Experiment driven and user eXPerience oriented Analytics for eXtremely Precise outcomes and decisions

Data Ingestion & Enrichment

ExtremeXP Concept

- A **human-centered approach** to AI and data driven analytics
- **Experimentation** is the core concept for generating extremely accurate analytics
- **Optimise the properties of a complex analytic process** (e.g., accuracy, time-to-answer, specificity, recall, precision, resource utilization) **by associating different user profiles to computation variants**.

AI Experimentation Lifecycle

Select & Prepare Data

Choose datasets, preprocessing options, etc.

Setup Experiment

Define workflows, select different models, configure hyperparameters

Run Experiment

Execute experiment, log parameters, metrics, and artifacts for each run

Evaluate Results

Assess metrics and compare performance across runs

I need to train a model for my task

Data scientist

Explore & Interpret

Drill into data and explain model behavior

Validate, Refine & Improve

Based on insights, adjust experiment for the next cycle

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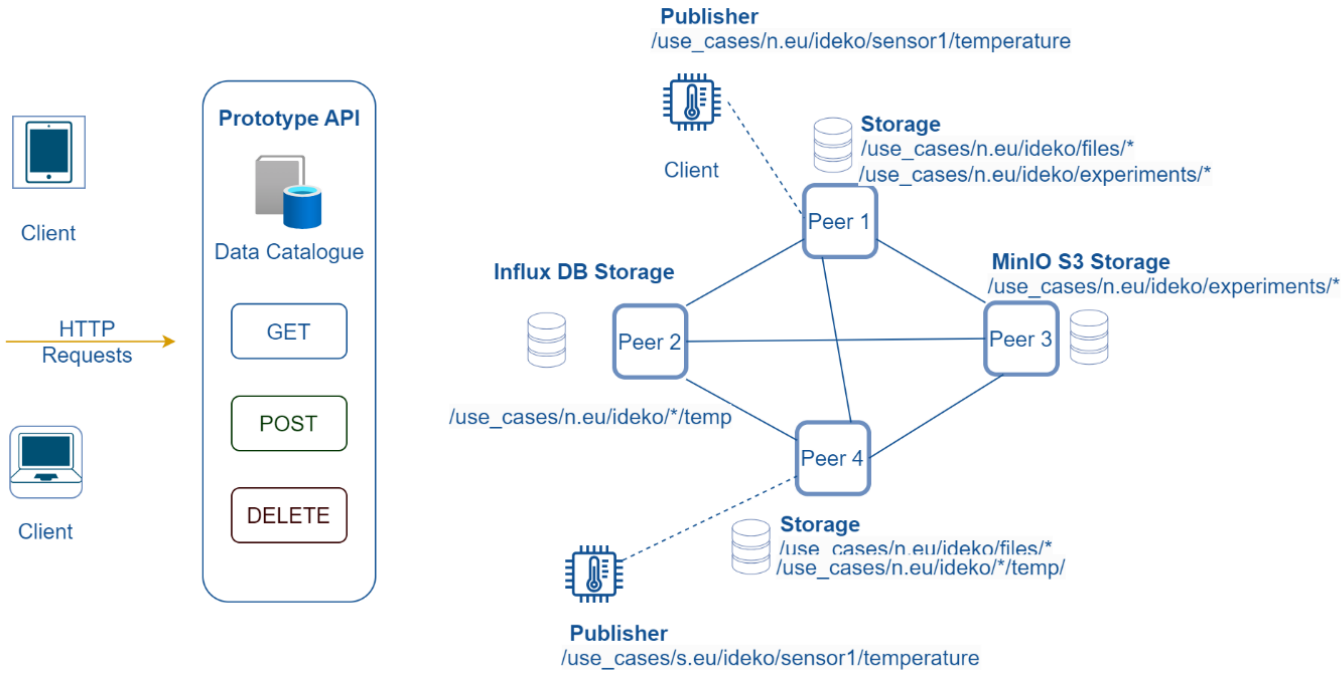
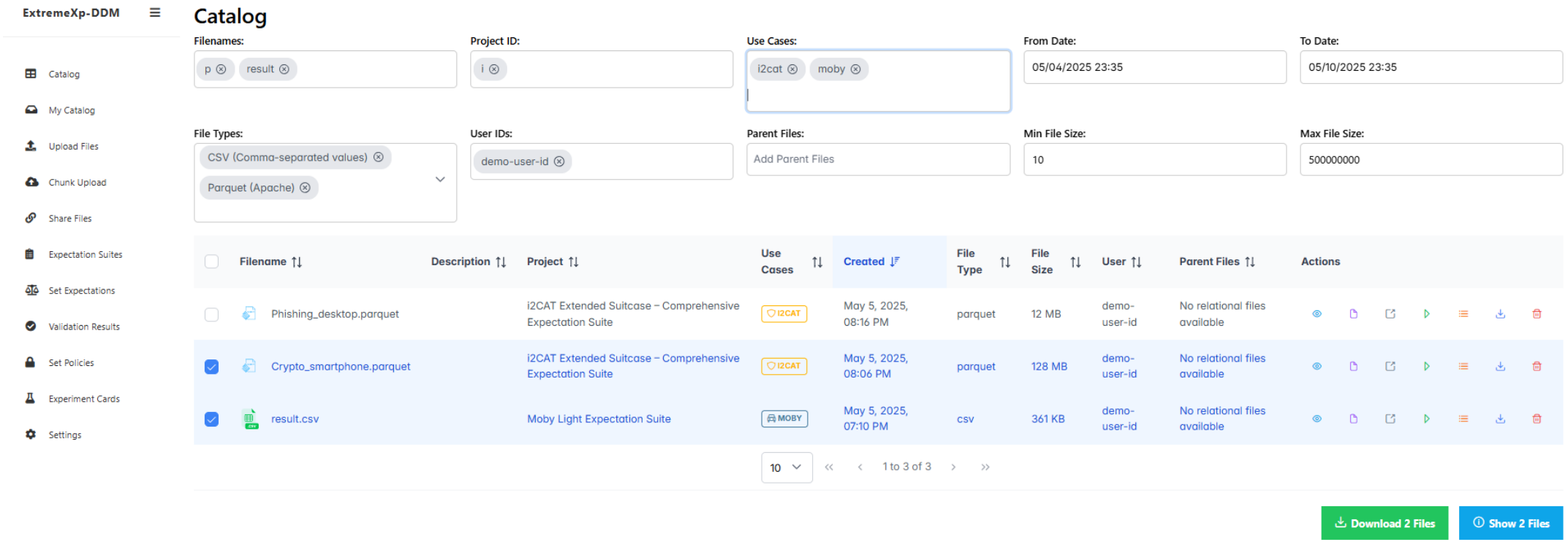
Zenoh Decentralized data management

