

Next '22 の Vertex AI 新情報ふりかえり

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Google Cloud, デベロッパー アドボケイト

牧 允皓

Google Cloud, AI/ML スペシャリスト

スピーカー紹介



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Google デベロッパーアドボケイト

Google Cloud のデベロッパー アドボケイトとして、機械学習や AI 系プロダクトの開発者支援を担当。Google Cloud Next、Google I/O、NVIDIA GTC 等の主要イベントでスピーカーを務め、Google Cloud 公式ブログに多数の記事を寄稿。

01

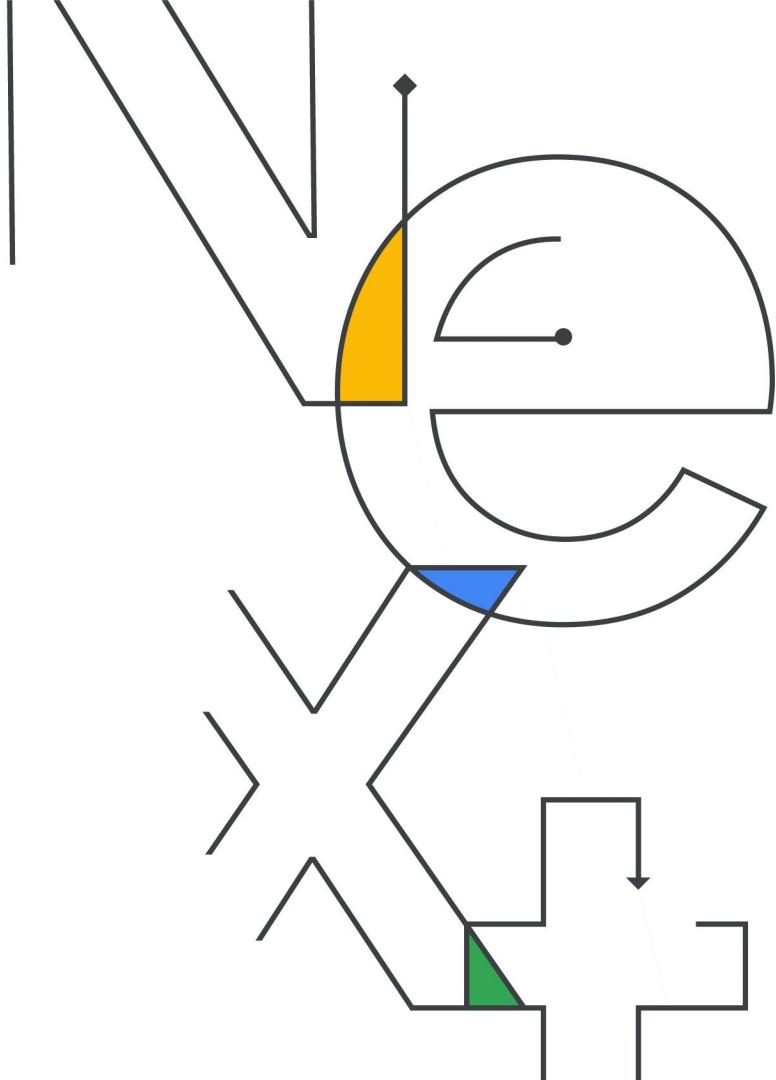
Next '22

ML/AI セッションふりかえり

Google Cloud

Next '22

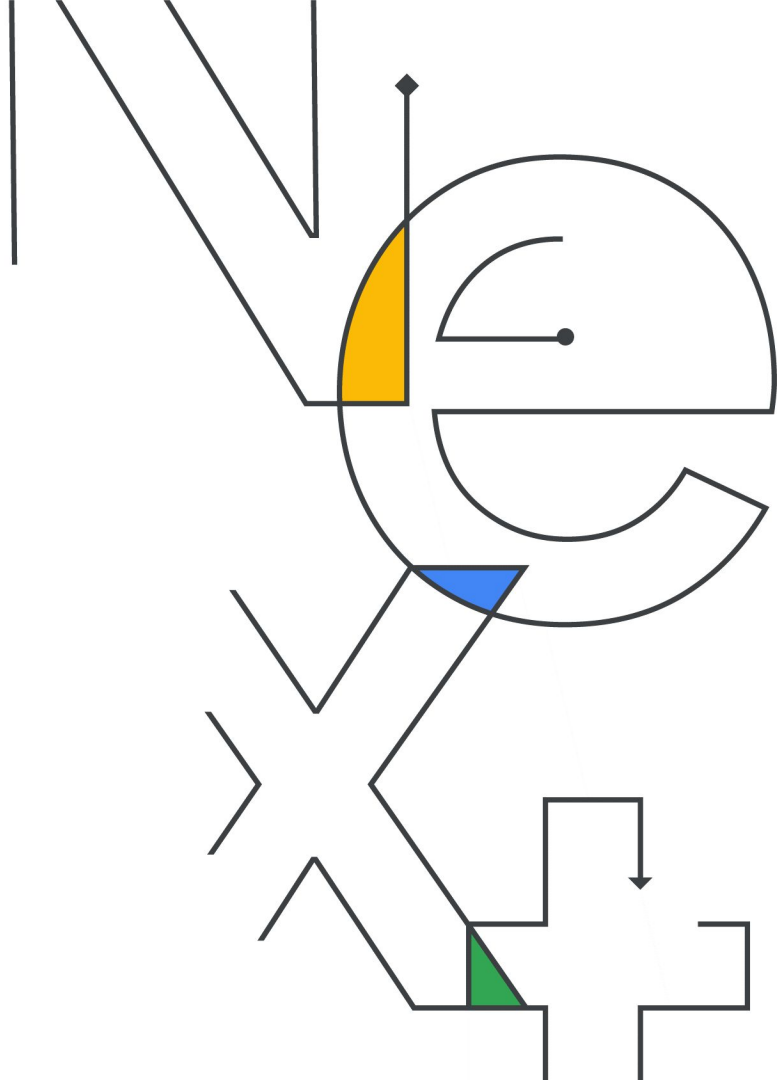
Move from raw data to
ML faster with
BigQuery and Vertex AI



