

# Slides That are used as screenshots in the github/statmike/vertex-ai-mlops repository

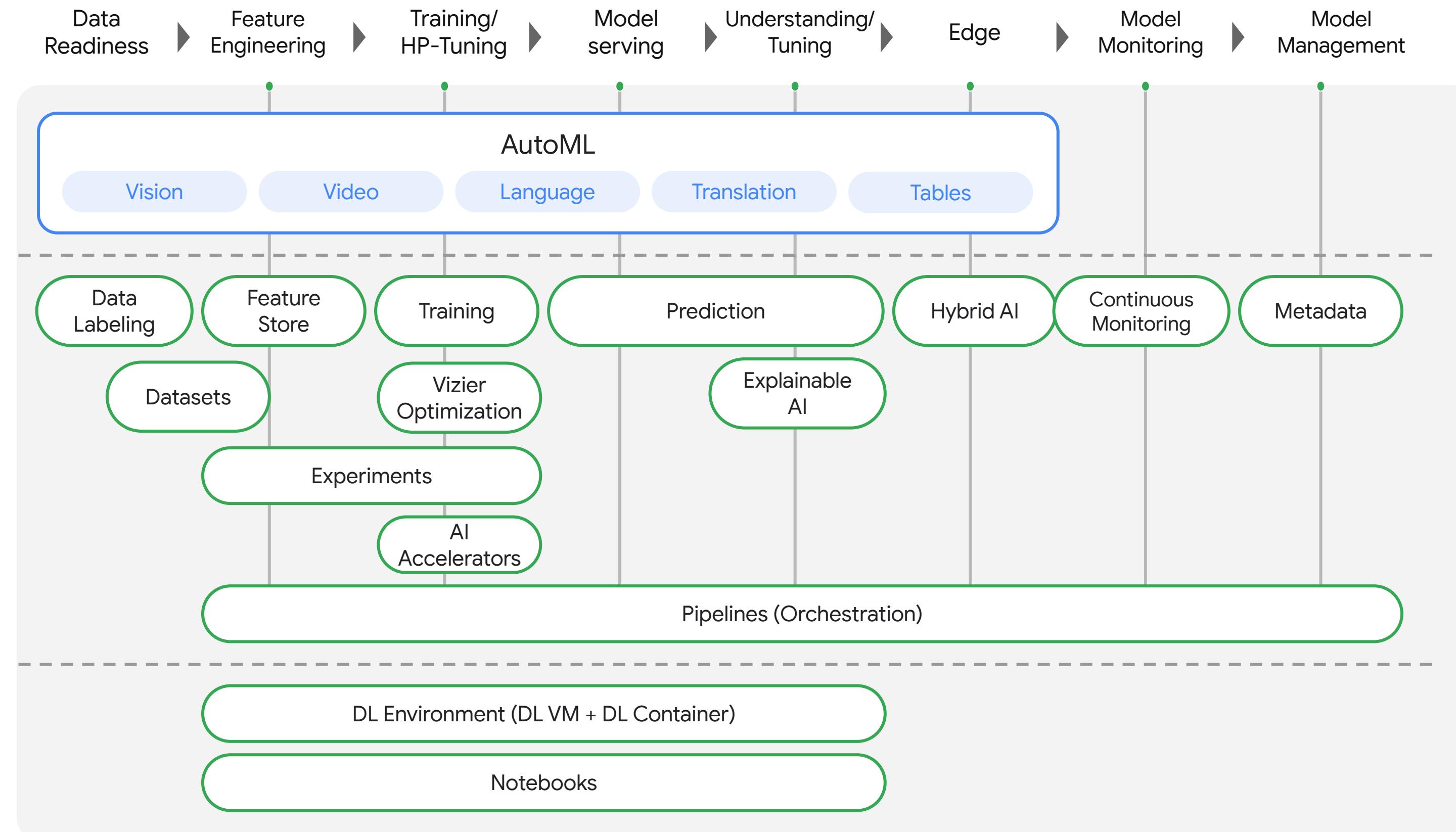
Notes:

- Do not insert new slides or reorder without updating the notebooks. The slides are exported to numbered .png files that are referenced in the notebooks

Process

- Save as PDF
- Copy to `github/statmike/vertex-ai-mlops/architectures/slides`
- Convert PDF to PNG images
  - Use Notebook: `/architectures/Create Images.ipynb`
  - OUTPUT:
    - To `/architectures/slides`

# Vertex AI Overview



## Vertex AI

## Dashboard

Dashboard

Datasets

Features

Labeling tasks

Notebooks

Pipelines

Training

Experiments

Models

Endpoints

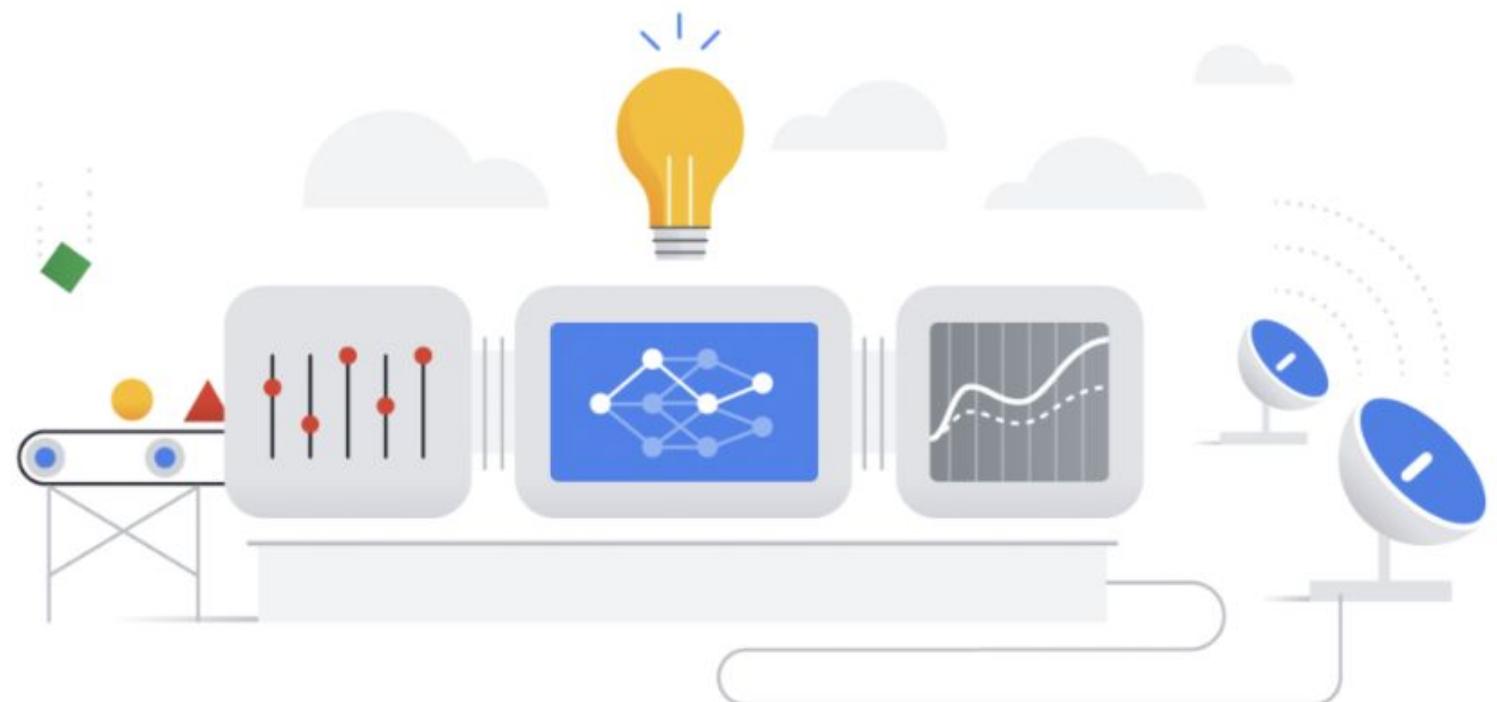
Batch predictions

Metadata

Marketplace

## Get started with Vertex AI

Vertex AI empowers machine learning developers, data scientists, and data engineers to take their projects from ideation to deployment, quickly and cost-effectively. [Learn more](#)



Region

us-central1 (Iowa)



## Recent datasets

- ✓ 02c\_digits\_20210919213805 16 hours ago
- ✓ 02b\_digits\_20210919205707 20 hours ago
- ✓ 02a 4 days ago
- ✓ 02b\_digits\_20210916141540 4 days ago
- ✓ 02c\_digits\_20210916004500 5 days ago

[+ CREATE DATASET](#)

## Recent models

- ✓ 05f\_digits\_20210920145828 1 hour ago
- ✓ 05e\_digits\_20210920125450 3 hours ago
- ✓ 02c\_digits\_20210919213805 12 hours ago  
Average precision: 1
- ✓ 02b\_digits\_20210919205707 19 hours ago  
Average precision: 1
- ✓ 05c\_digits\_20210919214125-model 19 hours ago

[+ TRAIN NEW MODEL](#)

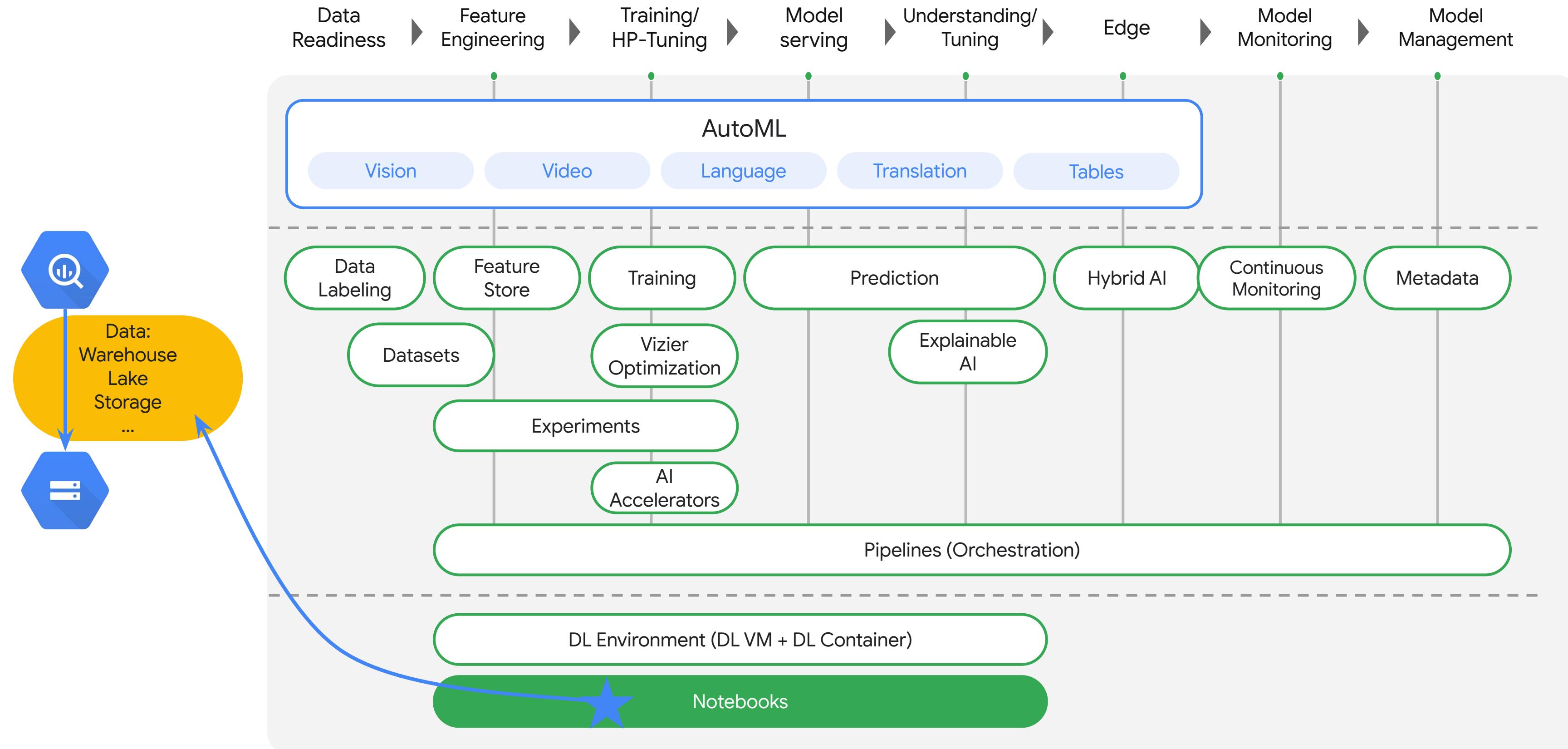
## Get predictions

After you train a model, you can use it to get predictions, either online as an endpoint or through batch requests

