FEATURE STORE SUMMIT

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ORGANIZED BY HOPSWORKS
Twitter's Management of ML Features in Dynamic Environments

David Liu
Machine Learning Engineer
Twitter

https://www.linkedin.com/in/mavysavydav/

@mavysavydav on Twitter
What is a Feature Store?

- Set of standards?
- A framework?
- Metadata management?
- Databases?
Is a feature store just a rebranding of existing tools/systems?

- Datastores / databases / data warehouses
- High load data fetching in online contexts
- SQL Joins
- Map-reduce based joins
- Data processing jobs management
- Workflow management
- Config management
Core Tenets of a Feature Store

In order of priority:

1. Ensure consistency
2. Increase experimental/productionization velocity
3. Shareability of features
What should a feature store be in the user’s perspective? (Consuming features)

Feature Store Abstraction

Online serving
API that takes in references to features and ids, and returns the feature data for those ids.

Experimentation (Offline)
API that takes in references to features and data, and returns the data with the features joined in.
What should a feature store be in the user’s perspective? (Producing/Registering features)

**Feature Store Abstraction**

- **Register Features**
  - Provide address of where the features are stored
  - Specify the features to include in the feature store and which entity they’re associated with
  - Specify any metadata

- **Auto-validation of source to ensure address exists and features exist**

- **Auto-staging + validation that it conforms with standards**

**Fill out / implement the provided config template for the recurring data job**
- Specify data source
- Specify any transform logic
- Specify any needed metadata
- Set schedule
Is a feature store just a rebranding of existing tools/systems?

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Don't need to worry about these details!!
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Consistency Pyramid

Consistency in feature group tied to the model

Consistency in use of correct version of sources and features

Consistency in feature definitions in a mutable shared registry

Consistency in data between offline / online stores
Consistency in data between offline / online stores

Standardized schemas and structure in offline store

Reliable transfer of feature data

Standardized schemas and structure in online store
Consistency in feature definitions in a mutable shared registry

Using the same model as git:
origin/master + branches
Consistency in use of correct version of sources and features

- First class support or can it just be incorporated as part of the naming scheme or extra metadata fields?

- Which versioning scheme would most reduce the chance of human error?

- Intuitive grouping of feature versions vs optimizing for datastore / data warehouse / database performance?
Consistency in feature group tied to the model

Time elapsing as the model is developed / retrained / reworked in a highly collaborative context
How Twitter solves some of these issues:

- BigQuery
- CockroachDB
- In-house database
- In-house ingestion management system
The Flexibility of the Feast Provider Abstraction

- Custom CRDB online store interface implementation that we'll probably open source
- Invokes methods of the online store / offline store interfaces and triggers entirely custom dataflow job
- Reference to Online Store Connector
- Reference to Offline Store Connector
- Logic to transfer data from offline store to online store

Existing open source BigQuery offline store implementation
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Increase experimental/productionization velocity

Integrate well with other ML components
- TFX Example Gens
- Data types consistency throughout the ML pipeline
- Kubeflow
Increase experimental/productionization velocity

Hot / live updates of feature sets that services use + on/off toggles
Increase experimental/productionization velocity

Automatically aggregation of experiment details that can be viewed via UI
- Model used
- Feature set used
- Which toggles were on/off
Increase experimental/productionization velocity

Ease of discovering which permissions are needed for certain feature data, ease of requesting it, and turnaround time for approval.
Increase experimental/productionization velocity

Ease of capacity planning / requesting capacity
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Shareability of Features

- Centralized Catalog
- Discovery
  - Usage tracking
  - Feature importance
- Reliability of using other teams’ features. Can the data be trusted?
- Deprecation process
- Get a data sample
The challenges we haven’t figured out yet

- How to minimize the amount of support in this two-sided marketplace of producers and consumers? How do we maximize self-serve?
- Access control that does its job but doesn’t introduce much friction
- What incentivizes sharing? Why would they want to share if they may have to provide maintenance / support for those pipelines?
- Massive datasets: 5000+ features, billions of rows
- How can a scribing system hook onto our new platform?
Thank you!

https://www.linkedin.com/in/mavysavydav/

@mavysavydav