Google Cloud

Next '22

How to accelerate machine learning development with BigQuery ML



BigQuery ML 新機能

BigQuery ML operators for Vertex AI Managed Pipelines ^{GA}

BigQuery ML to Vertex AI Model Registry ^{GA}

Multivariate time series forecasting ^{Preview}

Import custom vision models ^{Preview}

Advanced Feature Engineering functions ^{Preview}

Inference on Imported Models - TFLite & XGBoost ^{Preview}

Inference on Remote Models - Vertex AI & Cloud Functions ^{Preview}

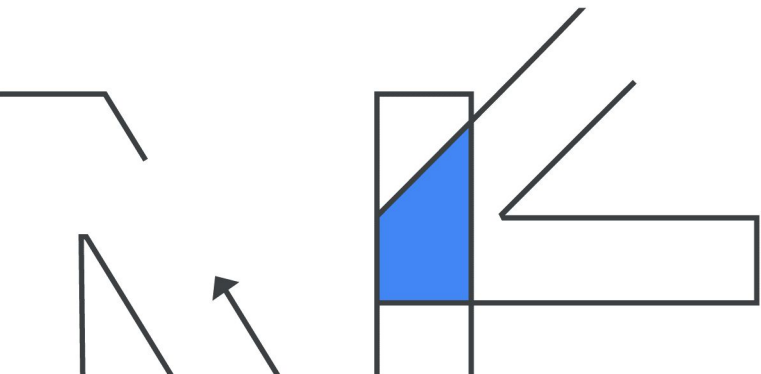
Launching in Q4 2022 or early 2023.

Express interest in trialing at bit.ly/bqml-interest-form



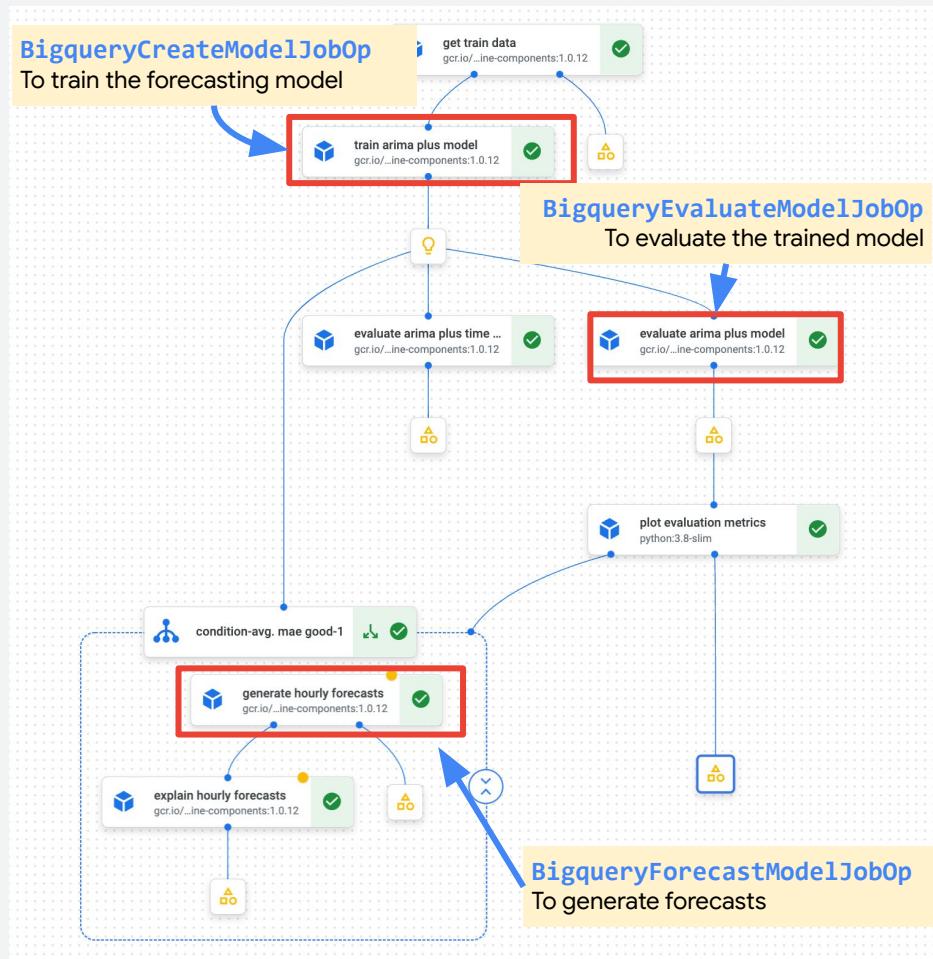
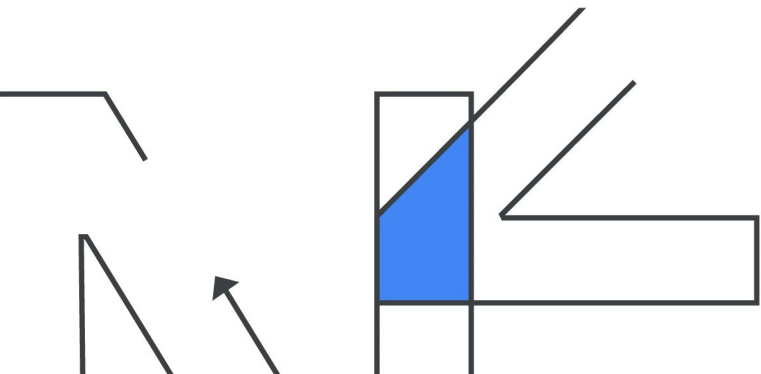
BigQuery ML + Vertex AI Model Registry