[+ CREATE BATCH PREDICTION](#)[Show debug panel](#)

# Notebook: 00

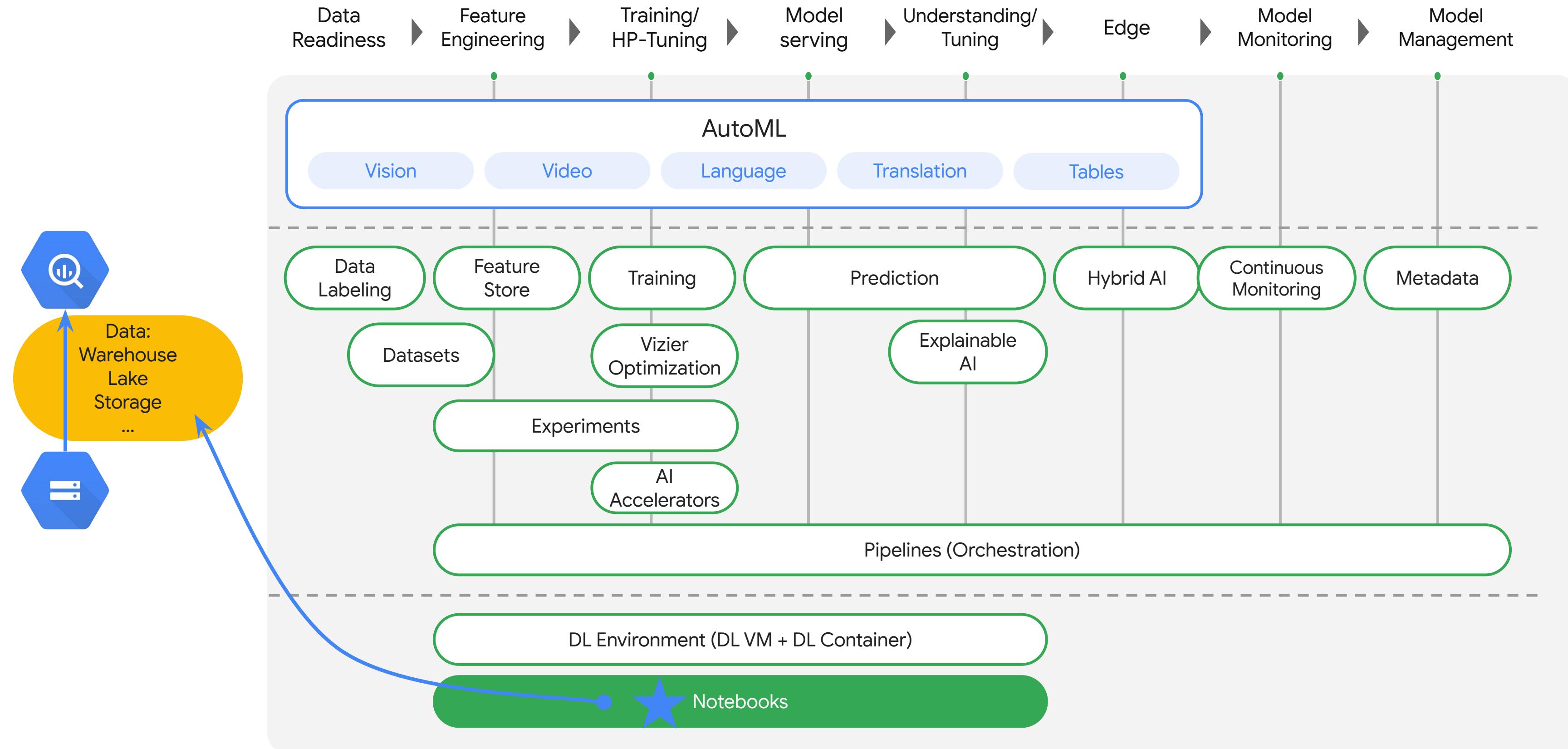
# Vertex AI Overview





# Notebook: 01

# Vertex AI Overview



# Google Cloud Platform

Vertex AI

Dashboard

Datasets

Features

Labeling tasks

Notebooks

Pipelines

Training

Experiments

Models

Endpoints

Batch predictions

Metadata

Marketplace

The screenshot shows a Jupyter Notebook environment within Google Colab. The notebook title is "01 - BigQuery - Table Data Source". The content discusses using BigQuery to load and prepare data for machine learning, listing prerequisites (Environment Setup) and an overview of BigQuery setup, table creation, and data loading from GCS. A large yellow arrow points from the "Notebooks" menu in the sidebar to the "01 - BigQuery - Table Data Source" tab in the notebook interface.

**01 - BigQuery - Table Data Source**

Use BigQuery to load and prepare data for machine learning:

**Prerequisites:**

- 00 - Environment Setup

**Overview:**

- Setup BigQuery
  - Create a Dataset
    - Use BigQuery Python Client
  - Create Tables
    - Copy from another Project:Dataset
      - SQL with BigQuery
    - Load data from GCS
      - BigQuery Python
  - Prepare Data For Analysis
    - Run SQL Queries to pi

**Resources:**

- Python Client For Google BigQ
- Download BigQuery Data to Pa
- Query Template Notebooks

0 19 Git: idle Python 3 | Idle

File Edit View Run Kernel Git Tabs Settings Help

Launcher 01 - BigQuery - Table Data git Python 3

00 - Environme... 3 days ago

01 - BigQuery - Table Data 3 days ago

02a - Vertex AI ... 4 days ago

02b - Vertex AI ... 8 hours ago

02c - Vertex AI ... 8 hours ago

03a - BigQuery ... 4 days ago

03b - Vertex AI ... 8 hours ago

04a - Vertex AI ... 8 hours ago

05 - Vertex AI >... 20 hours ago

05a - Vertex AI ... 8 hours ago

05b - Vertex AI ... 4 hours ago

05c - Vertex AI ... 4 hours ago

05d - Vertex AI ... 4 hours ago

05e - Vertex AI ... 3 hours ago

05f - Vertex AI ... an hour ago

06 - Vertex AI >... 4 days ago

07 - Vertex AI >... 4 days ago

readme.md 5 days ago

XX - Cleanup.ip... 5 days ago

FEATURES & INFO SHORTCUT DISABLE EDITOR TABS

Explorer + ADD DATA

Type to search

Viewing pinned projects.

statmike-mlops

digits

Models (1)