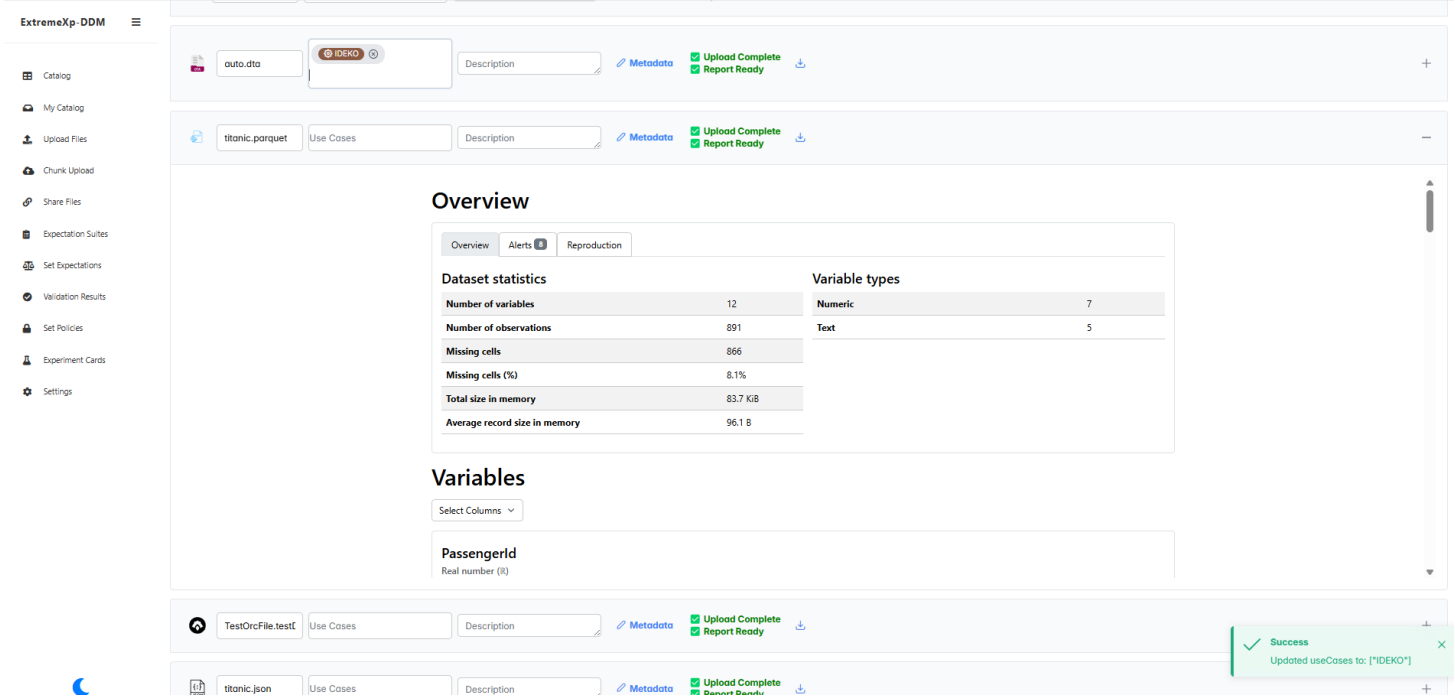


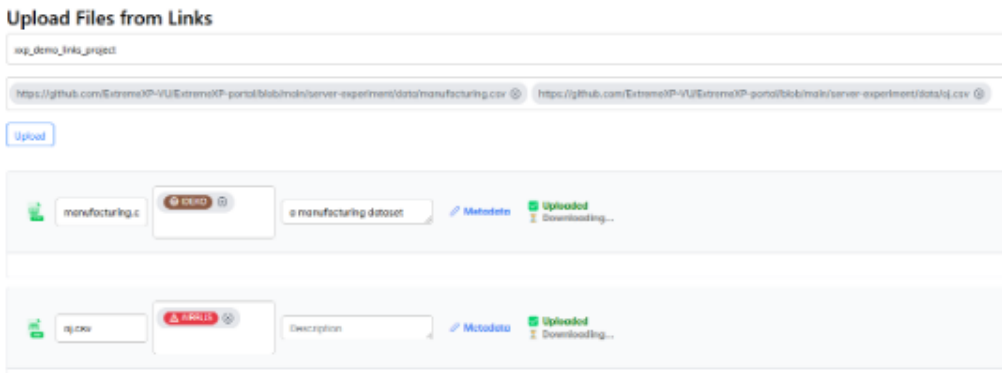
- Contextual information (location, user roles) for **access control policies**
- **Context handlers** developed as microservices for gathering contextual information necessary for evaluating incoming access requests.
- Integration of **decentralized data management tools** (zenoh).
- Access control mechanism using **smart contract and token standards**.

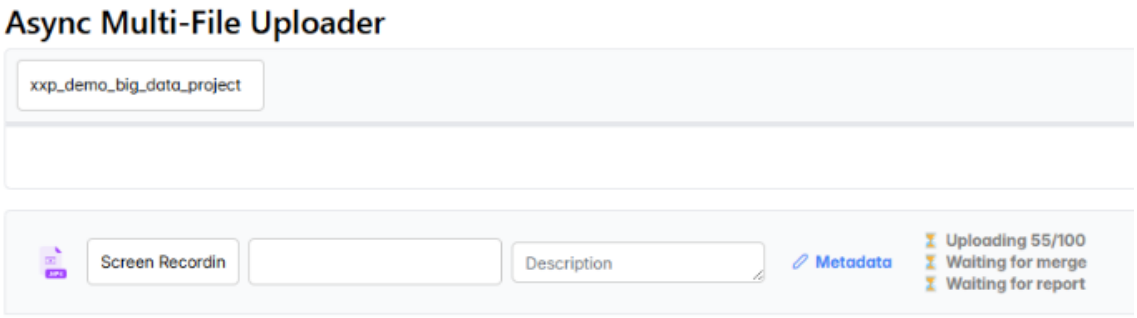
DDM Catalog


ExtremeXp-DDM
Catalog
My Catalog
Upload Files
Chunk Upload
Share Files
Expectation Suites
Set Expectations
Validation Results
Set Policies
Experiment Cards
Settings
Catalog
Filenames:
p
result
Project ID:
i
Use Cases:
i2cat
moby
From Date:
05/04/2025 23:35
To Date:
05/10/2025 23:35
File Types:
CSV (Comma-separated values)
Parquet (Apache)
User IDs:
demo-user-id
Parent Files:
Add Parent Files
Min File Size:
10
Max File Size:
500000000
Filename
Description
Project
Use Cases
Created
File Type
File Size
User
Parent Files
Actions
Phishing_desktop.parquet
i2CAT Extended Suitcase – Comprehensive Expectation Suite
I2CAT
May 5, 2025, 08:16 PM
parquet
12 MB
demo-user-id
No relational files available
Crypto_smartphone.parquet
i2CAT Extended Suitcase – Comprehensive Expectation Suite
I2CAT
May 5, 2025, 08:06 PM
parquet
128 MB
demo-user-id
No relational files available
result.csv
Moby Light Expectation Suite
MOBY
May 5, 2025, 07:10 PM
csv
361 KB
demo-user-id
No relational files available
10
1 to 3 of 3
Download 2 Files
Show 2 Files

