Case Study 5 – Smart Manufacturing Data Analytics Platform

- By *Kafeel Kamran*

Databricks Jobs Workflow

Step 1: Data Ingestion

- Instead of uploading CSVs manually to DBFS, use **Auto Loader** with cloud storage (ADLS, S3, GCS) for scalable, incremental ingestion.
- Maintain schema evolution to handle changes in IoT data.

Step 2: Notebook Modularization

- Consolidate notebooks where possible (e.g., ingestion + transformation can be handled in a single pipeline).
- Use **Delta Lake** for raw, cleaned, and curated layers instead of plain CSV/JSON, ensuring ACID compliance.
- Leverage parameterization at the job level rather than widget-based single file execution.

Step 3: Data Quality Validation

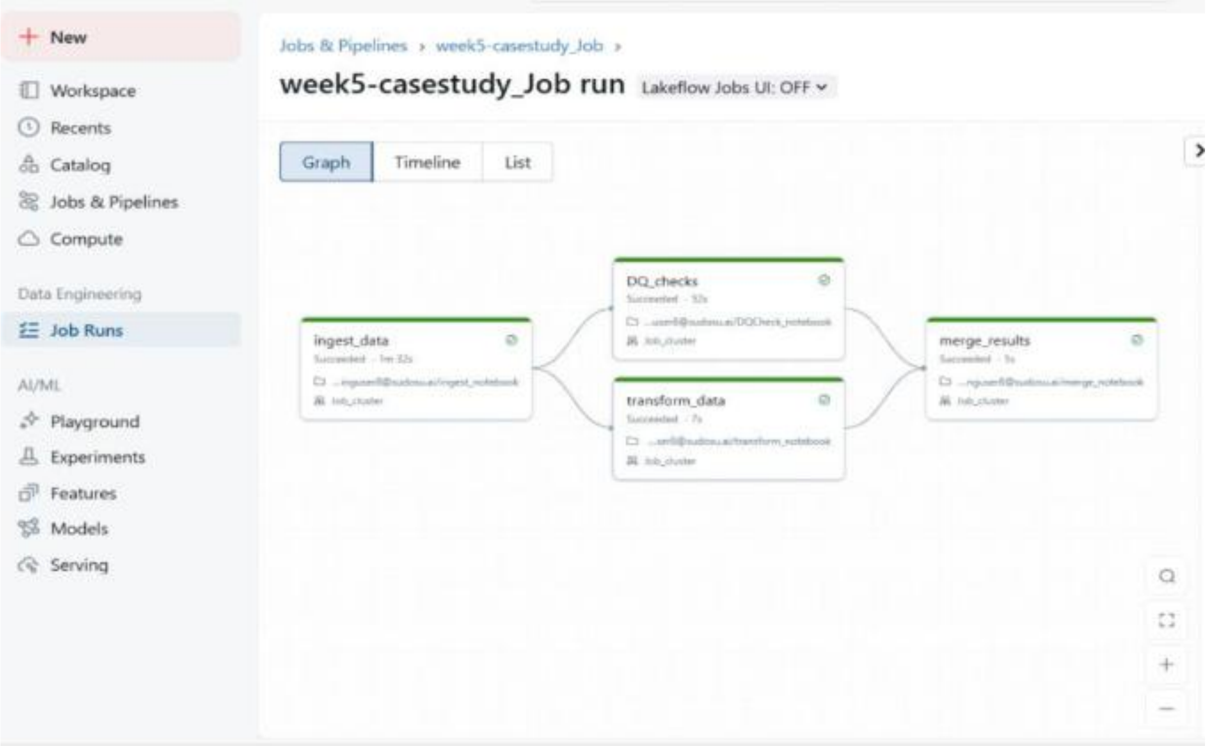
- Integrate **PyDeequ checks directly into the pipeline**, validating during transformation.
- Store validation results in a structured Delta table rather than JSON, making them queryable for reporting and monitoring.
- Automate alerting for failures with Databricks SQL alerts or monitoring dashboards.