- 1 Register and monitor your BigQuery ML models with Vertex AI Model Registry
- 2 Quick and easy model deployment to Vertex AI Endpoints
- 3 Use Vertex to compare and track eval metrics
- 4 Explainable AI for models, including built-in XAI for your BigQuery ML models! Coming in Q4 2022



BigQuery ML operators for Vertex AI Pipelines

20+ BigQuery ML operators that bring BigQuery ML to Vertex AI Pipelines.





Workbench

NEW NOTEBOOK

REFRESH

START

STOP

RESET

UPGRADE

DELETE

LEARN



MANAGED NOTEBOOKS

USER-MANAGED NOTEBOOKS

EXECUTIONS

SCHEDULES



Managed notebooks provide JupyterLab services and flexible computing resources integrated with Google Cloud services. [Learn more](#)



Region

us-central1 (Iowa)



Filter Enter property name or value



<input type="checkbox"/>	<input type="radio"/>	Notebook name ↑	Owner	Custom docker images	Last modified	
<input type="checkbox"/>	<input checked="" type="radio"/>	next-bqml-vertex	OPEN JUPYTERLAB	Service account	No custom images	9 Sept 2022, 11:06:56



Remote Models での推論

Run inference on models hosted on any of the these endpoints



Vertex AI



Cloud Functions



```
CREATE OR REPLACE MODEL remote_model_name
REMOTE WITH CONNECTION connection
OPTIONS (
  ENDPOINT = 'https://project.cloudfunctions.net/FUNCTION_NAME'
);
```

多変量の時系列分析

ARIMA PLUS, BigQuery's built-in large scale time series forecasting model, now supports external regressors



Object Table による画像データの管理

Private preview



Google Cloud BQ Huron Search Products, resources, docs (/)

Bucket details

caspian_houses

Location: us (multiple regions in United States) Storage class: Standard Public access: Not public Protection: None

OBJECTS CONFIGURATION PERMISSIONS PROTECTION LIFECYCLE

Buckets > caspian_houses

UPLOAD FILES UPLOAD FOLDER CREATE FOLDER MANAGE HOLDS DOWNLOAD

Filter by name prefix only Filter Filter objects and folders

<input type="checkbox"/>	Name	Size	Type	Created
<input type="checkbox"/>	10_Downing_St.jpeg	143.4 KB	image/jpeg	Aug 4, 20...
<input type="checkbox"/>	1242_Rose_St.jpeg	196.2 KB	image/jpeg	Aug 4, 20...
<input type="checkbox"/>	1995_Ward_Ave.jpeg	63 KB	image/jpeg	Aug 4, 20...
<input type="checkbox"/>	1_Washington_Ave.jpeg	109.6 KB	image/jpeg	Aug 4, 20...
<input type="checkbox"/>	2034_Cedar_St.jpeg	26.8 KB	image/jpeg	Aug 4, 20...
<input type="checkbox"/>	666_Newell_St.jpeg	170.8 KB	image/jpeg	Aug 4, 20...



```
CREATE EXTERNAL TABLE dataset.houses  
WITH CONNECTION us.demo_lake  
OPTIONS (uris=['gs://caspian_houses/*'],  
         object_metadata='DIRECTORY')
```

```
SELECT * FROM dataset.houses LIMIT 10
```