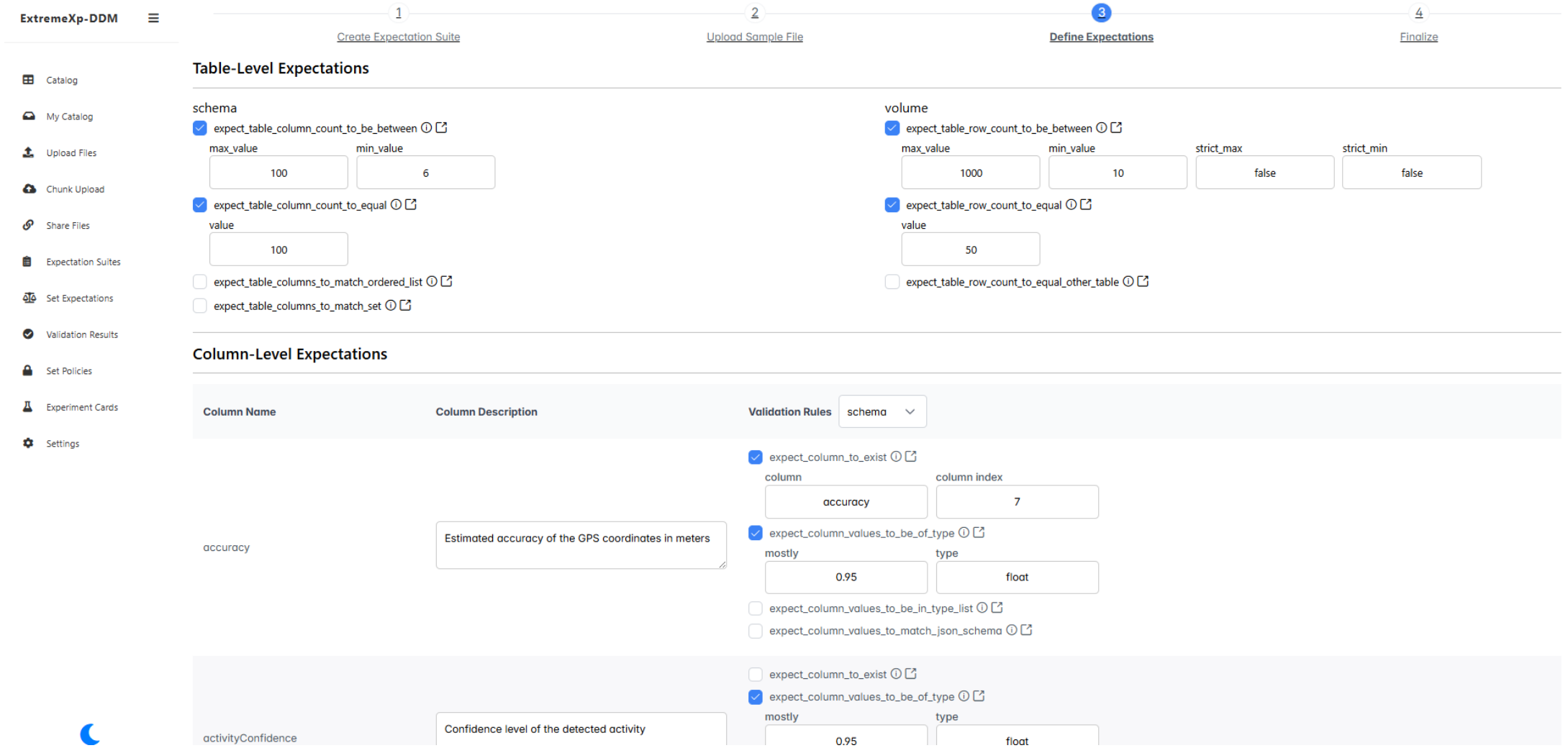
DDM File Uploads, Chunk Uploads, Share Links