digits

digits\_featurestore\_import

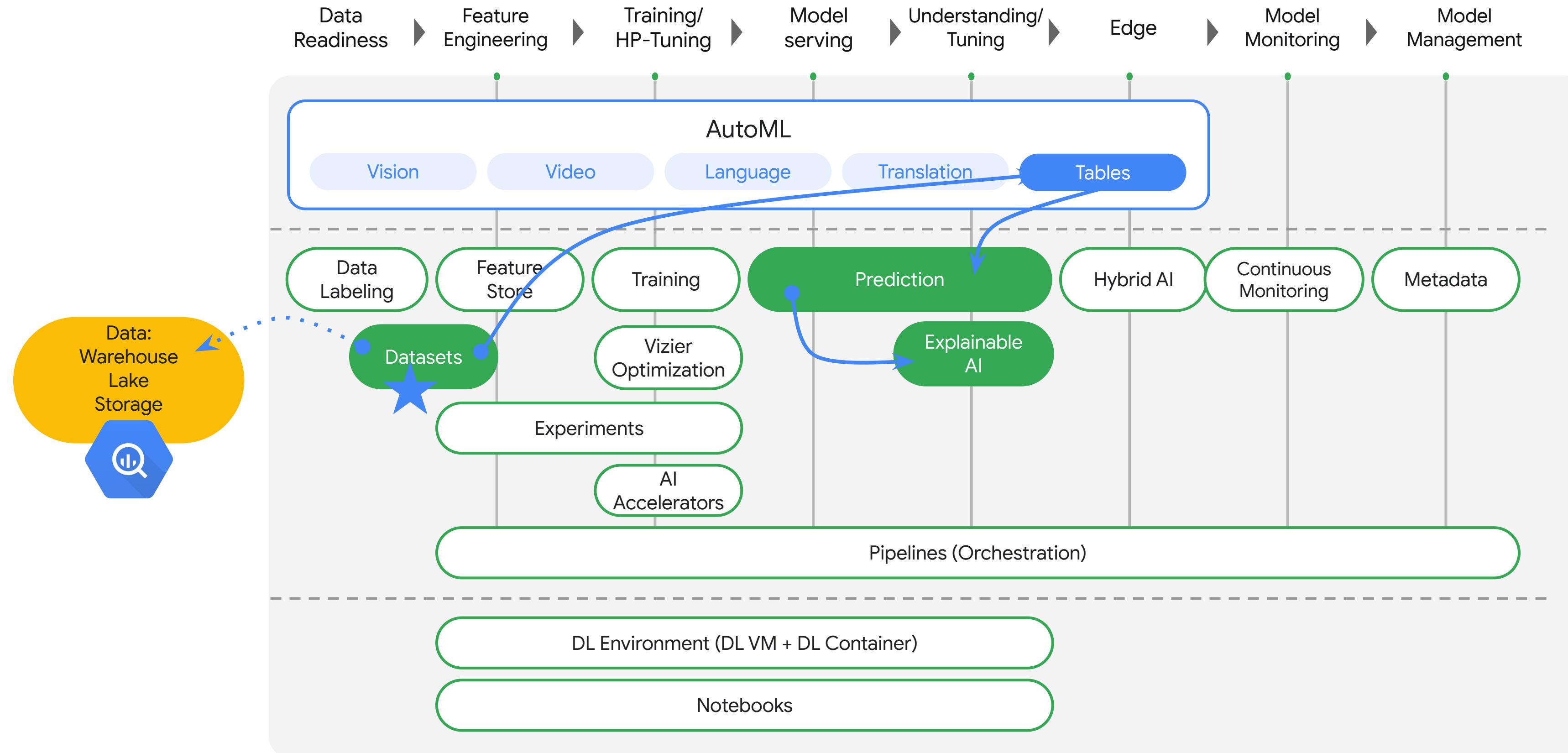
digits\_fs\_training

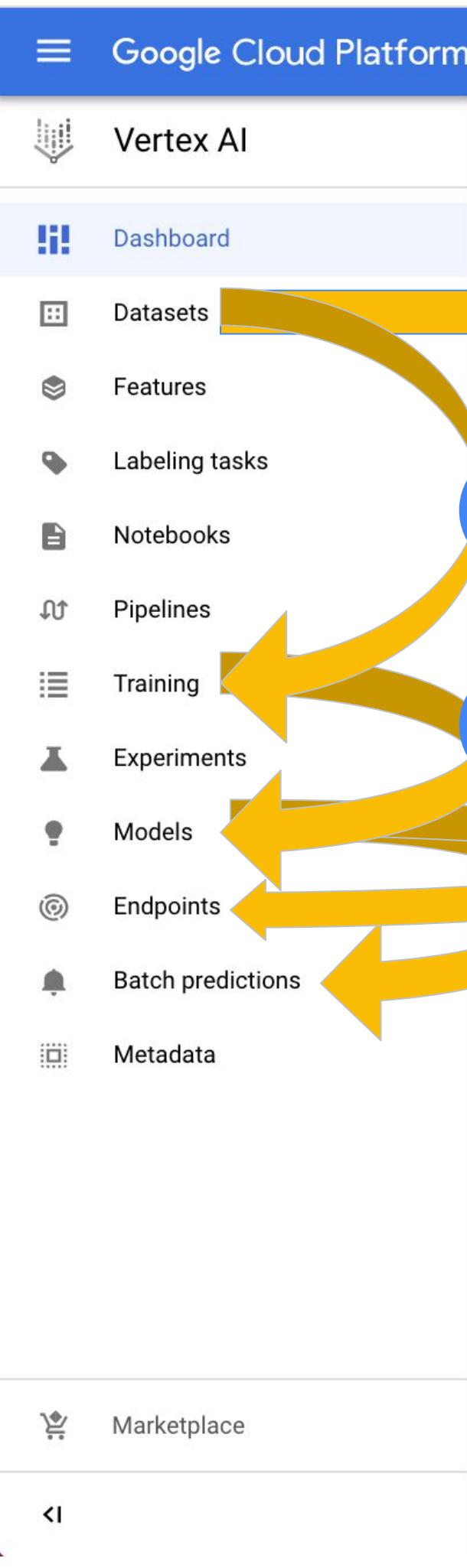
digits\_prepended

Row	p0	p1	p2	p3	p4	p5	p6	p7	p8	p
1	0.0	5.0	16.0	15.0	5.0	0.0	0.0	0.0	0.0	1
2	0.0	5.0	16.0	12.0	1.0	0.0	0.0	0.0	0.0	1
3	0.0	5.0	15.0	16.0	6.0	0.0	0.0	0.0	0.0	1
4	0.0	4.0	15.0	15.0	8.0	0.0	0.0	0.0	0.0	0.0
5	0.0	6.0	16.0	16.0	15.0	10.0	0.0	0.0	0.0	0.0
6	0.0	8.0	16.0	12.0	15.0	16.0	7.0	0.0	0.0	1
7	0.0	8.0	13.0	15.0	16.0	16.0	8.0	0.0	0.0	0.0
8	0.0	7.0	12.0	14.0	16.0	8.0	0.0	0.0	0.0	0.0

## Notebook: 02a

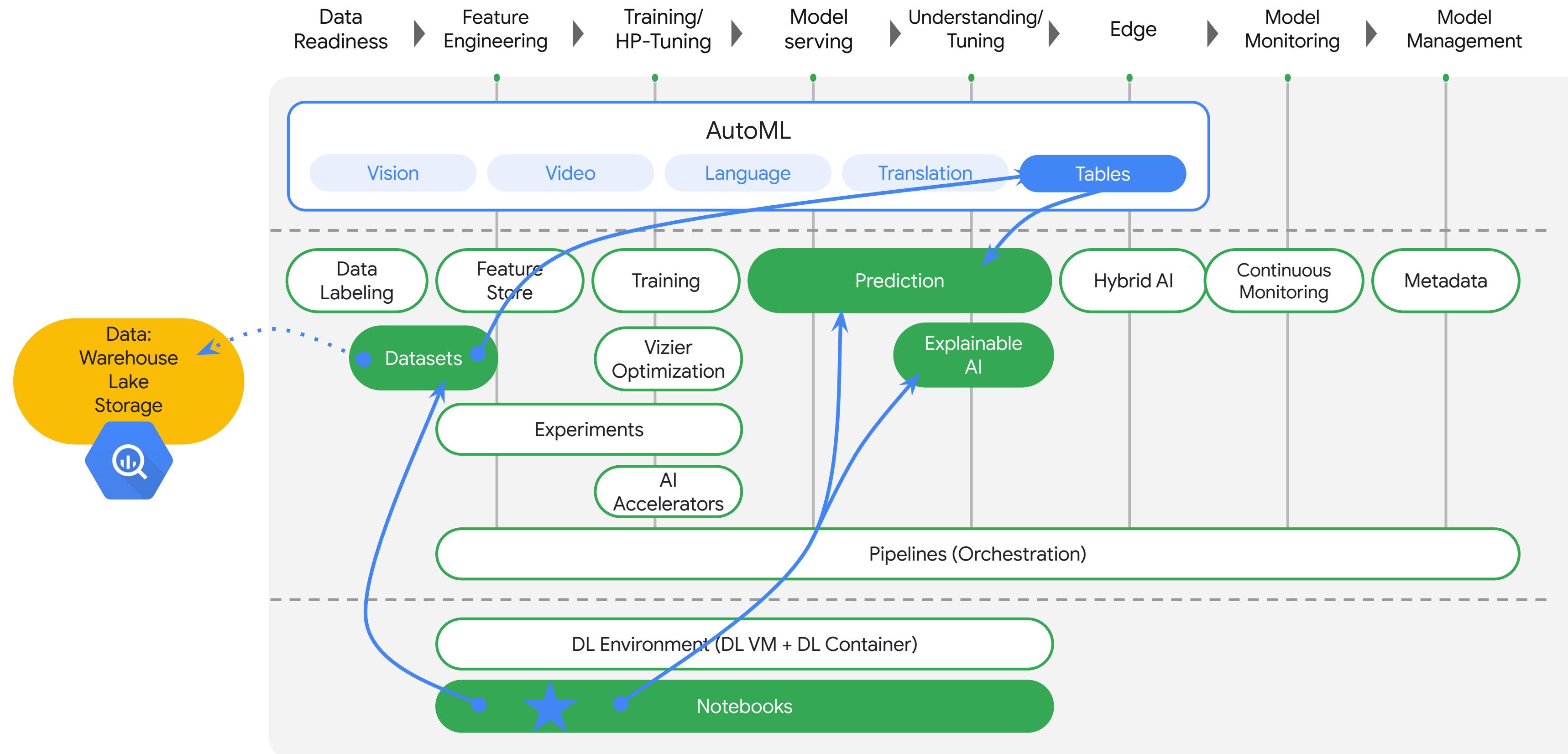
# Vertex AI Overview

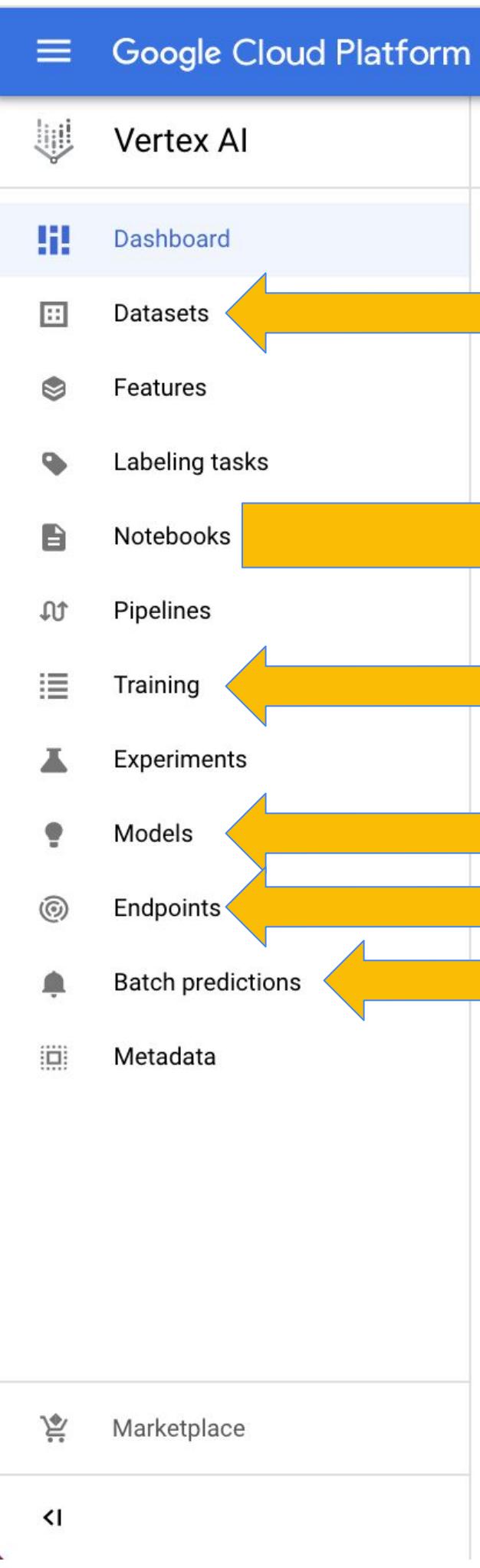




The screenshot shows the Google Cloud Platform Explorer interface. At the top, the project is set to 'statmike-mlops'. The main area displays the 'digits' dataset under the 'DIGITS' tab. The 'PREVIEW' tab is selected, showing a table with 8 rows and 10 columns (p0, p1, p2, p3, p4, p5, p6, p7, p8, p). The first few rows of data are as follows:

Row	p0	p1	p2	p3	p4	p5	p6	p7	p8	p
1	0.0	5.0	16.0	15.0	5.0	0.0	0.0	0.0	0.0	
2	0.0	5.0	16.0	12.0	1.0	0.0	0.0	0.0	0.0	
3	0.0	5.0	15.0	16.0	6.0	0.0	0.0	0.0	0.0	1
4	0.0	4.0	15.0	15.0	8.0	0.0	0.0	0.0	0.0	
5	0.0	6.0	16.0	16.0	16.0	15.0	10.0	0.0	0.0	
6	0.0	8.0	16.0	12.0	15.0	16.0	7.0	0.0	0.0	1
7	0.0	8.0	13.0	15.0	16.0	16.0	8.0	0.0	0.0	
8	0.0	7.0	12.0	14.0	16.0	8.0	0.0	0.0	0.0	





**File Edit View Run Kernel Git Tabs Settings Help**

**Launcher** **02b - Vertex AI - AutoML v**

**Python 3**

## 02b - Vertex AI - AutoML with clients (code)

Use the Vertex AI Python Client to recreate the no-code approach of (02a) with code (Python). This builds a custom model with AutoML and deploys it to an Endpoint for predictions and explanations.

