Predictive Maintenance
Doc v1.0.0

Problem we are addressing :

The time consuming nature of machine maintenance in large manufacturing and industrial processes, most of the troubleshooting and fault finding when a machine fails is done manually and as a result requires long hours and sometimes days. To address this we propose a solution to enable individuals with the foresight to rapidly resolve issues.

Why manufacturing you might ask?

The manufacturing industry faces challenges in :
-   The trustworthiness of the AI systems(should it be trusted over human intuition)
-   Lack of experts in the field working in these companies
-   Producing reliable insights with the data

AI/ML will be tools that enhance overall work in terms of production forecasting and machine maintenance. Most manufacturing companies use IOT enabled devices to allow for communication between different components on their factory floor. This presents us with the opportunity not just to gather the different data points and gain meaningful insights from them but also as a way to educate individuals from floor managers to machine operators to become more familiar with the systems. At the core the predictive maintenance solution aims to address a common issue in the field of industrial automation where fault finding and repairs in large machines are time consuming, the solution aims to reduce the overall duration of the process

Recently Siemens has partnered with Microsoft to create an Industrial copilot, Combining Siemens' unique domain know-how across industries with Microsoft Azure OpenAI Service,

the Copilot further improves handling of rigorous requirements in manufacturing and automation. Which has shown the overall appetite for AI/ML solutions in the Industry.

"The collaboration between Siemens and Microsoft marks a pivotal moment in the industrial sector; one where AI Transformation becomes a cornerstone for innovation and operational efficiency," said Judson Althoff, executive vice president and chief commercial officer at Microsoft.
Source :
https://press.siemens.com/global/en/pressrelease/siemens-and-microsoft-scale-industrial-ai?%3Fstc=press_cm

Note : access to the S7-1200 PLC was restricted and for demo purposes we will be using a publicly available dataset

Solution :
A Webapp that can predict the machines overall likelihood of failure and visualise important KPIs

Working methodology :

- Data from the PLC (Siemens S7 1200) is put into onelake via a tabular data stream from the siemens PLC
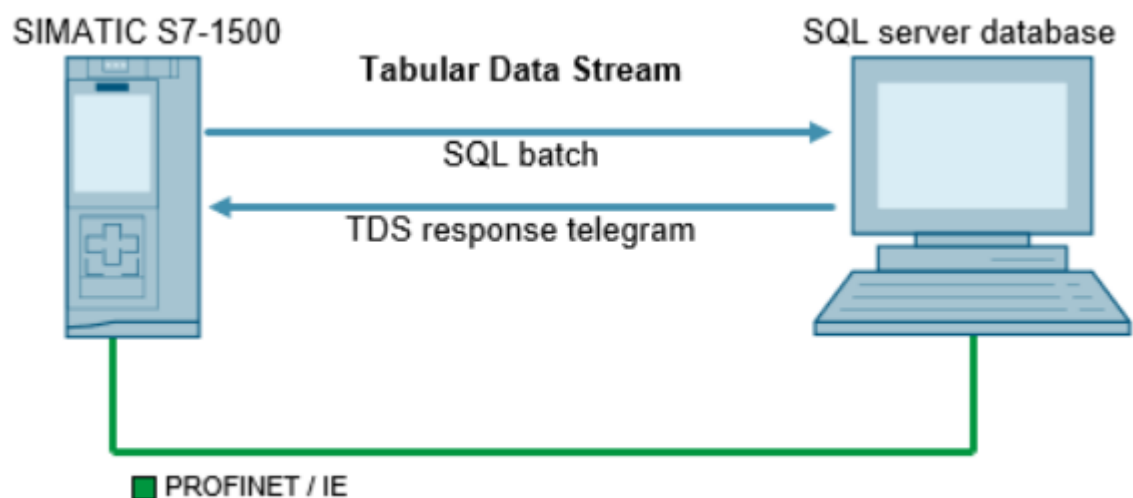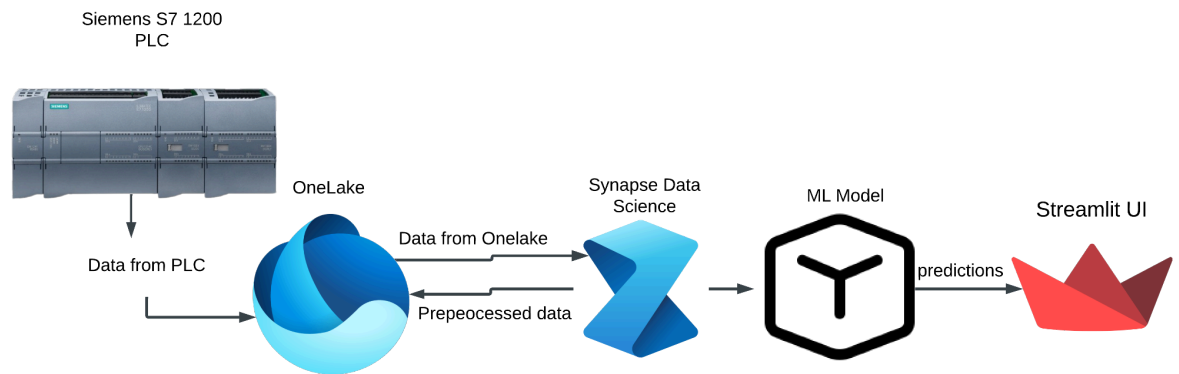