uri	generation	content_type	size
gs://caspian_houses/10_Downing_St.jpeg	1659659941032822	image/jpeg	146843
gs://caspian_houses/1242_Rose_St.jpeg	1659659941932150	image/jpeg	200905
gs://caspian_houses/1995_Ward_Ave.jpeg	1659659942122696	image/jpeg	64551
gs://caspian_houses/1_Washington_Ave.jpeg	1659659940828040	image/jpeg	112249
gs://caspian_houses/2034_Cedar_St.jpeg	1659659942231821	image/jpeg	27476
gs://caspian_houses/666_Newell_St.jpeg	1659659941129893	image/jpeg	174938
gs://caspian_houses/823_University_Ave.jpeg	1659659941526406	image/jpeg	78473
gs://caspian_houses/892_Fulton_Rd.jpeg	1659659941628295	image/jpeg	62013

BigQuery ML で画像の特徴ベクトルを抽出

Import the imagenet model into BigQuery



```
CREATE MODEL dataset.imagefv
OPTIONS (model_type='TENSORFLOW',
        color_space='RGB',
        model_path='gs://imagenet/*')
```



Use ML.PREDICT to extract the latent representations of images

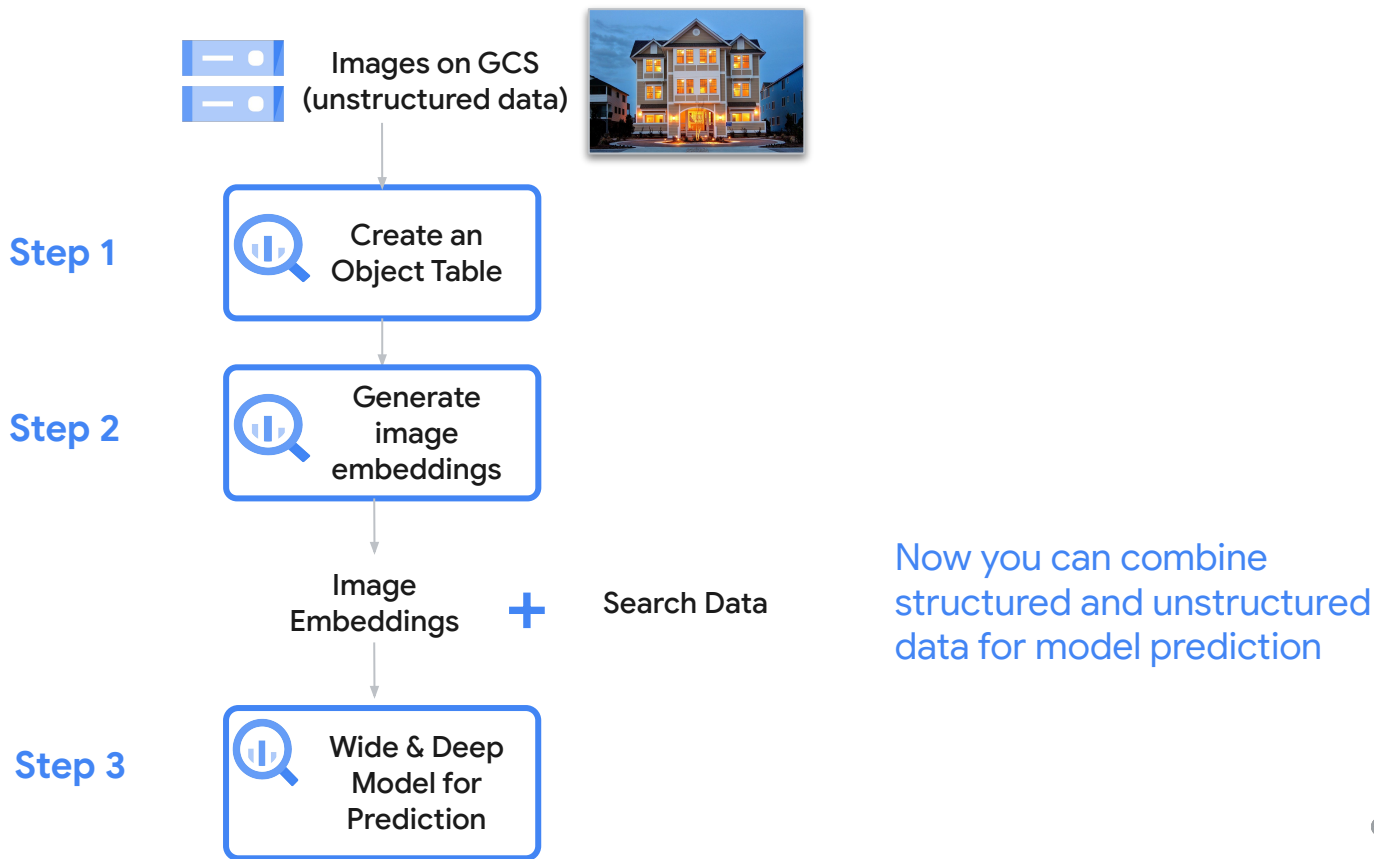


```
SELECT uri, feature_vec FROM
ML.PREDICT(
MODEL dataset.imagefv,
TABLE dataset.houses)
```