**Prerequisites:**

- 01 - BigQuery - Table Data Source

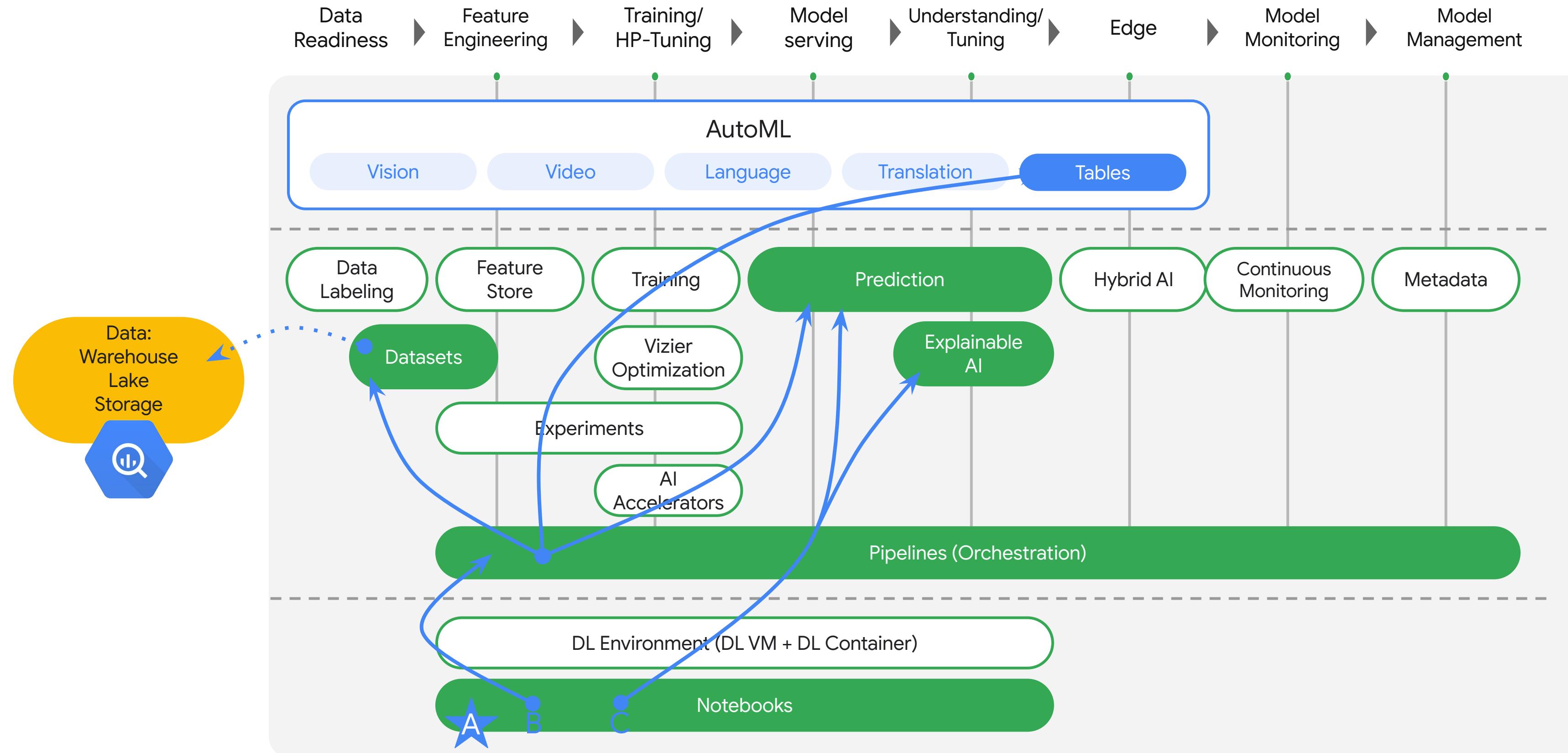
**Overview:**

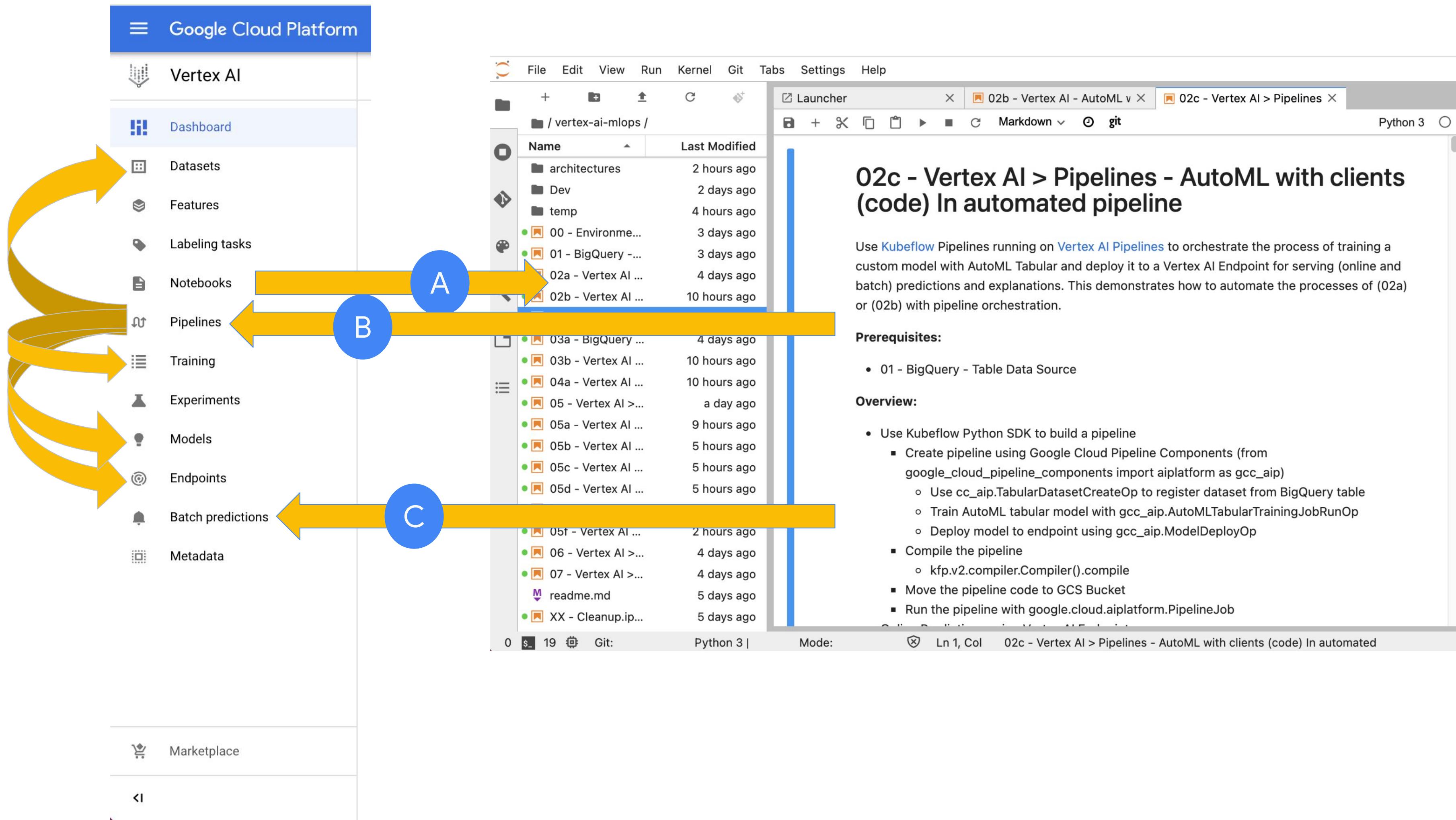
- Use Python client `google.cloud.aiplatform` for Vertex AI
  - Create a dataset
    - `aiplatform.TabularDataset`
    - Link BigQuery table
  - Train Model with AutoML
    - `aiplatform.AutoMLTabularTrainingJob`
  - Evaluate
    - Review the model in GCP Console > Vertex AI > Models
  - Deploy to Endpoint
    - `Endpoint = aiplatform.Endpoint`
    - `Endpoint.deploy`
  - Online Predictions
    - `Endpoint.predict`

Mode: Command **Ln 1, Col 1** 02b - Vertex AI - AutoML with clients (code).ipynb

Name	Last Modified
architectures	2 hours ago
Dev	2 days ago
temp	4 hours ago
01 - BigQuery - ...	3 days ago
02a - Vertex AI ...	4 days ago
<b>02b - Vertex AI ...</b>	<b>9 hours ago</b>
02c - Vertex AI ...	9 hours ago
03a - BigQuery ...	4 days ago
03b - Vertex AI ...	9 hours ago
04a - Vertex AI ...	9 hours ago
05 - Vertex AI >...	a day ago
05a - Vertex AI ...	9 hours ago
05c - Vertex AI ...	5 hours ago
05d - Vertex AI ...	5 hours ago
05e - Vertex AI ...	4 hours ago
06 - Vertex AI >...	2 hours ago
readme.md	4 days ago
requirements.ip...	4 days ago
M README	5 days ago
run.ip...	5 days ago

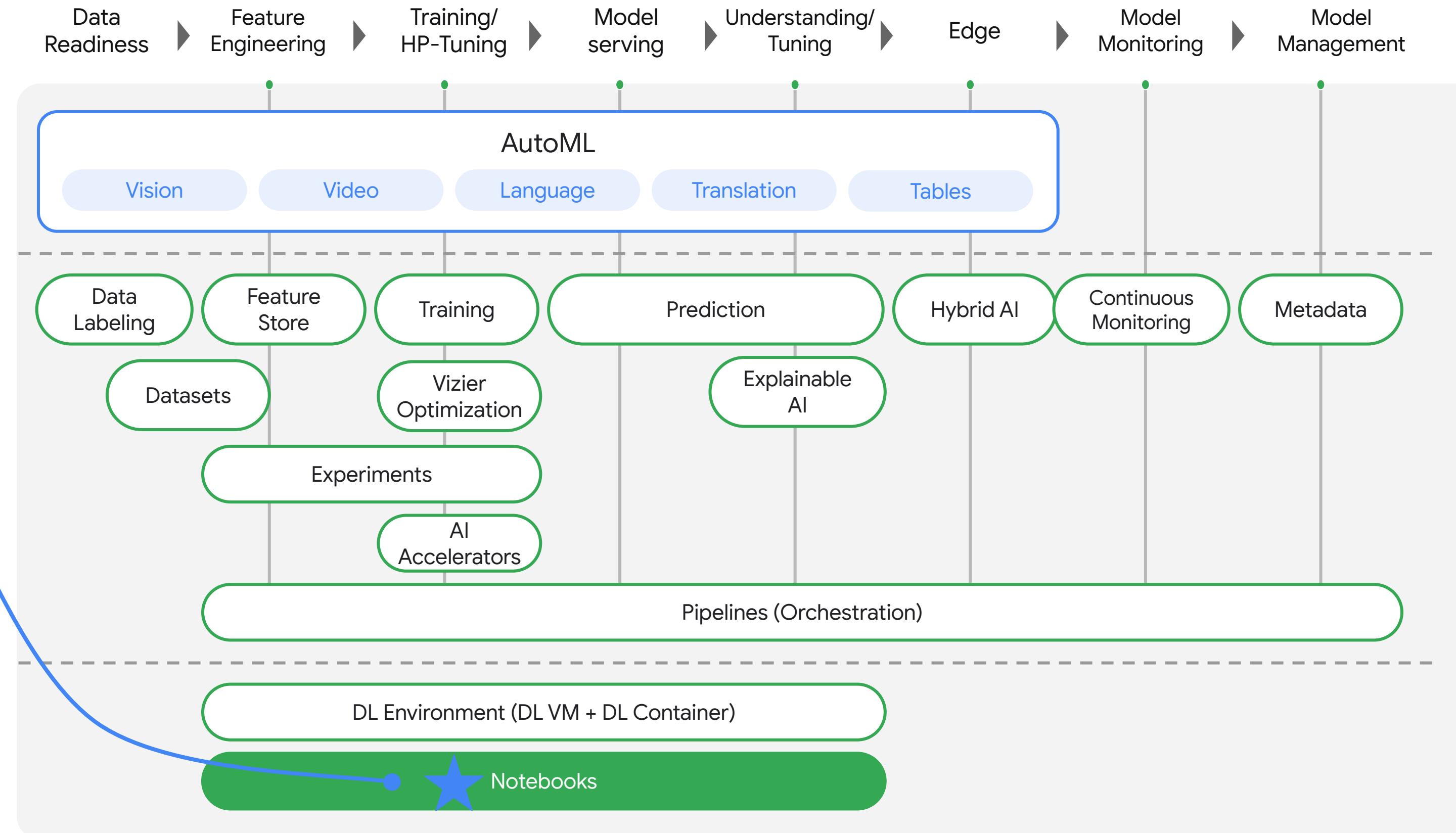
0 \$ 19 Git: idle Python 3 | Idle





## Notebook: 03a

# Vertex AI Overview



Google Cloud Platform

Vertex AI

- Dashboard
- Datasets
- Features
- Labeling tasks
- Notebooks
- Pipelines
- Training
- Experiments
- Models
- Endpoints
- Batch predictions
- Metadata