Fig. 1

Full documentation can be found :
Connecting a S7-1200 PLC / S7-1500 PLC to a SQL Database - ID: 109779336 - Industry Support Siemens
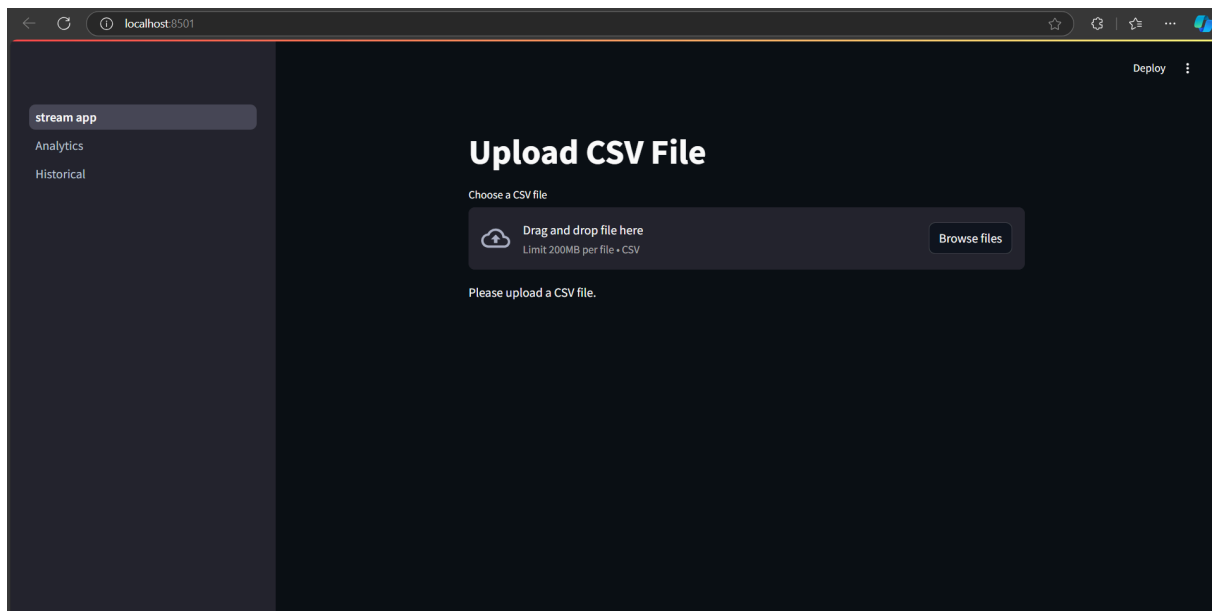
- The data in OneLake is then preprocessed , as well as engineered with new features the preprocessed data is then used to train a machine learning model, the model is then saved and used to make predictions of data that can either be uploaded as a csv or manually input
- Visualisations will be handled inside the webapp by the individual toggling on which visualisations they want

To visualise the flow of data from start to finish see image below :