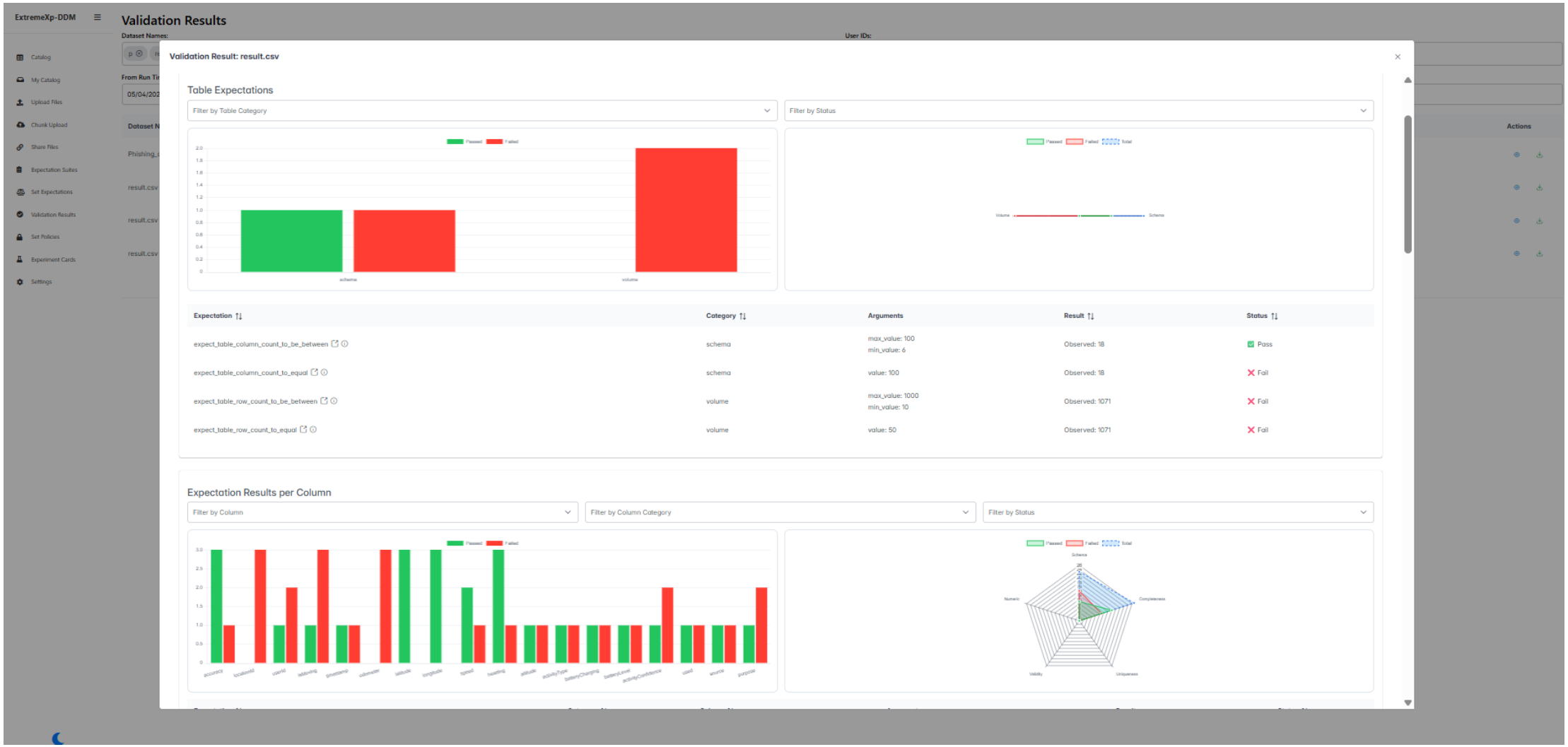


DDM Dataset Expectations & LLM Column Descriptions



https://github.com/extremexp-HORIZON/DDM

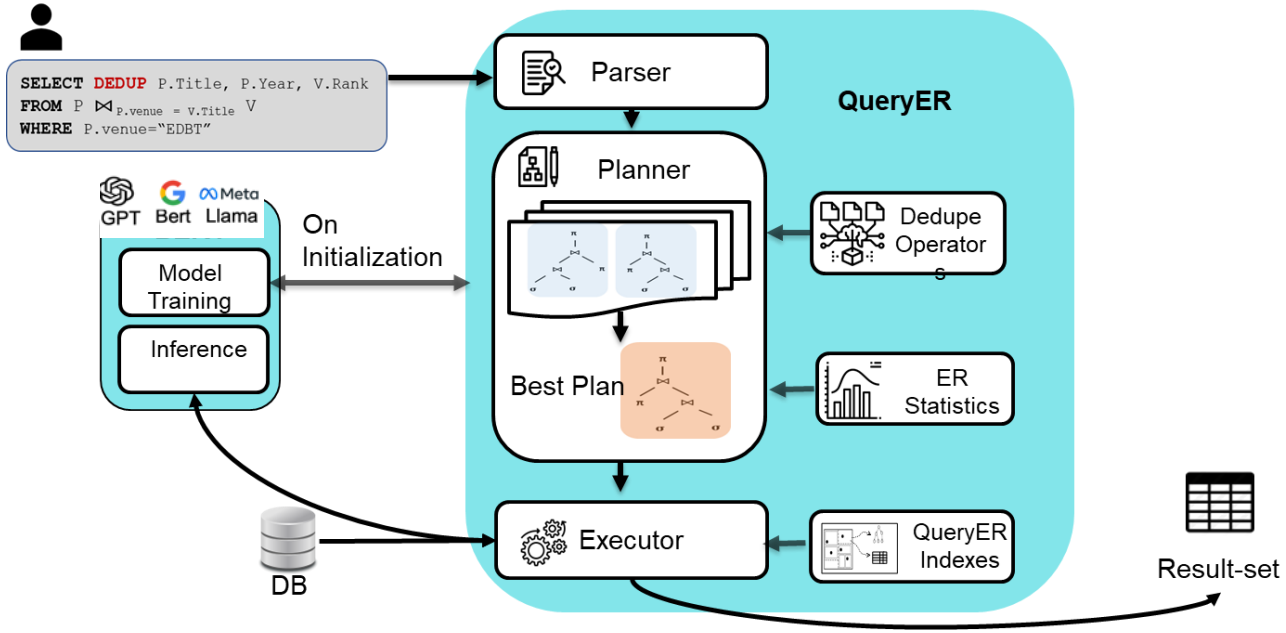
DDM Dataset Validations



More Screenshots https://github.com/extremexp-HORIZON/DDM

QueryER ML– On Demand Entity Resolution

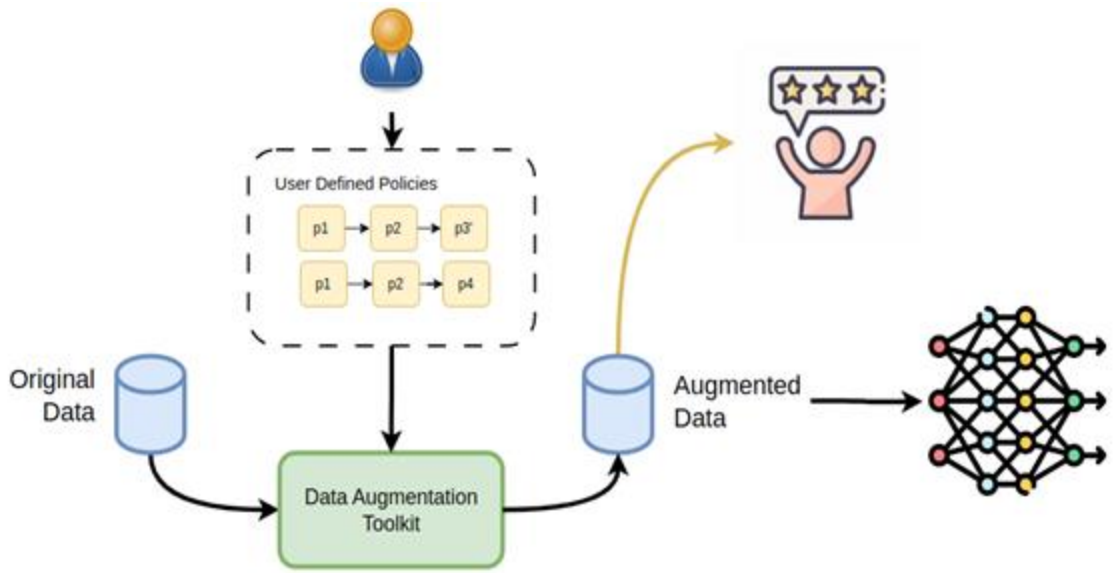
Data Integration using GPUs. Use of LLM models for entity resolution and data interlinking during user analysis



https://github.com/ExtremeXP-EU/QueryMLER

Data Augmentation Toolkit

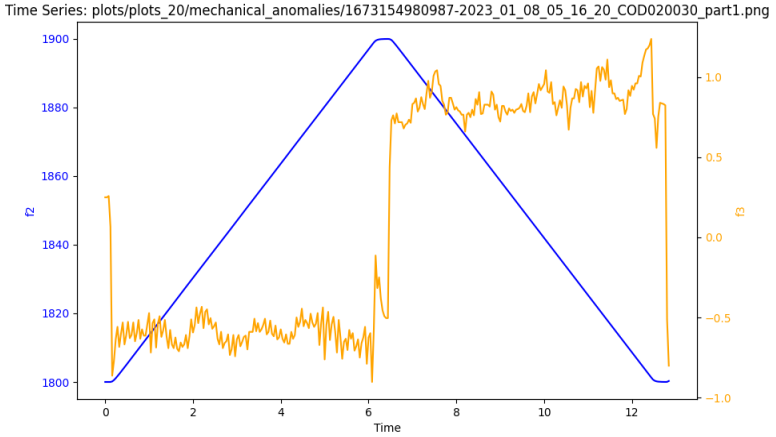
- Determine efficient **user-defined quality policies** to guide the DA algorithm, e.g. missing data types and ranges within datasets
- **Simulation-driven**. In the event that a region is detected where it is impossible to generate quality augmentation, a simulation will be proposed for a specific data region.



