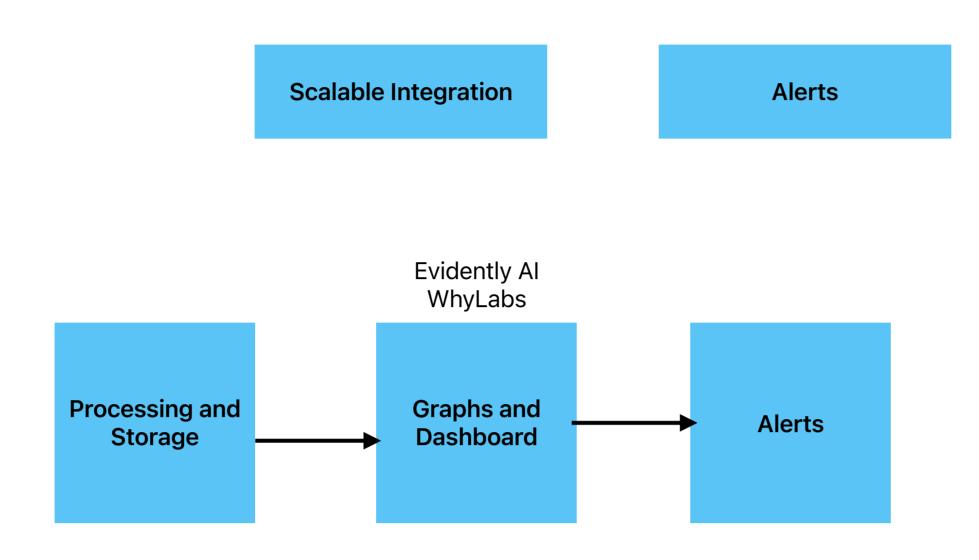
Why Monitoring?

- Changes in Data
- Latency issue
- Incoming data should be having same properties as my
- Training data
- Track extreme values - Model Security
- Model Availability
- Store logs and metrics for compliance purpose

What do we Monitor?

- Performance
- Error
- Metrics
- Sending the Alerts
- Input Data
- Data Version Data Drift
- Outliers
- ML Model
 - Model Version Model Hyperparameters
 - Metadata
 - Predictions
 - Model Evaluation Metrics
- Prediction Drift
- **Functional Monitoring Operational Monitoring**
 - CPU, RAM, Memory usage, etc.
- · Resource Usage
- Availability
- Latency
- Throughput
- Infrastructure Cost Storage cost
- Additional Service (if any)



- What do we plan to Monitor?
- What Tools are we using?
- Which Platform?
- How to Integrate the Tools?
- What are my Alert Thresholds?
- What should we do when we detect an issue?

Drift in ML Model

Change in behavior of the ML Model

- **Types of Drift:**
- **Data Drift** 2. Prediction Drift
- 3. Concept Drift

Data Drift:

Data drift is when the distribution of the input features change with reference to training data.

A.K.A --> Feature Drift, Population Drift, Covariate Shift

Salary Distance to Office Approve? **Prediction Drift:** It refers to a change in predictions over the time **Concept Drift:** It refers to a change in relationship between input and output

If number of features/input columns is many: Apply PCA

How to Detect Drift in ML

Statistical Test:

- Mean - Standard Deviation
- Correlation
- Minimum - Maximum
- Distance Measures:
 - Population Stability Index (PSI) - Characteristic Stability Index (CSI)
 - Kullback-Leibler Divergence (KL-Divergence)
 - Jensen-Shanon Divergence (JS-Divergence) - Kolmogorov-Smirnov (KS)

Cardinal Check:

- Chi-squared Test
- Entropy
- Visualization:
- Histogram - Control charts

Addressing the Drift in ML System

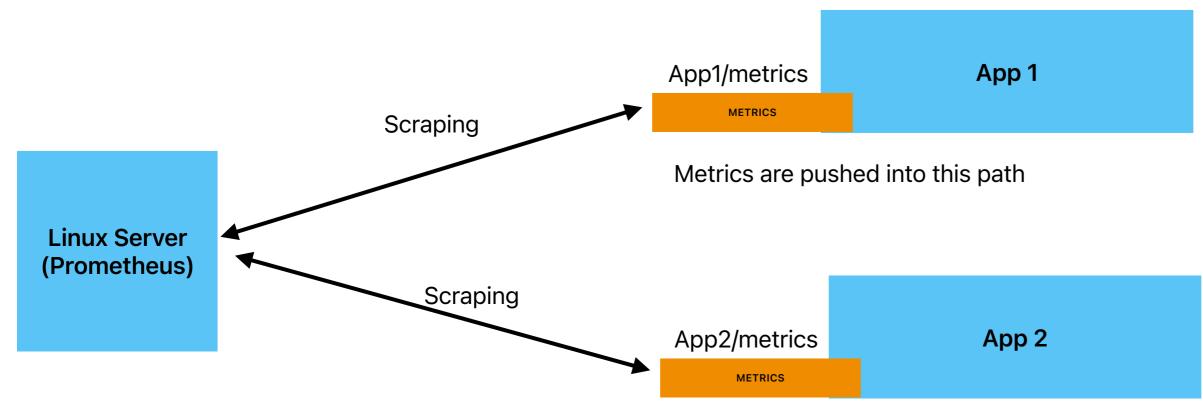
- Data Quality Issue - Retraining the Model
 - Periodic
 - Data driven - Metric Driven
- Tuning the Model

Pre-requisite:

- Free Tier Account with AWS
- Foundation of Operational Metrics

- Monitoring of ML Models

Prometheus



Metrics are pushed into this path