uri	feature_vec
gs://caspian_houses/10_Downing_St.jpeg	["-0.6858665347099304", "0.03352648764848709", "1.7552795410
gs://caspian_houses/823_University_Ave.jpeg	["-0.4768984317779541", "0.8592596650123596", "1.6156368255
gs://caspian_houses/892_Fulton_Rd.jpeg	["0.36786502599716187", "1.6773165464401245", "0.69309496879
gs://caspian_houses/666_Newell_St.jpeg	["0.020243331789970398", "0.24682791531085968", "1.6812396049
gs://caspian_houses/2034_Cedar_St.jpeg	["-1.0804210901260376", "1.1235047578811646", "1.580204963
gs://caspian_houses/1242_Rose_St.jpeg	["-0.2593004107475281", "-0.5539816617965698", "2.464727401
gs://caspian_houses/1_Washington_Ave.jpeg	["-0.9279747605323792", "-1.5976200103759766", "2.9774522783
gs://caspian_houses/1995_Ward_Ave.jpeg	["-0.33510828018188477", "0.9801657199859619", "0.814768856

The results are then used to join the customer-house click record data as the model training dataset

構造化データと非構造化データを組み合わせて推論



Object Table を作成し画像データにアクセス



```
CREATE OR REPLACE EXTERNAL TABLE
`images.property-images`
WITH CONNECTION `us.property-images`
OPTIONS(
  object_metadata="DIRECTORY",
  uris=["gs://demo/images/*"]
);
```



uri	content_type	size
gs://as-bqml-launch-demo/images/ER010-aerialrearext.jpg	image/jpeg	1940969
gs://as-bqml-launch-demo/images/KD1111-rearext.jpg	image/jpeg	1508587
gs://as-bqml-launch-demo/images/ER011-aerialrearext.jpg	image/jpeg	1949278
gs://as-bqml-launch-demo/images/B800-rearext.jpg	image/jpeg	338409
gs://as-bqml-launch-demo/images/b372-rearext.jpg	image/jpeg	1841978
gs://as-bqml-launch-demo/images/J10975-aerial-2.jpg	image/jpeg	1606464

Step 1: Create an object table

Step 2: Generate image embeddings

Step 3: Wide & Deep model for prediction

TensorFlow 画像認識モデルを使い、画像特徴ベクトル抽出



CREATE OR REPLACE MODEL

```
`pipeline.resnet_imagenet_embeddings_model`  
OPTIONS(  
  model_type="TENSORFLOW",  
  color_space="RGB",  
  model_path="gs://demo/resnet-embeddings/*")
```



```
SELECT *  
FROM ML.PREDICT (  
  MODEL `pipeline.resnet_imagenet_embeddings_model`,  
  (SELECT * FROM `images.property-images`)
```



img_name	pc1	pc2	pc3
EC1-Bar.jpg	1.8493...	1.3984...	1.9969...
EC1-ext.jpg	-18.16...	-8.0527...	1.3630...
EC1-Bar2.jpg	-1.382...	-0.5212...	-3.135...
EC1-Bar3.jpg	3.8091...	-5.0284...	2.1694...
ec1-pool.jpg	-4.891...	7.1742...	-5.182...

Step 1: Create an object table

Step 2: Generate image embeddings

Step 3: Wide & Deep model for prediction

Wide and Deep モデルの学習

image_embeddings

img_name	pc1	pc2	pc3
EC1-Bar.jpg	1.8493...	1.3984...	1.9969...
EC1-ext.jpg	-18.16...	-8.0527...	1.3630...
EC1-Bar2.jpg	-1.382...	-0.5212...	-3.135...
EC1-Bar3.jpg	3.8091...	-5.0284...	2.1694...
ec1-pool.jpg	-4.891...	7.1742...	-5.182...

search_data

img_name	distanceToB...	location	state
EC1-Bar.jpg	Oceanfront	Corolla	NC
EC1-ext.jpg	Oceanfront	Corolla	NC
EC1-Bar2.jpg	Oceanfront	Corolla	NC
EC1-Bar3.jpg	Oceanfront	Corolla	NC
ec1-pool.jpg	Oceanfront	Corolla	NC

img_name	distanceTo...	location	state	pc1	pc2	pc3
EC1-Bar.jpg	Oceanfront	Corolla	NC	1.84936261...	1.39845214...	1.99695636...
EC1-ext.jpg	Oceanfront	Corolla	NC	-18.166918...	-8.0527233...	1.36307251...
EC1-Bar2.jpg	Oceanfront	Corolla	NC	-1.3826520...	-0.5212412...	-3.1352281...
EC1-Bar3.jpg	Oceanfront	Corolla	NC	3.80916701...	-5.0284545...	2.16948761...
ec1-pool.jpg	Oceanfront	Corolla	NC	-4.8918667...	7.17424064...	-5.1822880...