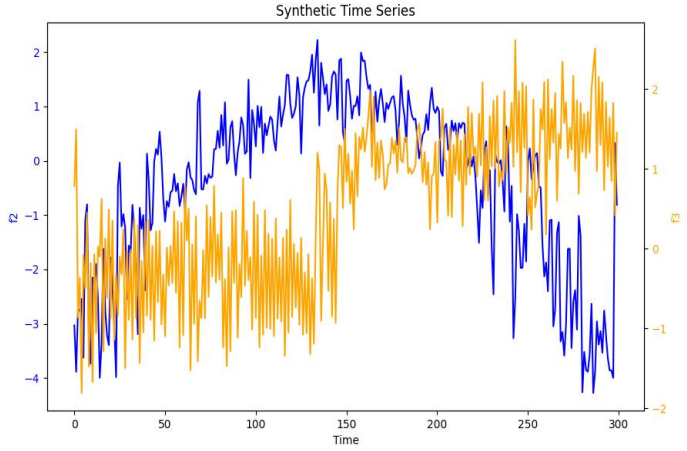
Timeseries data generation

Failure Prediction in Maintenance

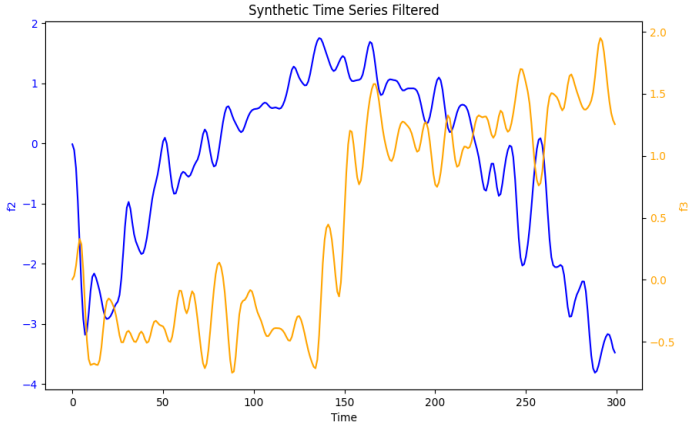
- Analysis of Machine signals to observe anomalous behaviors



I want to generate new synthetic time series using the DA component



After Looking the generated data, reduce the noise (policy)



Data product creation

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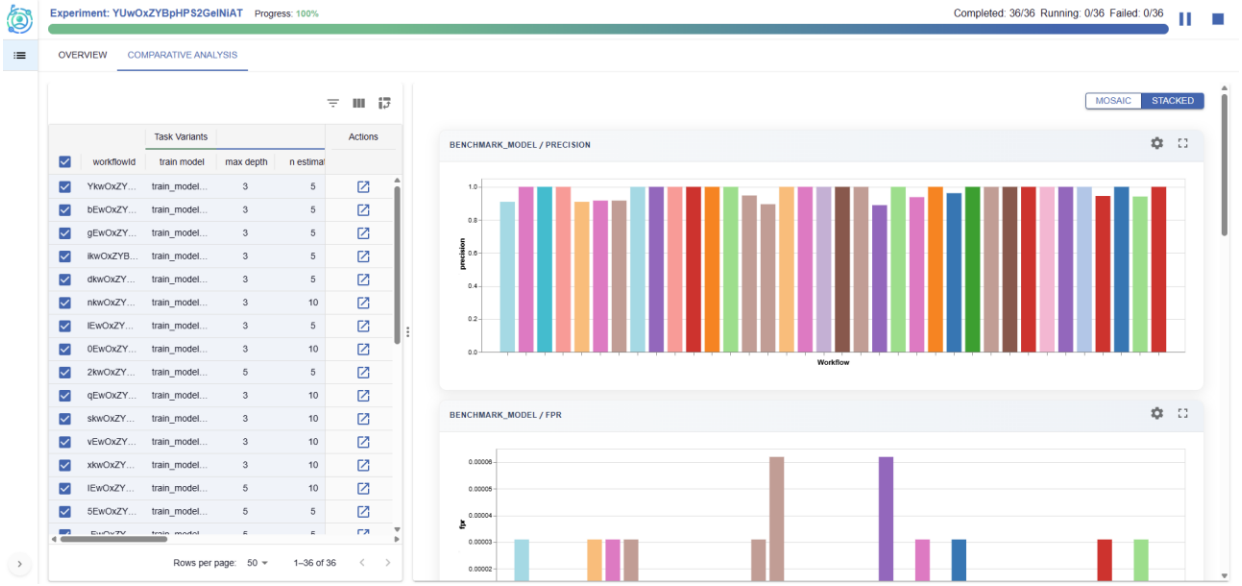
ExperimentLens