Marketplace

Google Cloud Platform statmike-mlops Search products and resources

FEATURES & INFO SHORTCUT DISABLE EDITOR TABS

Explorer + ADD DATA EDITOR DIGITS DIGITS\_LR

Type to search

Viewing pinned projects.

statmike-mlops digits Models (1) digits\_lr digits digits\_featurestore\_import digits\_fs\_training digits\_prepred

DETAILS TRAINING EVALUATION SCHEMA

Loss Duration (sec)

10 Training loss: 0.011 Evaluation loss: 0.014

Duration (seconds)

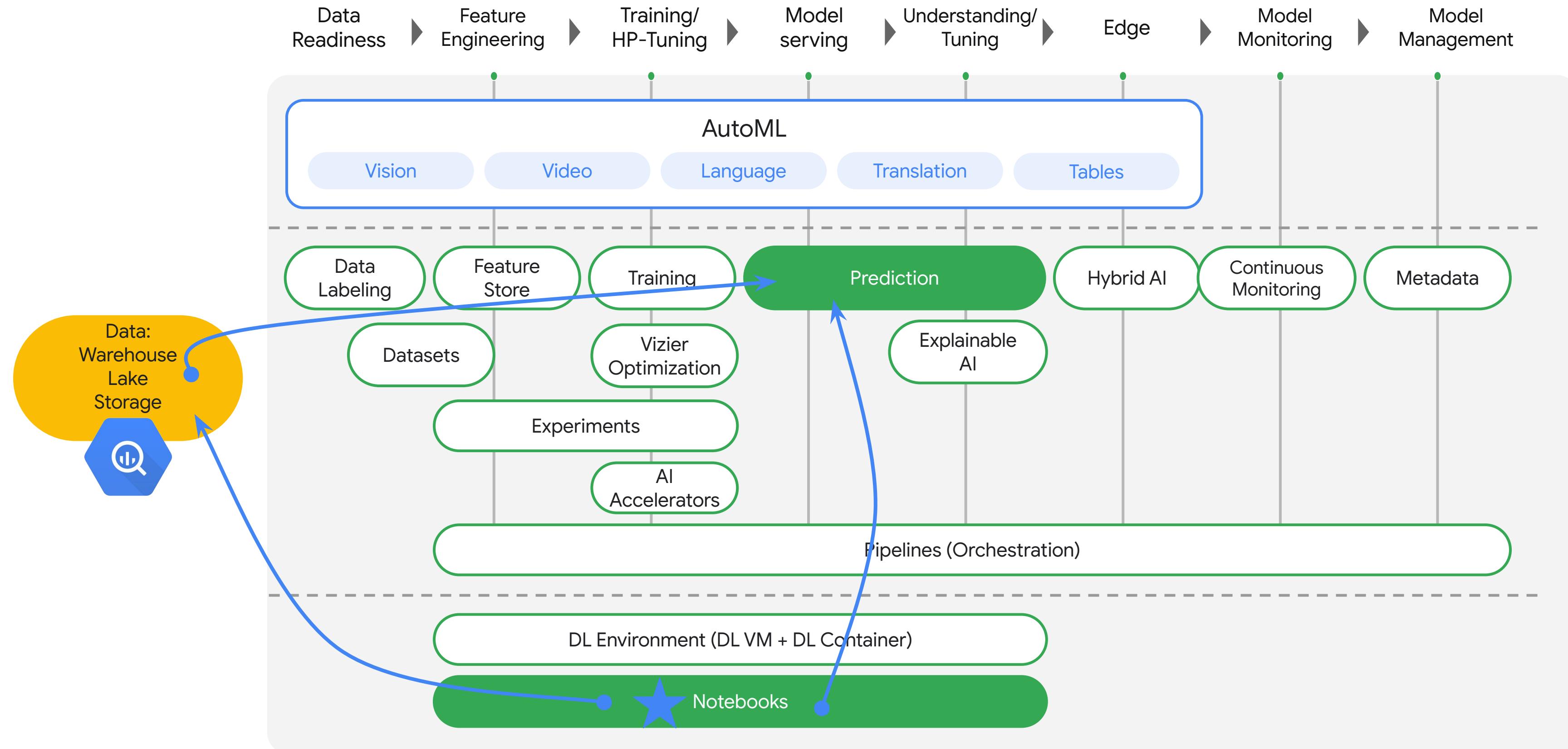
File Edit View Run Kernel Git Tabs Settings Help

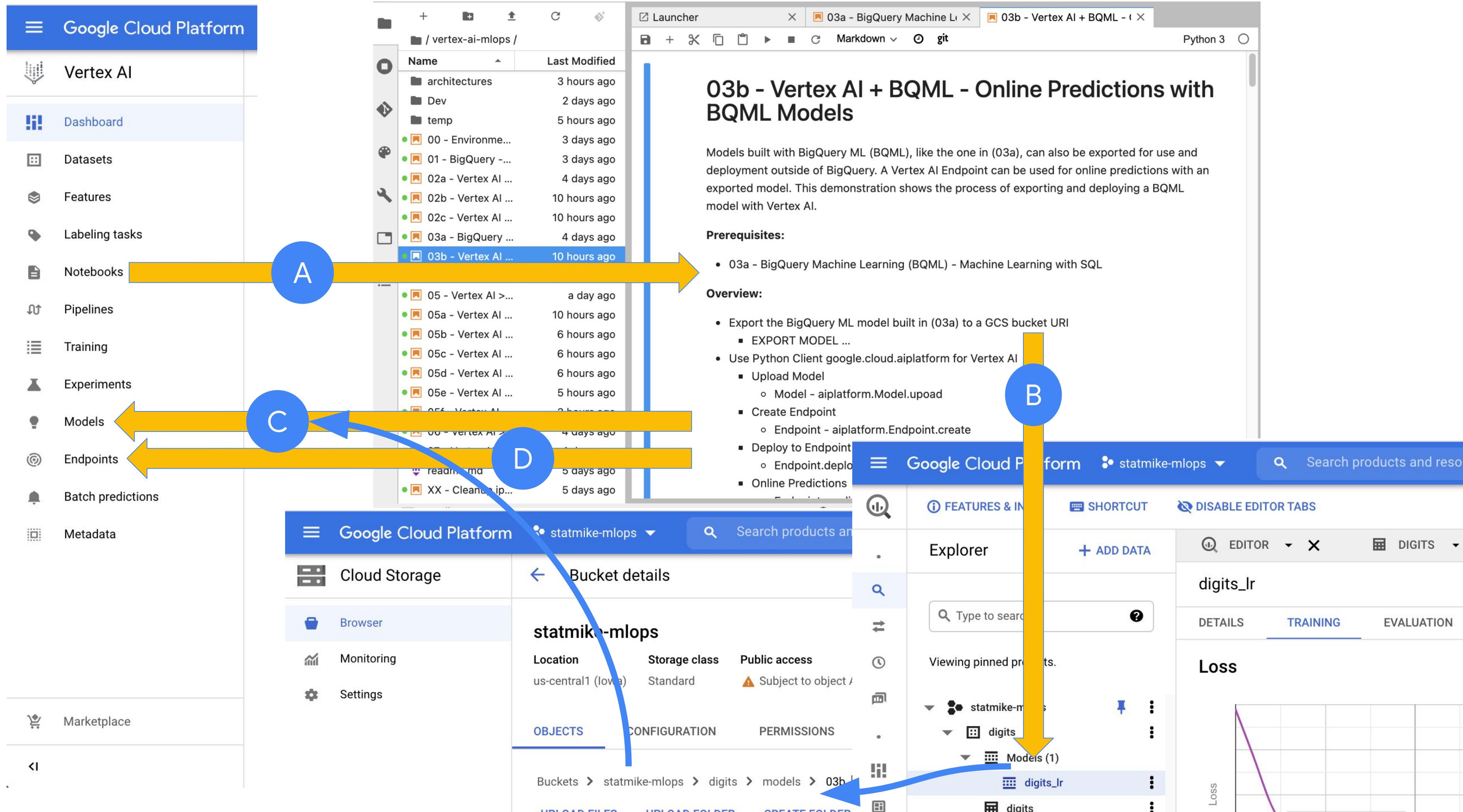
/ vertex-ai-mlops /

Name	Last Modified
architectures	3 hours ago
Dev	2 days ago
temp	5 hours ago
00 - Environment...	3 days ago
01 - BigQuery -...	3 days ago
02a - Vertex AI ...	4 days ago
02b - Vertex AI ...	10 hours ago
02c - Vertex AI ...	10 hours ago
03a - BigQuery Machine Learning (BQML) - Machine Learning with SQL	4 days ago