Siemens S7 1200
PLC

Data from PLC

OneLake

Data from Onelake

Prepeocessed data

Synapse Data
Science
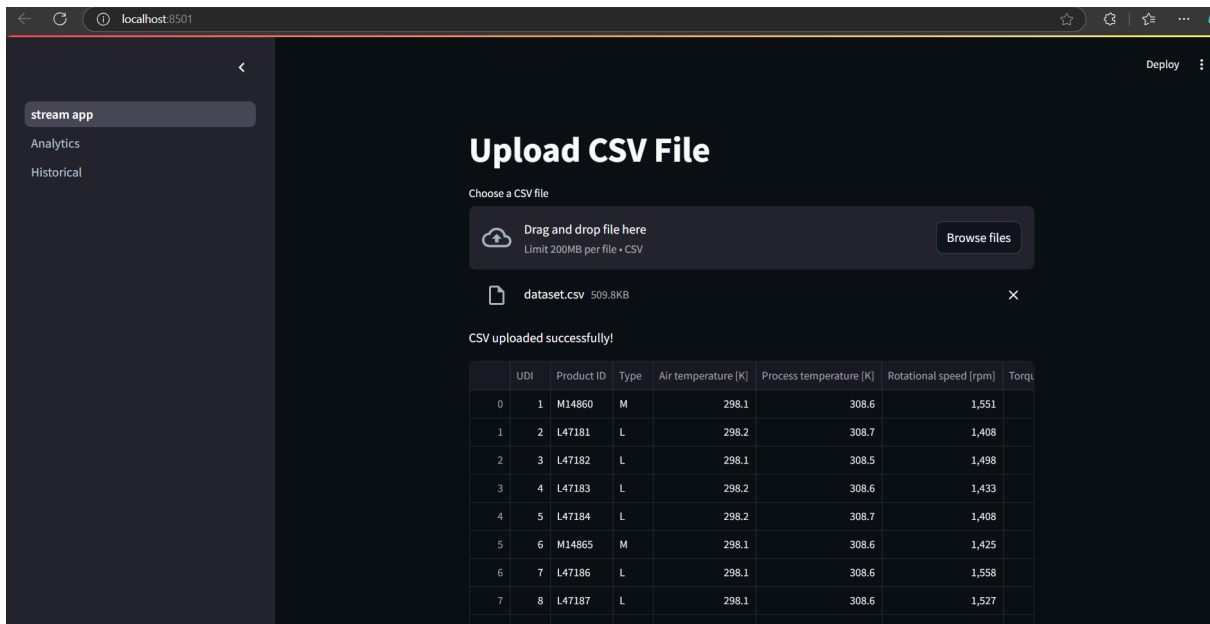
ML Model

predictions

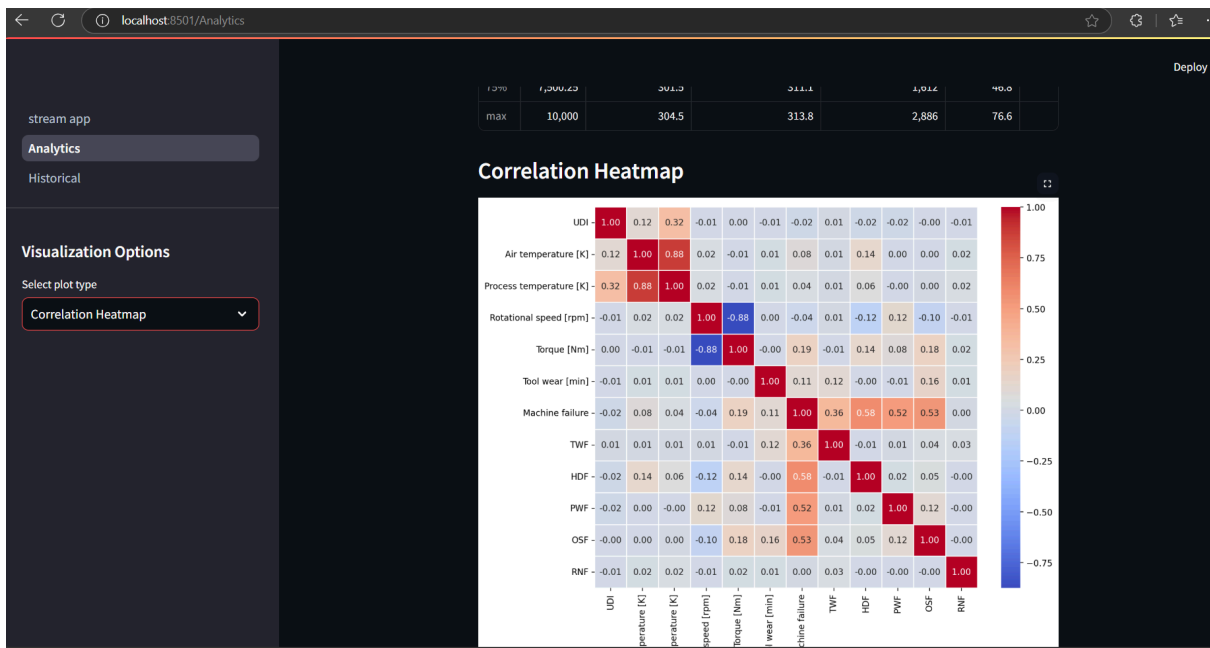Streamlit UI

The Web App :

On the landing page the user is prompted to upload a dataset

The moment the CSV is uploaded you get notified, with a small tabular visualisation

On the analytics side, the the moment the user clicks on the analytics a new window pops up and gives different visualisations available to the user

Other Visualization