Live Demo: https://experimentlens.imsi.athenarc.gr/demo/

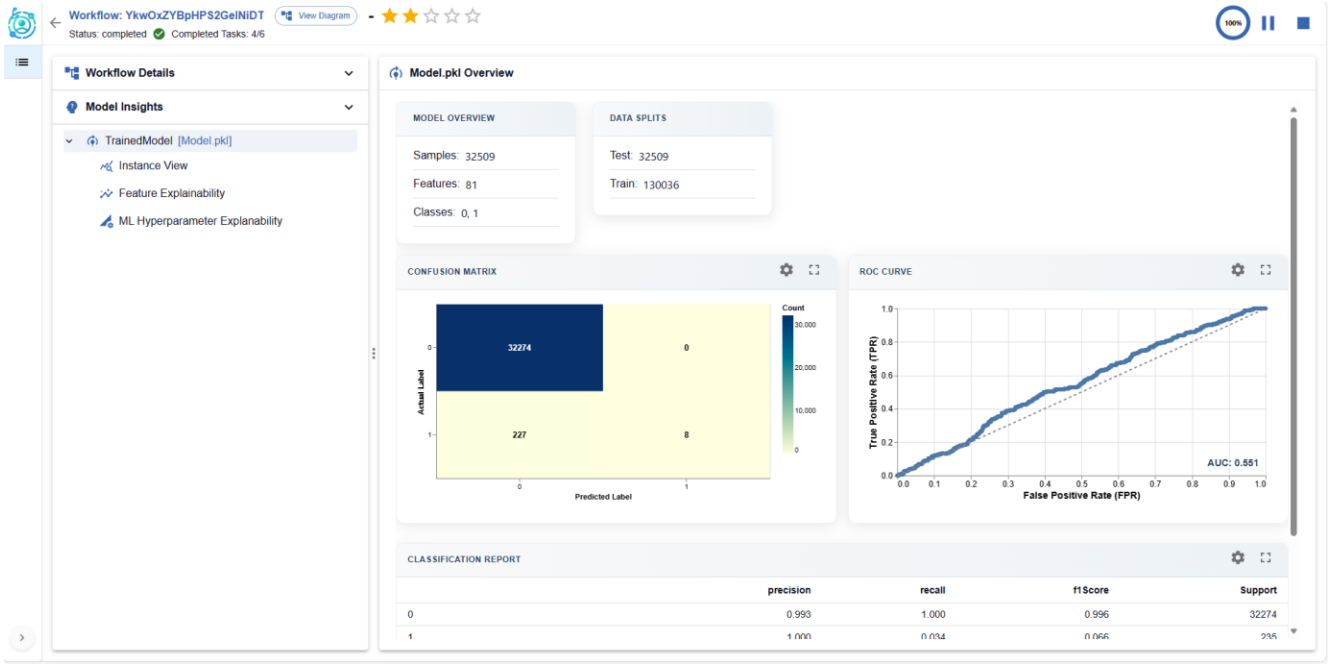


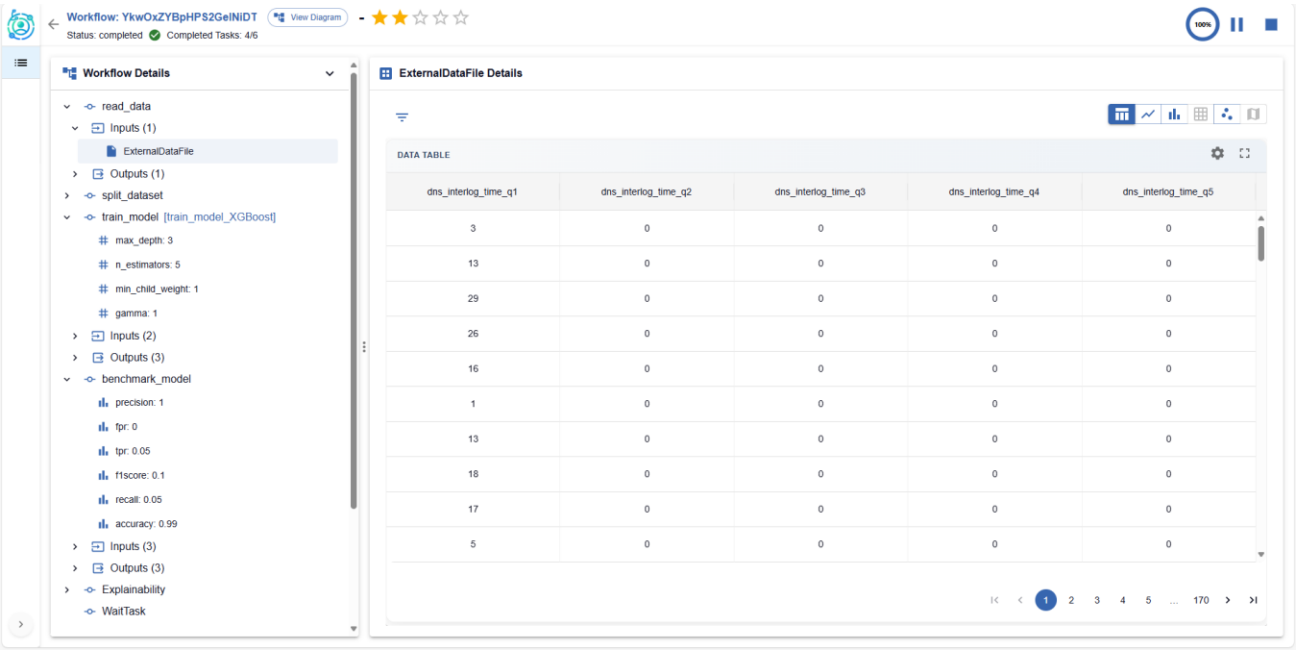
Run and Configuration Analysis

- Extensible Experiment Analytics Tool
  - Works on top of existing trackers (e.g., MLflow)
  - Supports multiple backends via adapters
- Compare metrics and outputs across multiple experiment runs.
- Analyze the effect of variability points (e.g., hyperparameters, engine configurations).
- Detect patterns, trends, and outliers across different pipeline variants.

Pipeline Control and Human-in-the-Loop Feedback

- Monitor and steer pipeline executions at runtime, guided by intermediate results and visual feedback.
- Use diagnostic views to adjust configuration choices and re-launch modified pipelines.
- Support interactive refinement by integrating user feedback into the exploration process.



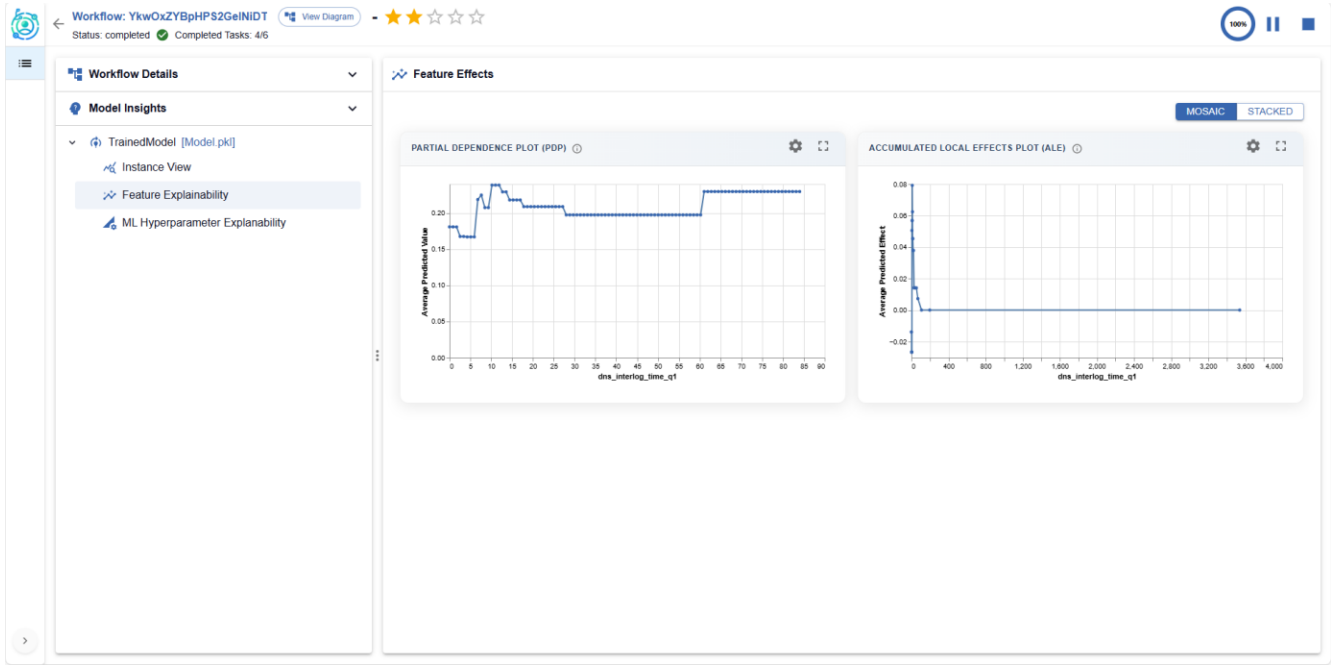


Artifact and Data Inspection

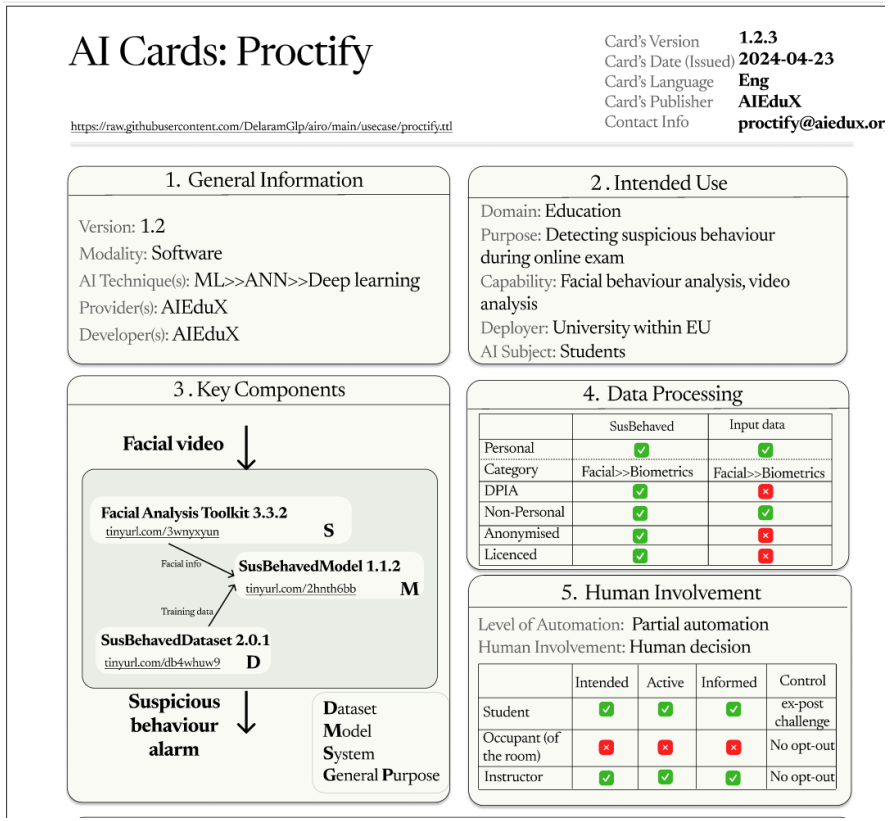
- Preview input and output datasets, prediction results, and artifacts in rich visual formats.
- Context-aware inspection scoped to the task and pipeline level.