03a - BigQuery Machine Learning (BQML) - Machine Learning with SQL

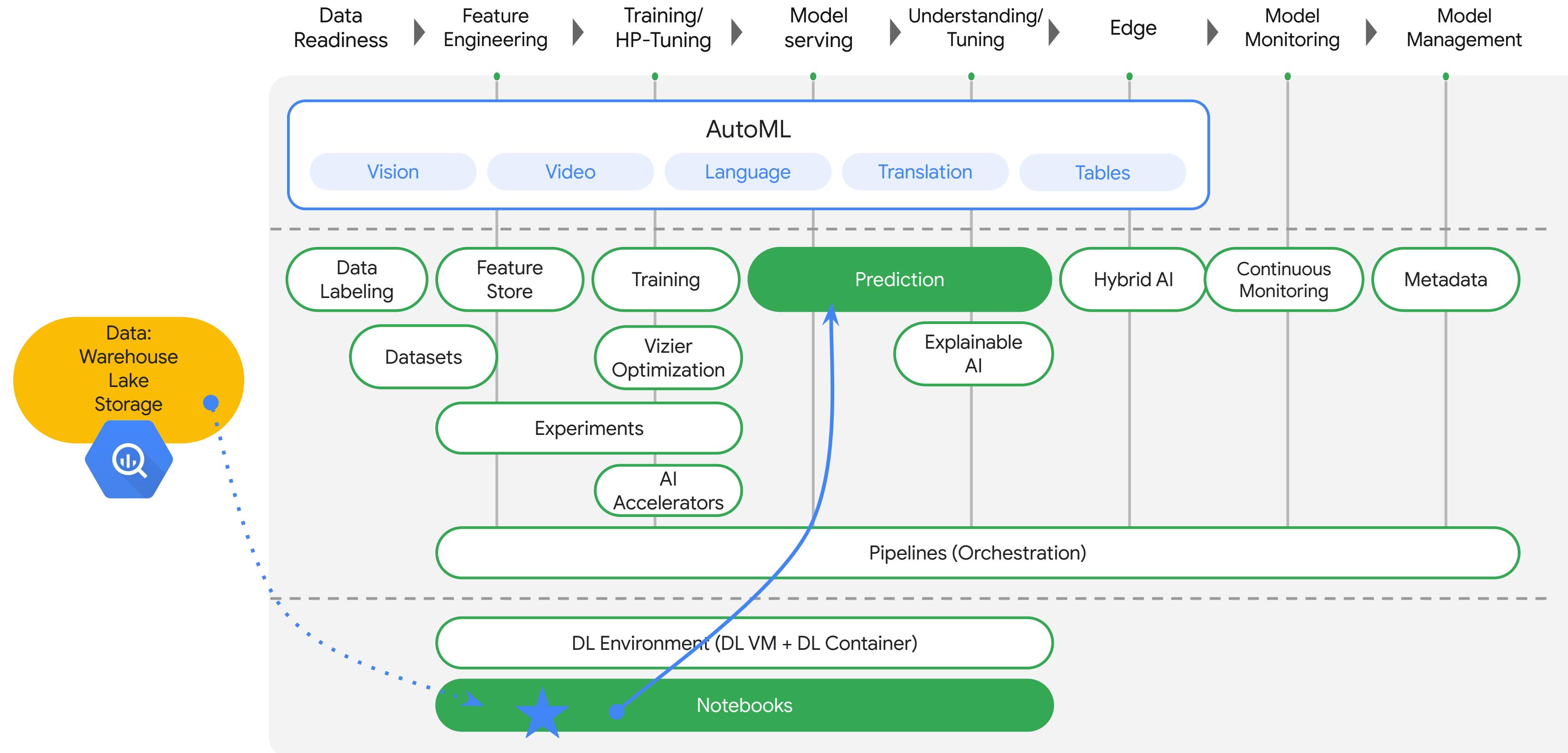
BigQuery has a number of machine learning algorithms callable directly from SQL. This gives the convenience of using the common language of SQL to "CREATE MODEL ..."). The library of available models is constantly growing and covers supervised, unsupervised, and time series methods as well as functions for evaluation - even anomaly detection from results, explainability and hyperparameter tuning. A great starting point for seeing the scope of available methods is [your journey for models](#).





## Notebook: 04a

# Vertex AI Overview



**A**

**B**

**C**

**D**

## 04a - Vertex AI > Notebooks - Models Built in Notebooks with Tensorflow

Where a model gets trained is where it consumes computing resources. With Vertex AI, you have choices for configuring the computing resources available at training. This notebook is an example of an execution environment. When it was set up there were choices for machine type and accelerators (GPUs).

This notebook shows training a model directly within the runtime of the notebook. Then the model is saved and moved to GCS for deployment to a Vertex AI endpoint. The predictions. The model training is done with [Tensorflow](#), specifically [Keras](#). The notebook shows a neural network approach to logistic regression. The training data is loaded from BigQuery using [Tensorflow I/O](#).

**Prerequisites:**

- 01 - BigQuery - Table Data Source

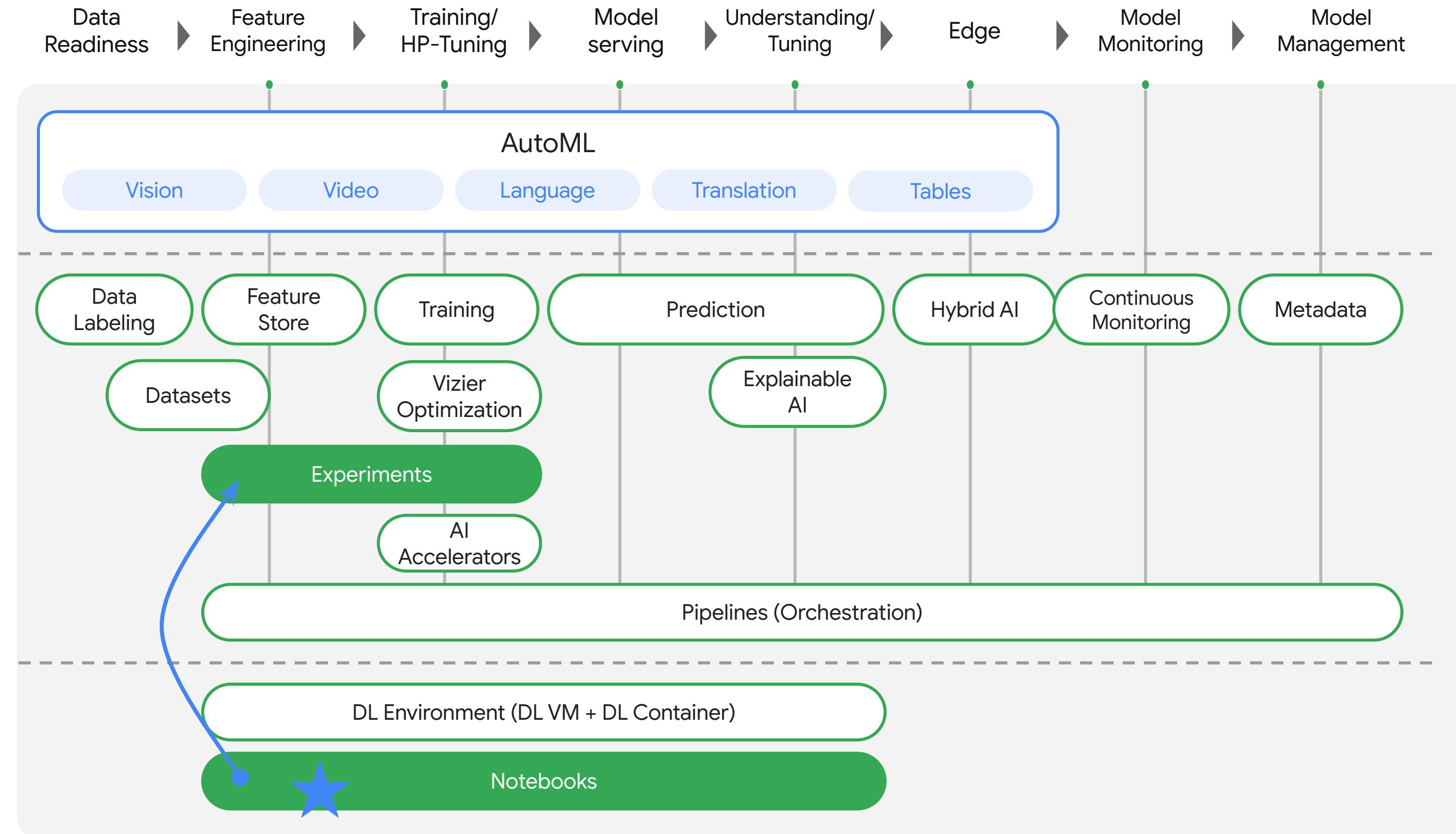
**Overview:**

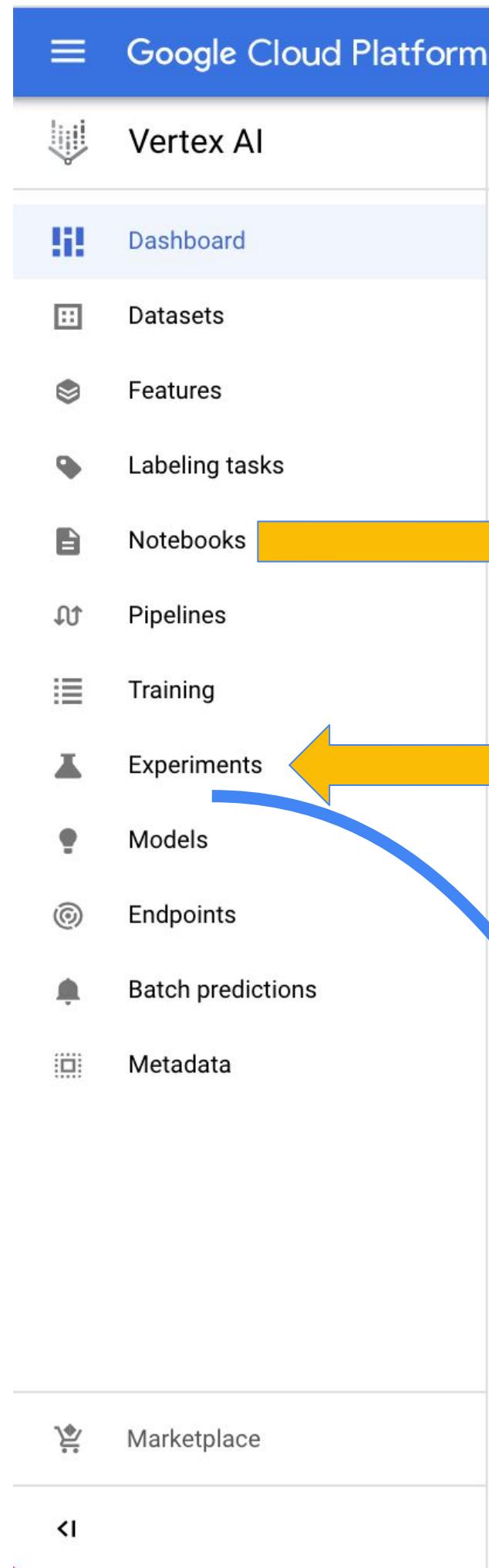
- Use Python Client for BigQuery
  - Read the tables schema from BigQuery INFORMATION\_SCHEMA
  - Prepare the feature information for Tensorflow
- Define a function that remaps the input data into features and target variables where target is one-hot encoded (classification model with 10 classes)

Mode: Command    Git: idle    Python 3 | Idle    0 \$ 19    04a - Vertex AI > Notebooks - Models Built in Notebooks with Tensorflow.ipynb

## Notebook: 05

# Vertex AI Overview





File Edit View Run Kernel Git Tabs Settings Help

Launcher 05 - Vertex AI > Experim... Python 3

/ vertex-ai-mlops /

Name	Last Modified
architectures	4 hours ago
Dev	2 days ago
temp	6 hours ago
00 - Environme...	3 days ago
01 - BigQuery -...	3 days ago
02a - Vertex AI ...	4 days ago
02b - Vertex AI ...	11 hours ago
02c - Vertex AI ...	11 hours ago
03a - BigQue v...	4 days ago
03b - Vertex AI ...	11 hours ago
04a - Vertex AI ...	11 hours ago
05 - Vertex AI >...	a day ago
05a - Vertex AI ...	11 hours ago
05b - Vertex AI ...	6 hours ago
05d - Vertex AI ...	6 hours ago
05e - Vertex AI ...	6 hours ago
05f - Vertex AI ...	4 hours ago
06 - Vertex AI >...	4 days ago
07 - Vertex AI >...	4 days ago
readme.md	5 days ago
XX - Cleanup.ip...	5 days ago

Vertex AI Experiments has managed Tensorboard instances that you can track Tensorboard Experiments (a training run or hyperparameter tuning sweep).