image_embeddings_with_search



```
CREATE OR REPLACE MODEL pipeline.wide_and_deep
OPTIONS(MODEL_TYPE='DNN_LINEAR_COMBINED_CLASSIFIER'
```

```
,
  AUTO_CLASS_WEIGHTS = TRUE,
  ACTIVATION_FN = 'RELU',
  BATCH_SIZE = 64,
  DROPOUT = 0.1,
  EARLY_STOP = FALSE,
  HIDDEN_UNITS = [128, 64, 32, 64, 128],
  INPUT_LABEL_COLS = ['clicked'],
  LEARN_RATE=0.00001,
  MAX_ITERATIONS = 25,
  OPTIMIZER = 'RMSPROP',
  DATA_SPLIT_METHOD="CUSTOM",
  DATA_SPLIT_COL = "split_col_bool",
  ENABLE_GLOBAL_EXPLAIN = TRUE
)
```

```
Select * from image_embeddings_with_search
```

Step 1: Create an object table

Step 2: Generate image embeddings

Step 3: Wide & Deep model for prediction

ML.predict で賃貸リストのクリック率を予測



```
SELECT
  *
FROM
  ML.PREDICT(MODEL
    `bqml-demo.pipeline.wide_and_deep`,
    (SELECT * FROM base));
```



name	img_name	avg_prob
Aqua Dream	J10975-aerial-2.jpg	0.77494834...
Atlantis	KD1111-rearext.jpg	0.78830668...
Creme de la Creme	J20944-aerialrearext.jpg	0.69067030...
Heavens to Betsy	ER011-aerialrearext.jpg	0.82573245...
Mariner's Compass	ER008-aerialrearext.jpg	0.74198232...
SEAesta	KD1301-rearext.jpg	0.69142866...
Salty Paws	B800-rearext.jpg	0.70336384...
Sound to Sea Beach Club	ec3-aerialrearext.jpg	0.78168062...