Integrated Explainability

- Access both local and global post-hoc explanation techniques.
- Visualize results of explainability methods like counterfactual examples, Partial Dependence Plots (PDP), and Accumulated Local Effects (ALE).
- Link pipeline behavior to specific inputs, parameter settings, and structure.



Experiment Cards:
Make your AI pipeline more transparent, understandable, and accountable.



AI Cards: Proctify

Card's Version 1.2.3
Card's Date (Issued) 2024-04-23
Card's Language Eng
Card's Publisher AIEduX
Contact Info proctify@aiedux.or

https://raw.githubusercontent.com/DelaramGlp/airo/main/usecase/proctify.ttl

1. General Information

Version: 1.2
Modality: Software
AI Technique(s): ML>>ANN>>Deep learning
Provider(s): AIEduX
Developer(s): AIEduX

2. Intended Use

Domain: Education
Purpose: Detecting suspicious behaviour during online exam
Capability: Facial behaviour analysis, video analysis
Deployer: University within EU
AI Subject: Students

3. Key Components

Facial video
Facial Analysis Toolkit 3.3.2
tinyurl.com/3wnyxyun S
Facial info
SusBehavedModel 1.1.2
tinyurl.com/2hnth6bb M
Training data
SusBehavedDataset 2.0.1
tinyurl.com/db4whuw9 D
Suspicious behaviour alarm
Dataset
Model
System
General Purpose

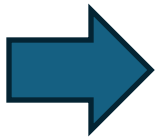
4. Data Processing

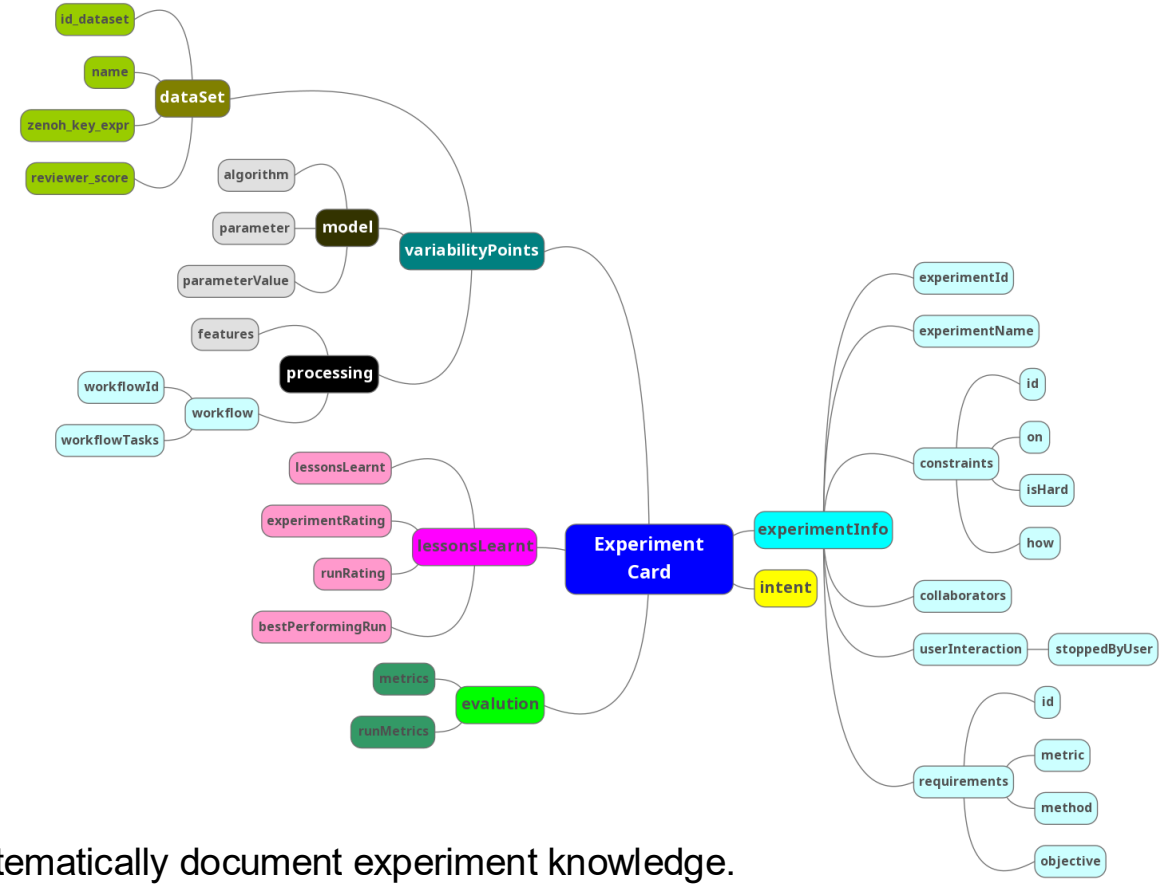
	SusBehaved	Input data
Personal	✓	✓
Category	Facial>>Biometrics	Facial>>Biometrics
DPIA	✓	✗
Non-Personal	✓	✓
Anonymised	✓	✗
Licenced	✓	✗