**Prerequisites:**

- None

**Overview:**

- Use Python Client `google.cloud.aiplatform` for Vertex AI
  - Create and Tensorboard instance for use in other notebooks
- To use this tensorboard in other notebooks:
  - Locate the Tensorboard
    - `tb = aiplatform.Tensorboard.list(filter='display_name={}'.format(TENSORBOARD_ID))`
    - `TENSORBOARD_NAME = tb[0].resource_name`
  - Provide the `TENSORBOARD_NAME` and direct callbacks to it

**Resources:**

- [Python Client for Vertex AI](#)

**Related Training:**

EXPERIMENTS PREVIEW STUDIES PREVIEW TENSORBOARD INSTANCES PREVIEW

Mode: Command Git: idle Python 3 | Idle Ln 1, Col 1 05 - Vertex AI > Experiments - Managed Tensorboard.ipynb

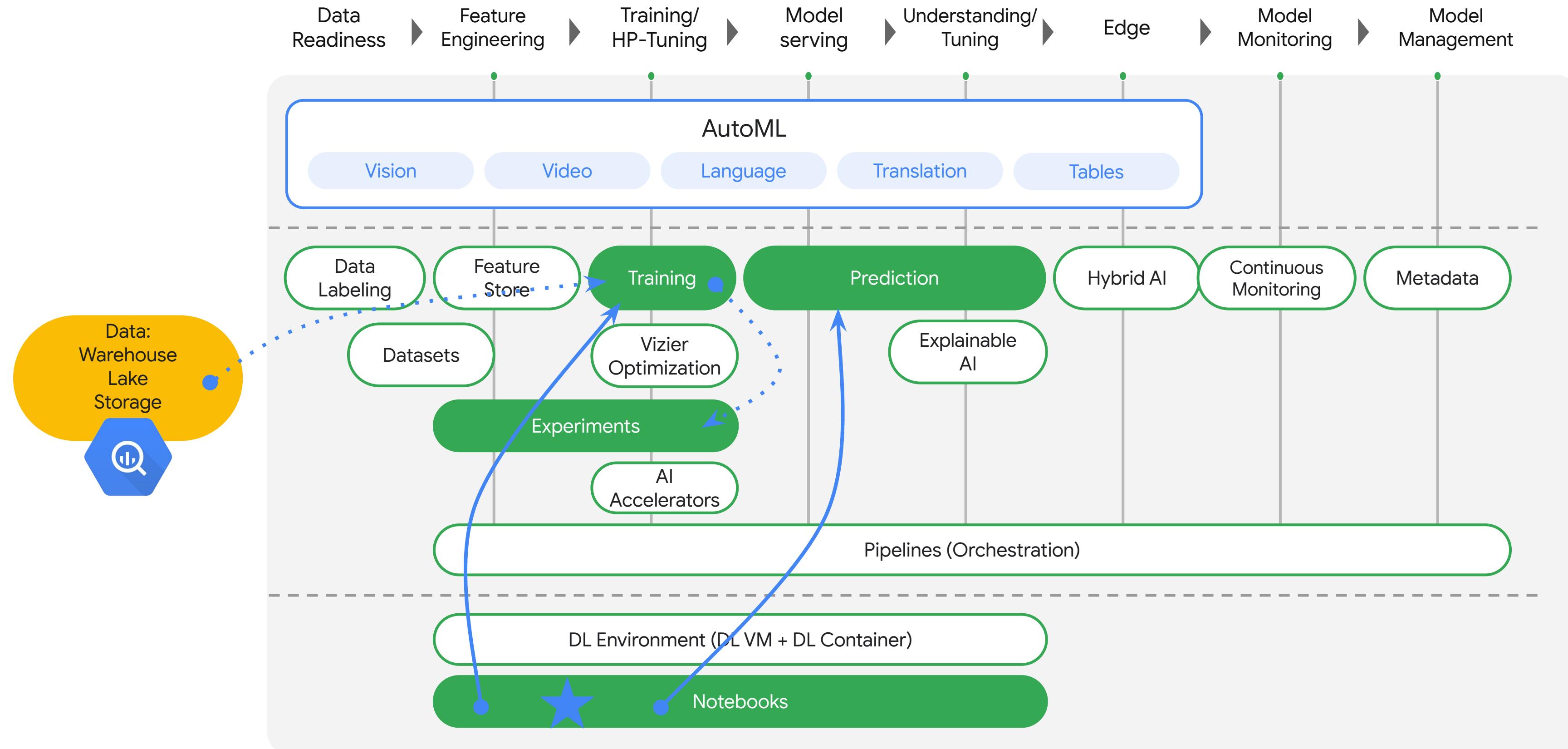
Vertex TensorBoard instances are used to store experiments. Instances belong to a region and any experiments they store will belong to the same one. [Learn more](#)

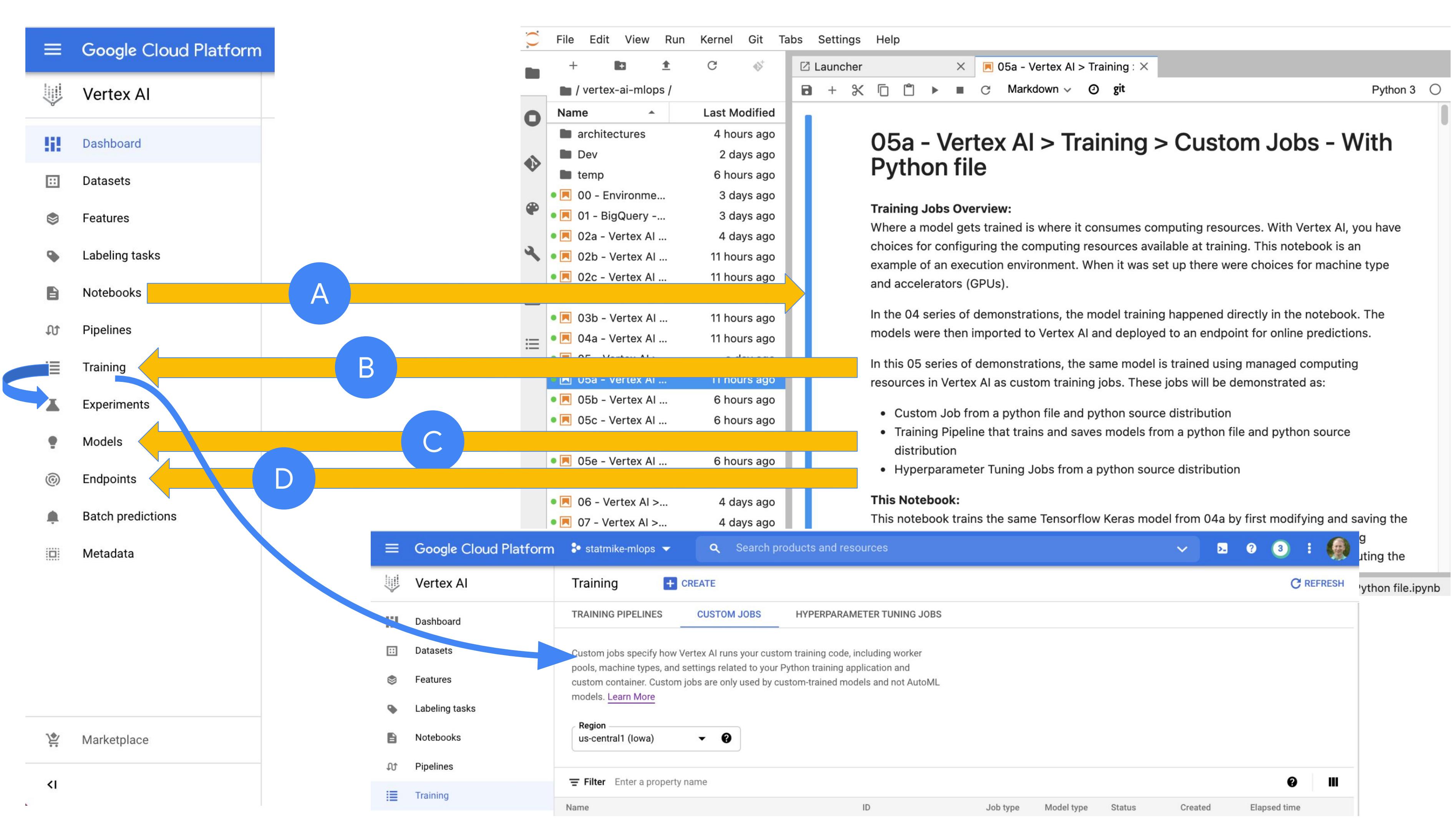
Region us-central1 (Iowa)

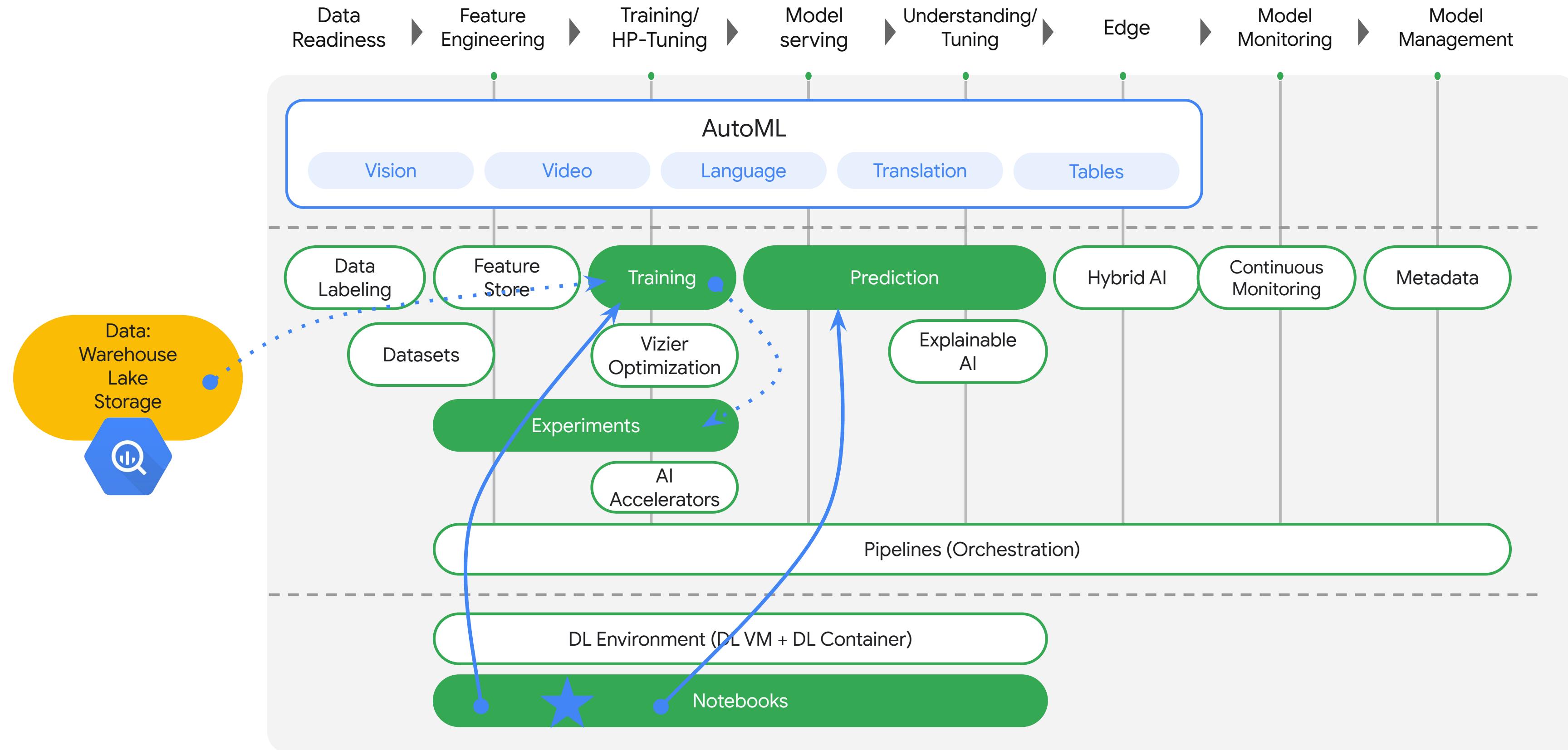
Name	ID	Description	Updated	Created	Metadata
digits	8640050331994030080	-	September 15, 2021	September 15, 2021	⋮

