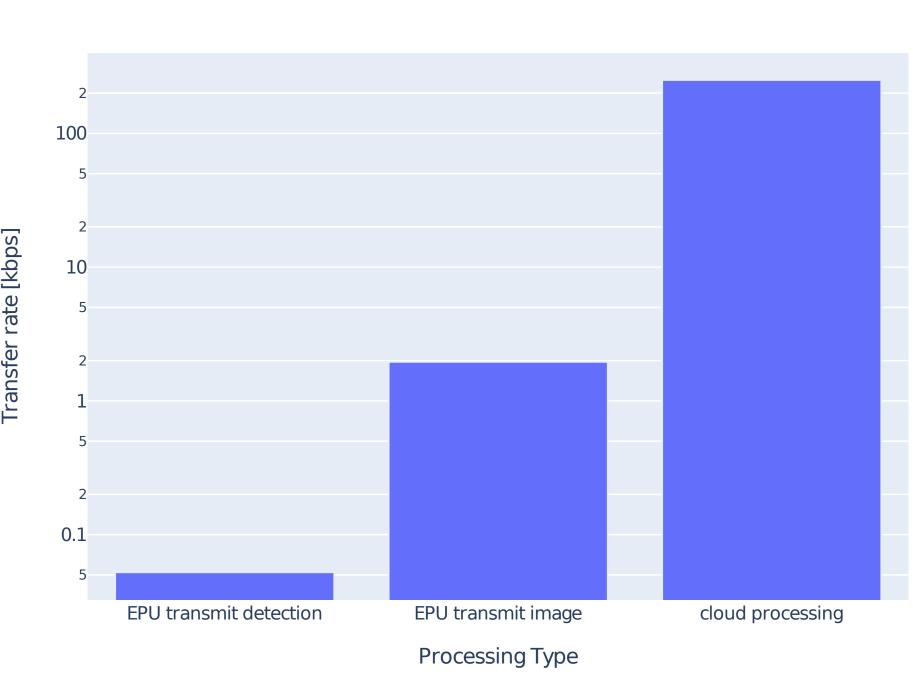
Comparison FPGA vs. Software



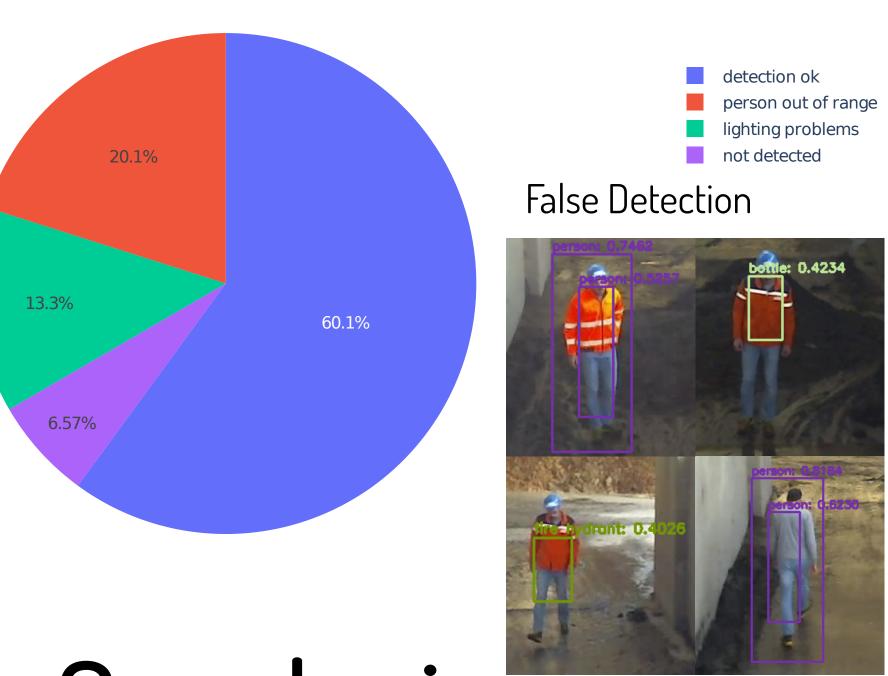
Comparison Energy



Comparison Data Transferrate



Overall Detection Rate



- Evaluation criteria: Detection, Importance, Environment, Installation.
- Highly automated slug treatment facility.
- Selected usecase contains an automatic crane, people verify the operation and wheelloader & truck deliver new to be processed material.

Use Case

Edge Processing Unit MOTT Broker Clients Cloud User GUI On-site PLC [3]

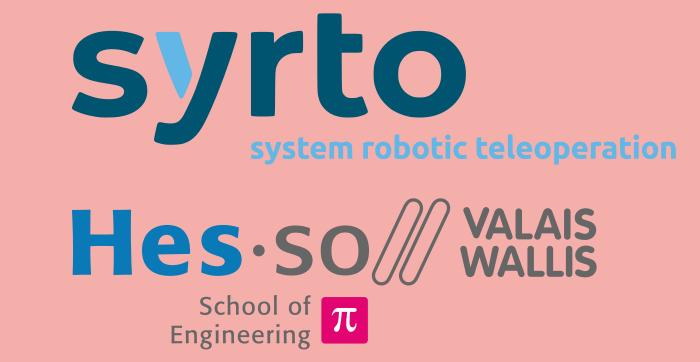
Conclusion

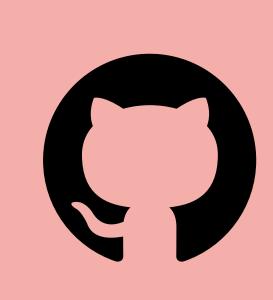
- Additional knowhow required
- Abstraction layer for FPGA developement
- Adaptive hardware for future expansion
- On-site processing reducing latency & bw

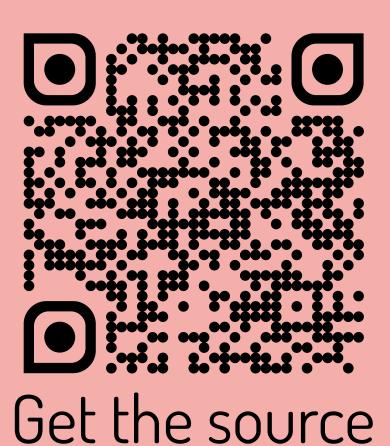
References

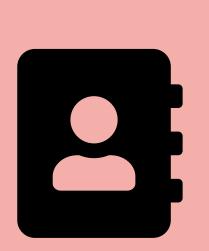
- [1] Xilinx. (2020, June). PYNQ Python productivity for Zynq. http://www.pynq.io/
- [2] Xilinx. (2020, December). QNN-MO-PYNQ. https://github.com/Xilinx/QNN-MO-PYNQ
- [3] This poster has been designed using resources from Flaticon.com and Fontawesome.com

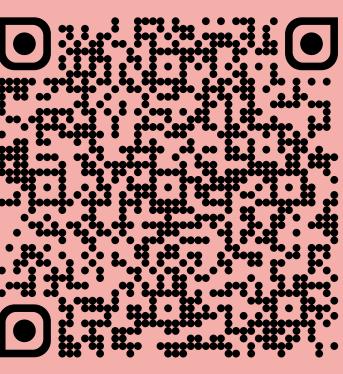












Contact me