5. Human Involvement

Level of Automation: Partial automation
Human Involvement: Human decision

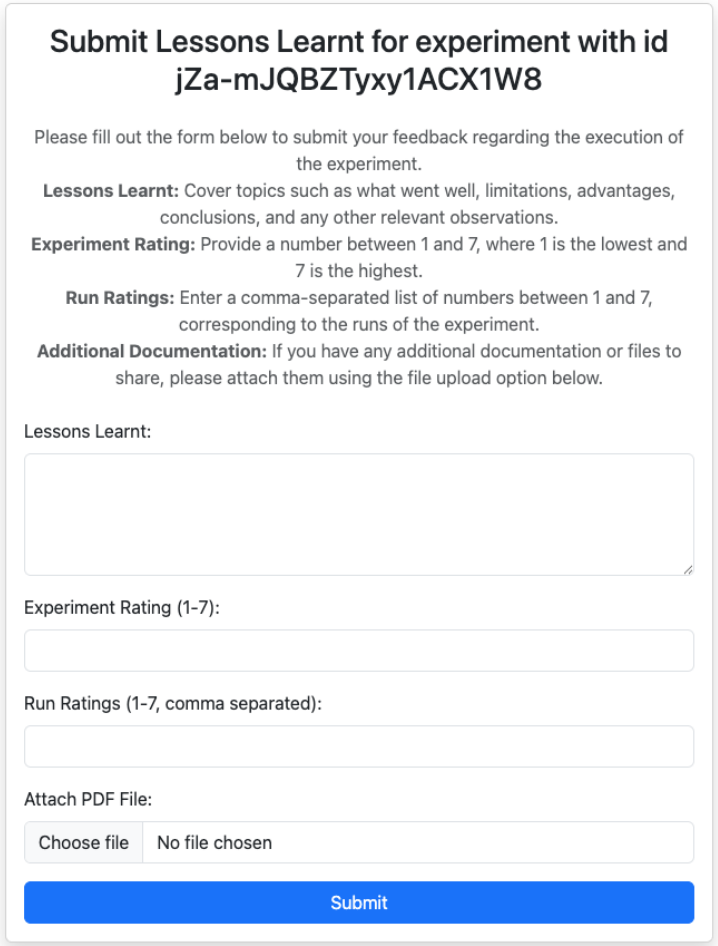
	Intended	Active	Informed	Control
Student	✓	✓	✓	ex-post challenge
Occupant (of the room)	✗	✗	✗	No opt-out
Instructor	✓	✓	✓	No opt-out

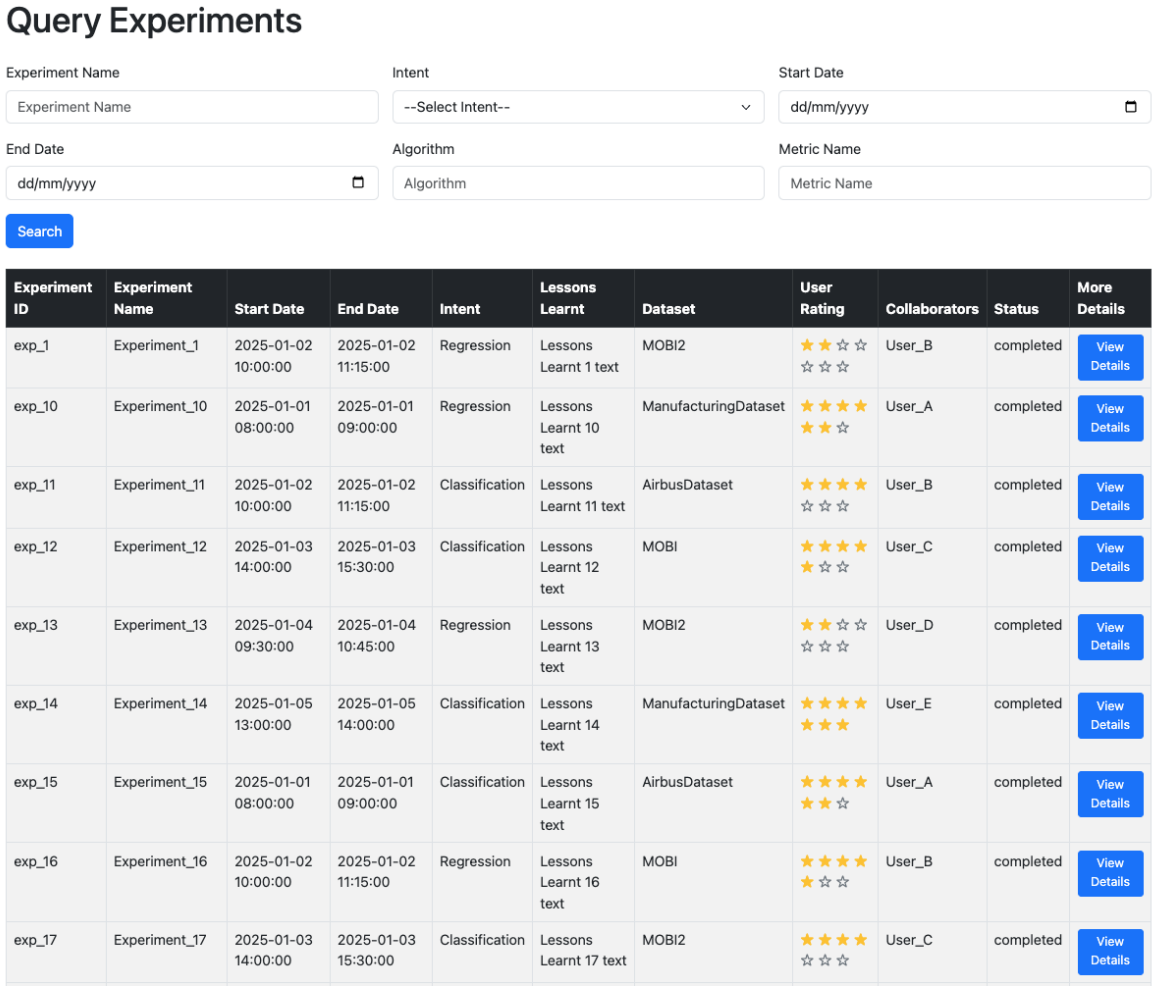




Create an Experiment Card - *similarly to the AI card shown* – to systematically document experiment knowledge.
Readable by users, but also automatically populated where applicable

User Interaction and Form-Based Input





Experiment ID	Experiment Name	Start Date	End Date	Intent	Lessons Learnt	Dataset	User Rating	Collaborators	Status	More Details
exp_1	Experiment_1	2025-01-02 10:00:00	2025-01-02 11:15:00	Regression	Lessons Learnt 1 text	MOBI2	★★☆☆☆☆☆	User_B	completed	View Details
exp_10	Experiment_10	2025-01-01 08:00:00	2025-01-01 09:00:00	Regression	Lessons Learnt 10 text	ManufacturingDataset	★★★★★★☆	User_A	completed	View Details
exp_11	Experiment_11	2025-01-02 10:00:00	2025-01-02 11:15:00	Classification	Lessons Learnt 11 text	AirbusDataset	★★★★☆☆☆	User_B	completed	View Details
exp_12	Experiment_12	2025-01-03 14:00:00	2025-01-03 15:30:00	Classification	Lessons Learnt 12 text	MOBI	★★★★★☆☆	User_C	completed	View Details
exp_13	Experiment_13	2025-01-04 09:30:00	2025-01-04 10:45:00	Regression	Lessons Learnt 13 text	MOBI2	★★☆☆☆☆☆	User_D	completed	View Details
exp_14	Experiment_14	2025-01-05 13:00:00	2025-01-05 14:00:00	Classification	Lessons Learnt 14 text	ManufacturingDataset	★★★★★★★	User_E	completed	View Details
exp_15	Experiment_15	2025-01-01 08:00:00	2025-01-01 09:00:00	Classification	Lessons Learnt 15 text	AirbusDataset	★★★★★★☆	User_A	completed	View Details
exp_16	Experiment_16	2025-01-02 10:00:00	2025-01-02 11:15:00	Regression	Lessons Learnt 16 text	MOBI	★★★★★☆☆	User_B	completed	View Details
exp_17	Experiment_17	2025-01-03 14:00:00	2025-01-03 15:30:00	Classification	Lessons Learnt 17 text	MOBI2	★★★★☆☆☆	User_C	completed	View Details

https://github.com/extremexp-HORIZON/extremeXP_experimentCards