Step 1: Create an object table

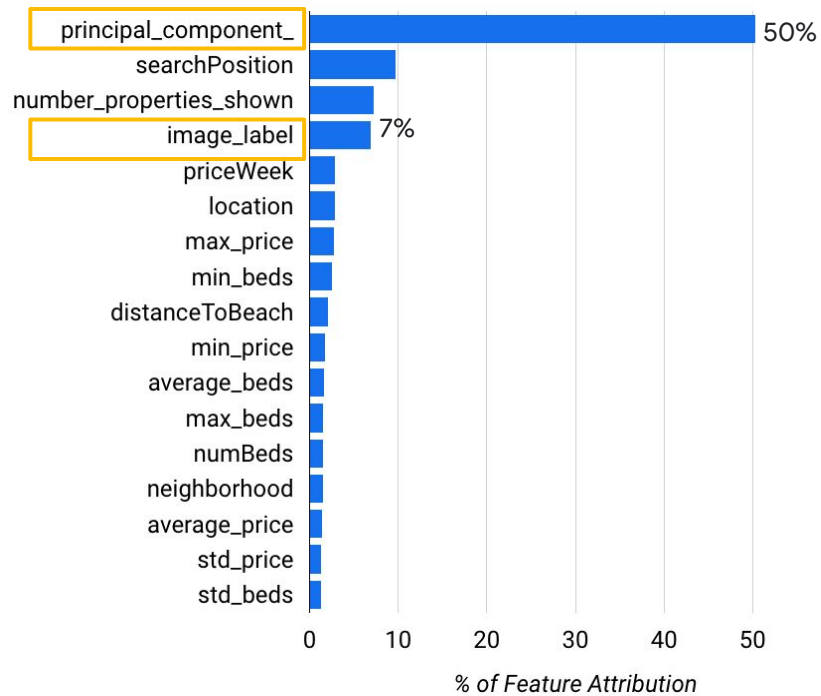
Step 2: Generate image embeddings

Step 3: Wide & Deep model for prediction

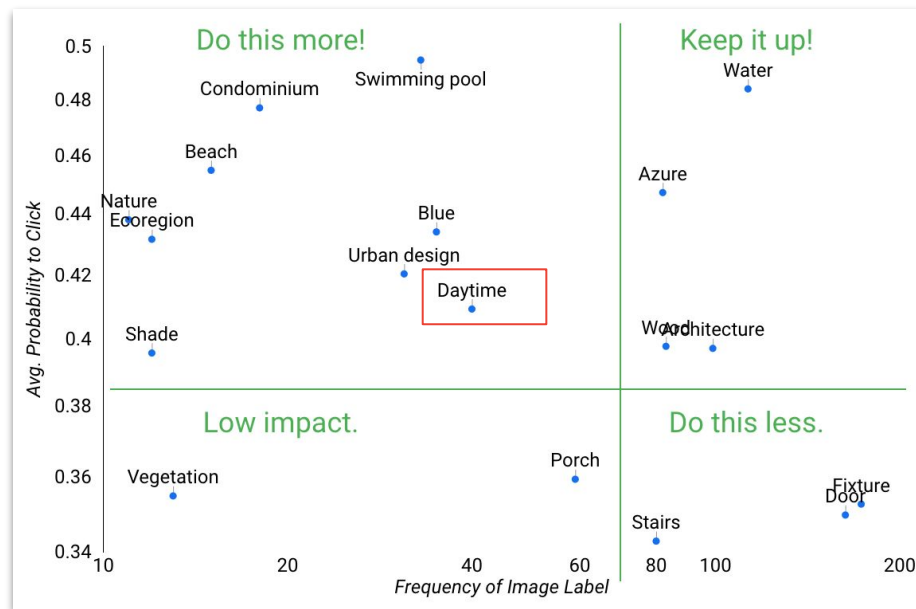
Taking action on the data

特徴量重要度からわかること

~57% attribution credited to image data



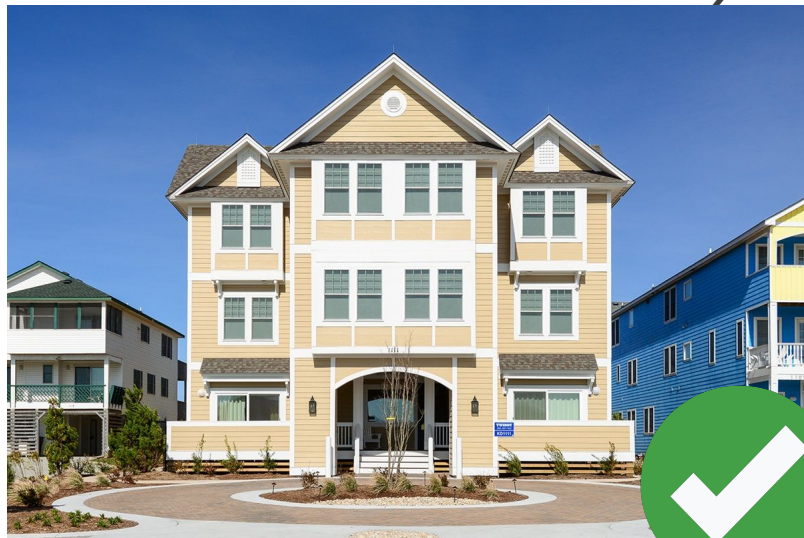
Water & natural environment top performers



Taking action on the data

Twiddy 物件リストでの導入事例

The model prefers daytime shots over the nighttime shots selected by the editorial team



スピーカー紹介



牧 允皓

Google Cloud
AI/ML スペシャリスト

Google Cloud の AI/ML スペシャリスト。これまで構造化データの分析や、機械学習システムのビジネス実装に携わる。Google Cloud では Vertex AI で実装する MLOps を専門に Google Cloud のお客様を支援。

02

Vertex AI アップデート

Vertex AI アップデート

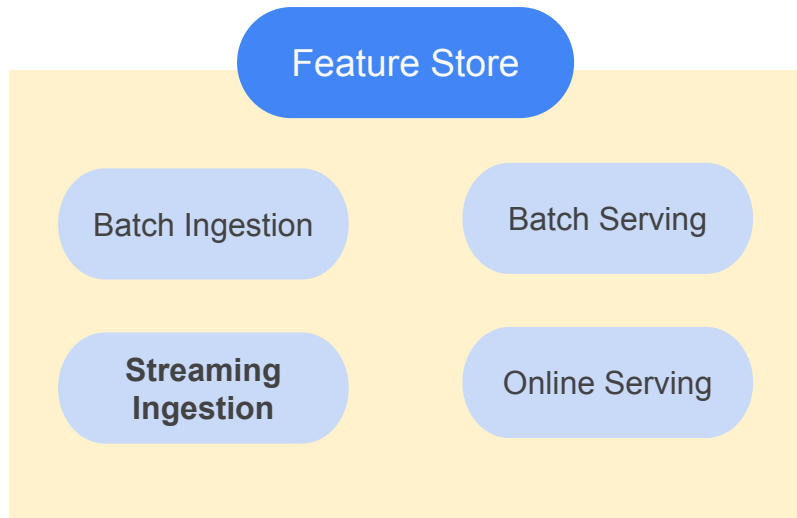
- Prediction - Custom prediction routines (GA)
- TabNet on Vertex AI Tabular Workflows (Preview)
- **Feature Store - Streaming ingestion (Preview)**
- Model Registry (GA)
- **Model Evaluation (Preview)**
- **Batch Prediction Monitoring (Preview)**
- Feature Store - Feature value monitoring (GA)
- **Matching Engine - Streaming update (Preview)**