Step 4: Job Orchestration

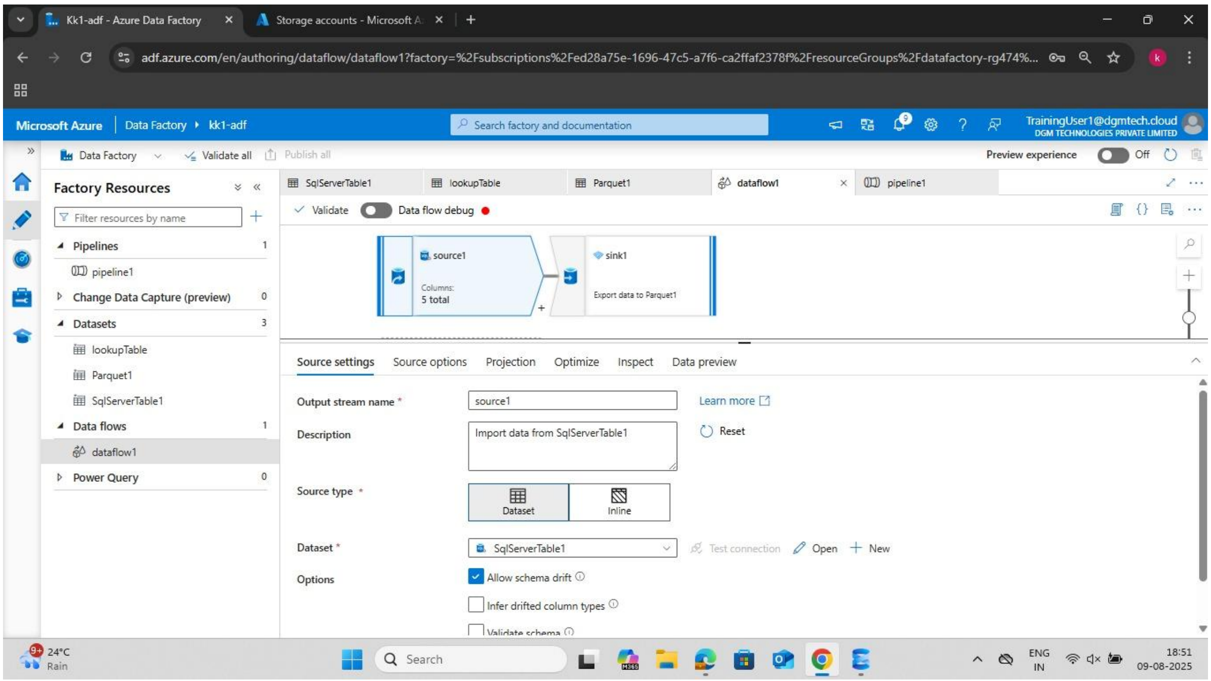
- Replace manual fan-out/fan-in with **Task Orchestration** in Databricks Jobs (task dependencies, retries, conditional execution).
- Where transformations are independent, leverage **parallel tasks** to reduce runtime.
- For automation, use **Databricks Workflows with GitHub Actions or Azure DevOps** for CI/CD, ensuring libraries and cluster configurations are version-controlled.

Step 5: Observability & Optimization

- Enable **job monitoring, retry logic, and cluster autoscaling** for efficient resource usage.
- Use **DBFS only for temp/debug data**; production data should live in cloud object storage.
- Add **Delta Live Tables (DLT)** or structured streaming if continuous ingestion and quality checks are needed.



ADF pipeline And Data Flow Structure:



Output stream name * source1

Description Import data from SqlServerTable1

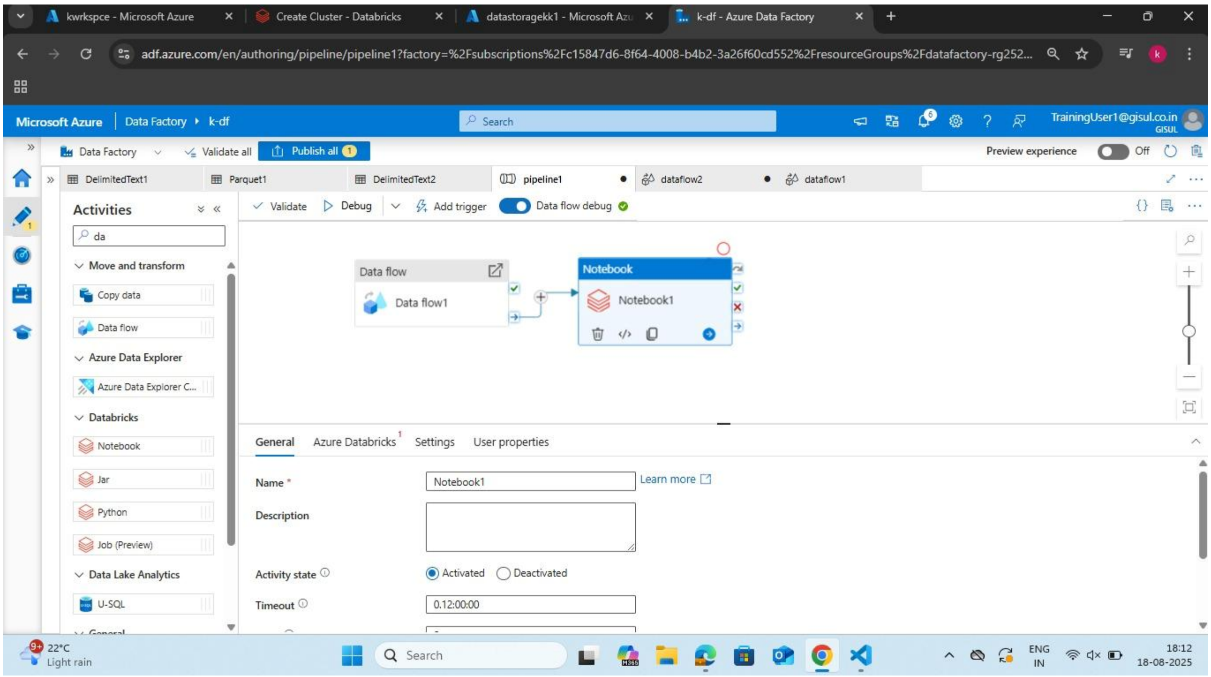
Source type * Dataset

Dataset * SqlServerTable1

Options ☑ Allow schema drift ⓘ

□ Infer drifted column types ⓘ

□ Validate schema ⓘ

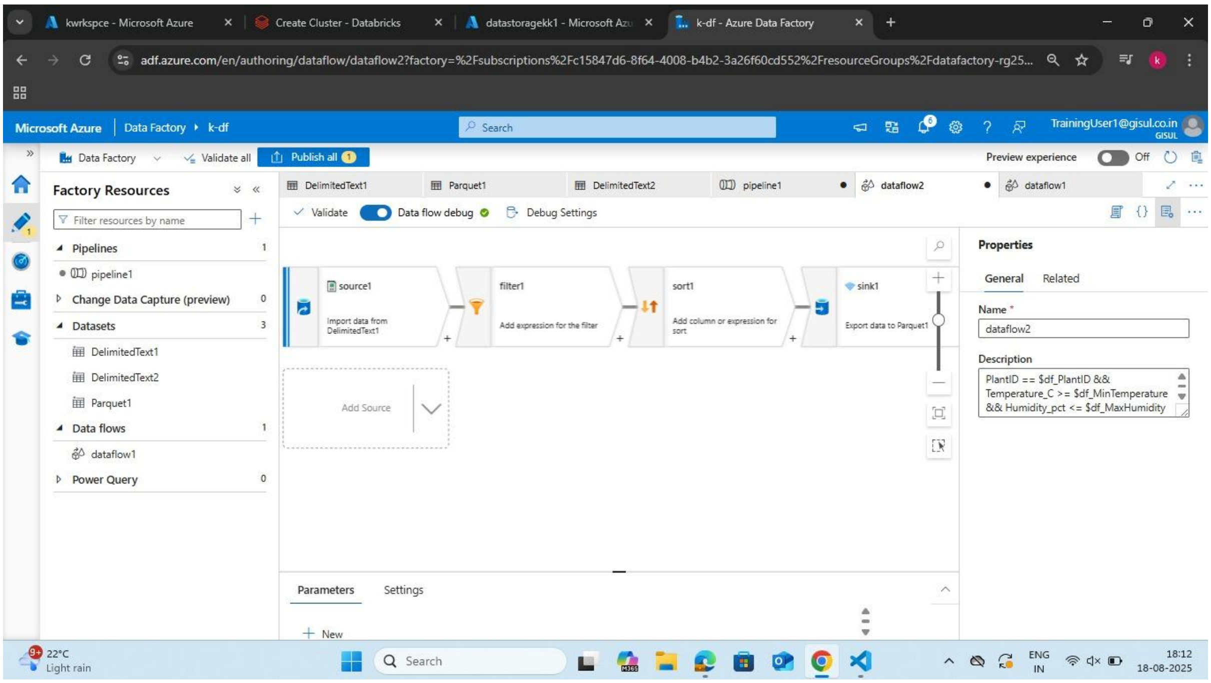


Name * Notebook1

Description

Activity state ⓘ ● Activated ○ Deactivated

Timeout ⓘ 0.12:00:00



Name *

dataflow2

Description

PlantID == $df_PlantID && Temperature_C >= $df_MinTemperature && Humidity_pct <= $df_MaxHumidity