Feature Store Streaming Ingestion (Preview)

Vertex AI Feature Store は、機械学習の特徴量を整理、保存、提供するための一元化されたリポジトリが用意されている。

これまではバッチ処理による特徴量取り込みが提供されていたが、Streaming Ingestion によって Online Serving のリアルタイム性を高める。

高速に推論結果を返す際に使われる Online Serving において、**最新のデータが取り込めることはデータドリフトなどの回避も期待できる。**

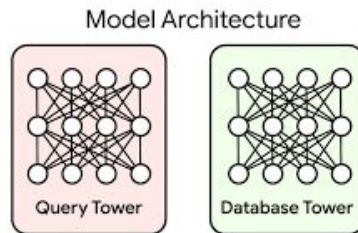


Matching Engine Streaming Update (Preview)

Vertex AI Matching Engine は、拡張性が高くレイテンシが低いベクトル類似性マッチング(近似最近傍探索)サービスを提供している。

これまではバッチ処理によるインデックスアップデートが提供されていたが、Streaming Update によってアップデートとクエリを即座に実行できる。

推薦したいアイテムがダイナミックに変化する環境では、Streaming Update によって機会損失を減らす ことにつながる。



Source:

https://cloud.google.com/vertex-ai/docs/matching-engine/update-rebuild-index#update_an_index_using_streaming_updates

Batch Prediction Monitoring (Preview)

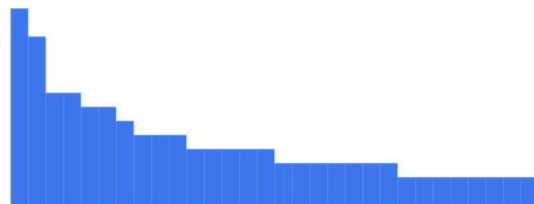
Vertex AI Model Monitoring は、モデルのパフォーマンスを維持するため、モデルの予測入力データをモニタリングし、特徴のスキューとドリフトをモニタリングするための機能。

これまではオンライン予測に対する機能として提供されていたが、バッチ予測でもモニタリングが可能になった。

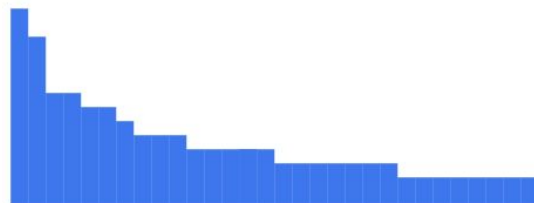
特徴量のスキューとドリフトをバッチ / オンライン予測の両方のシナリオで分析できることで、**モニタリングの利便性が向上した**。

Feature: petal_length

Prediction stats distribution



Training stats distribution

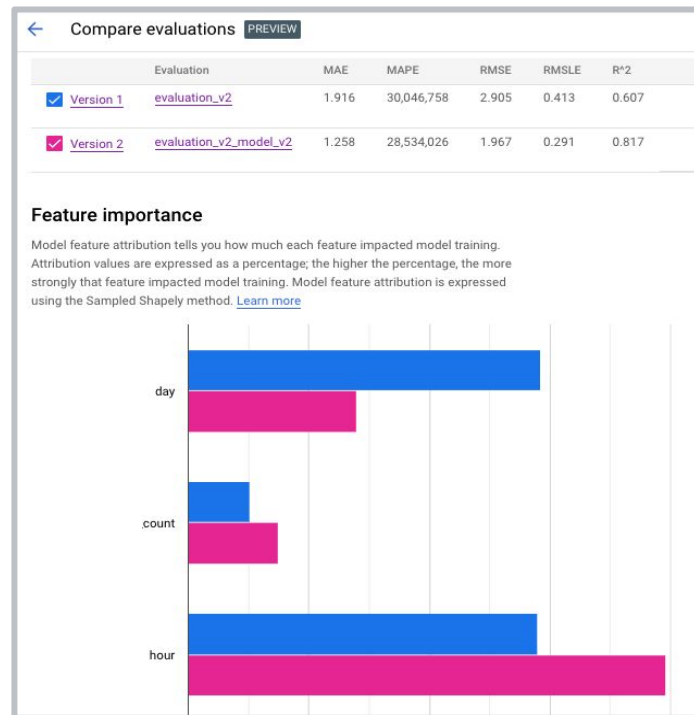


Model Evaluation (Preview)

Vertex AI Model Evaluation は、機械学習の評価指標（適合率、再現率など）を算出し、モデル選択を円滑に行うためのツール。

日頃の機械学習モデルの学習時に評価指標を記録しても、同じデータセットに対する比較評価は別途必要なことが多い。

これまで登録してきたモデルに対して、各評価指標や特徴アトリビューションを比較し、モデル選択を効率化できる。



Demo

Model Evaluation



Thank you.