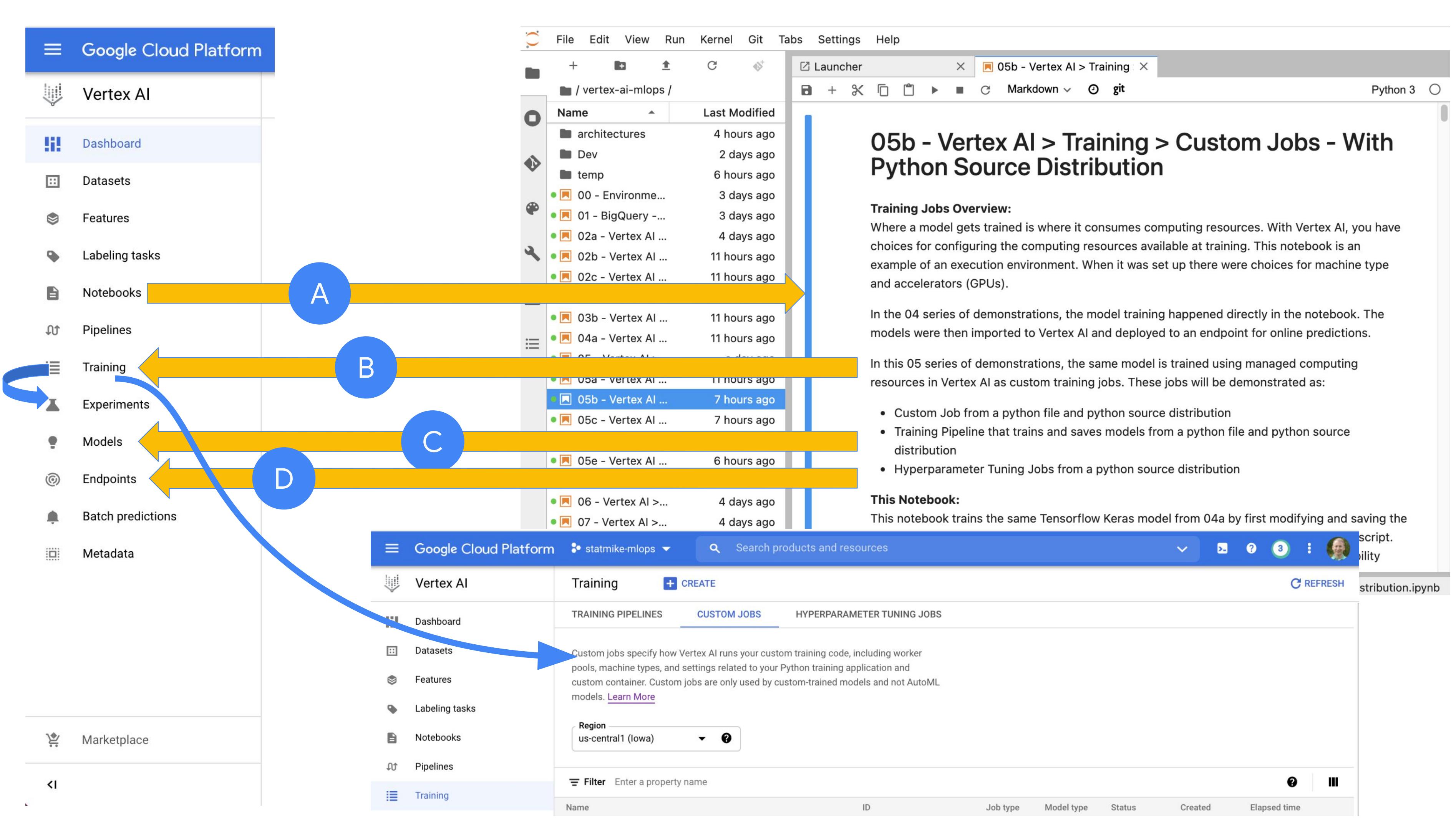
## Notebook: 05a

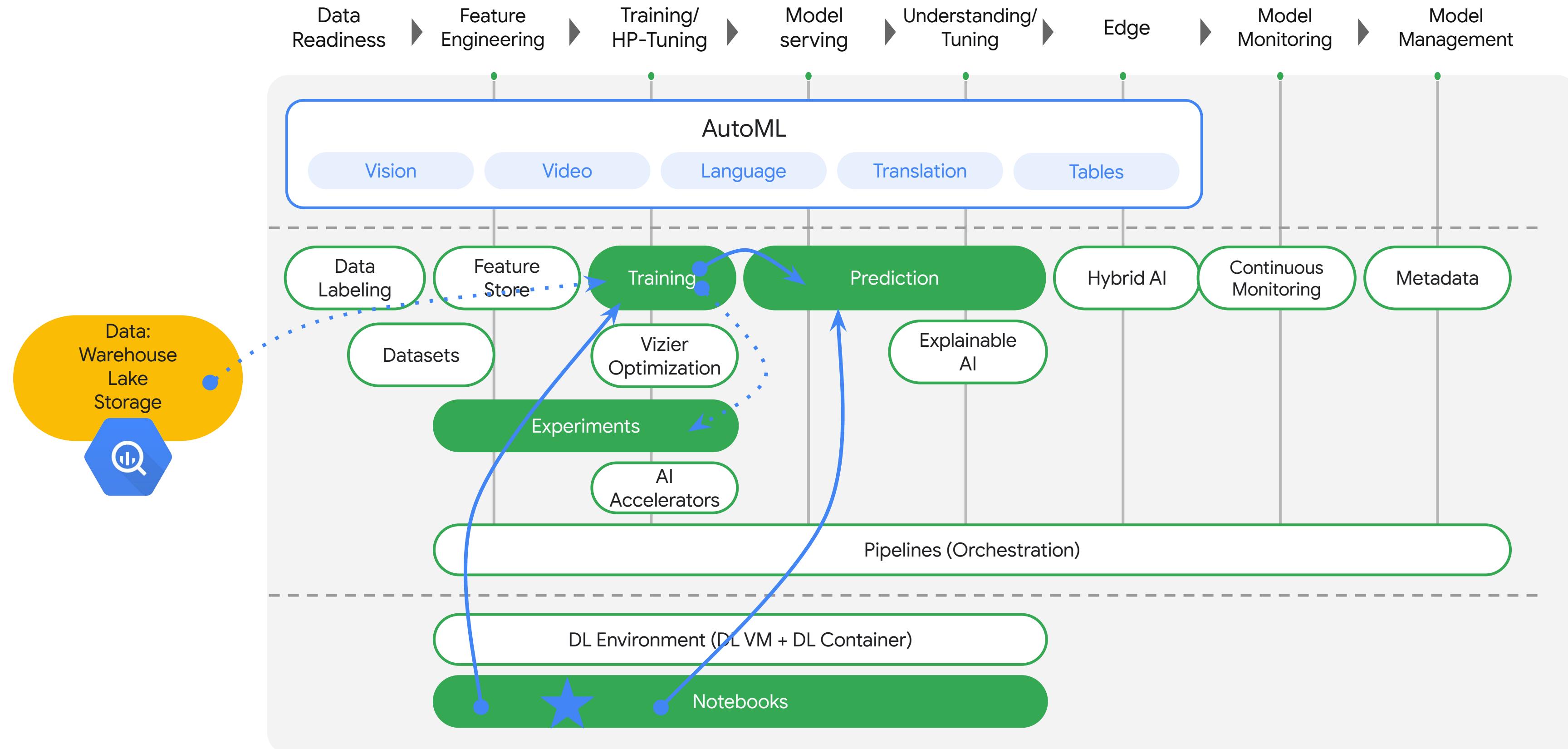
# Vertex AI Overview

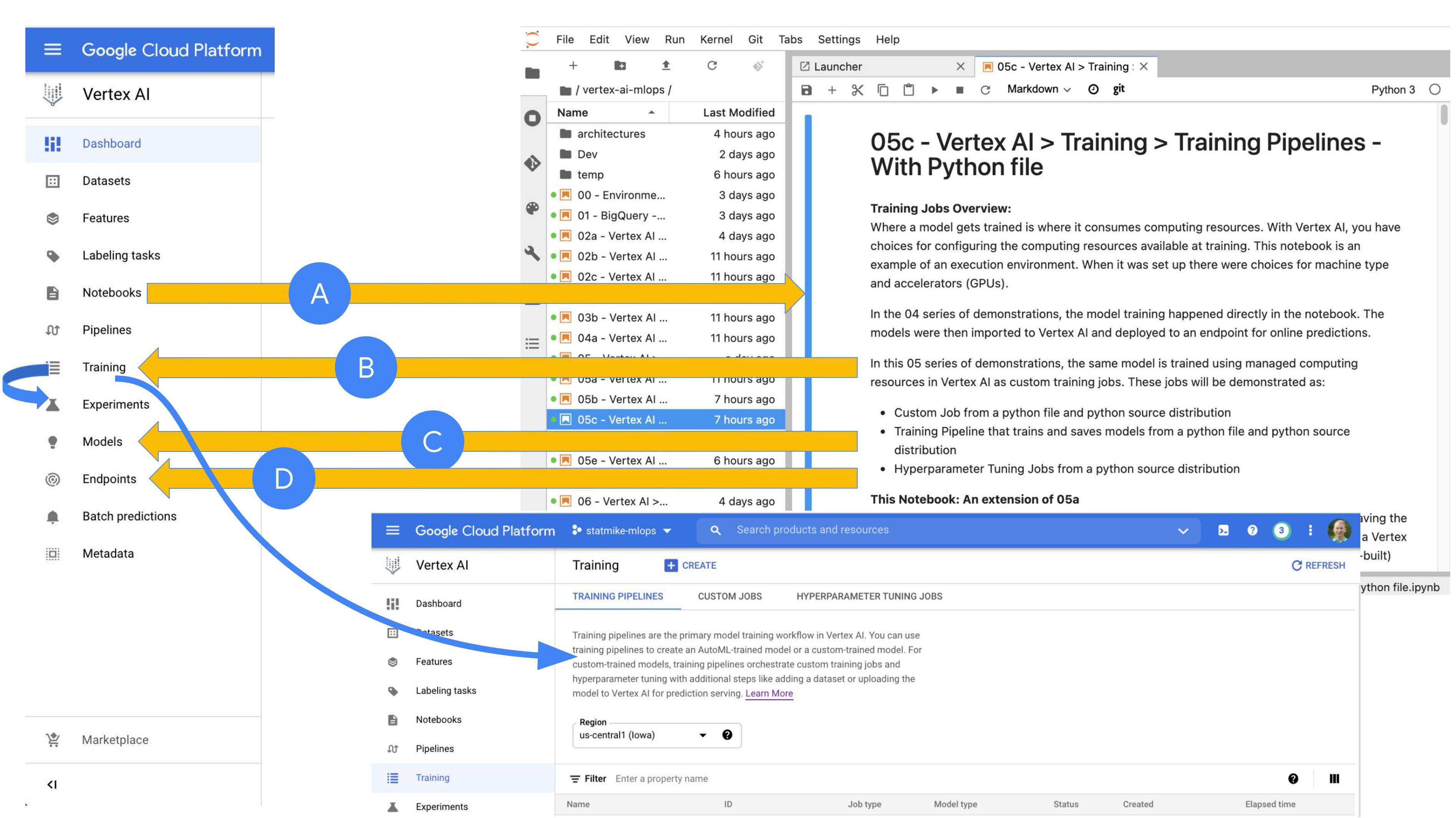


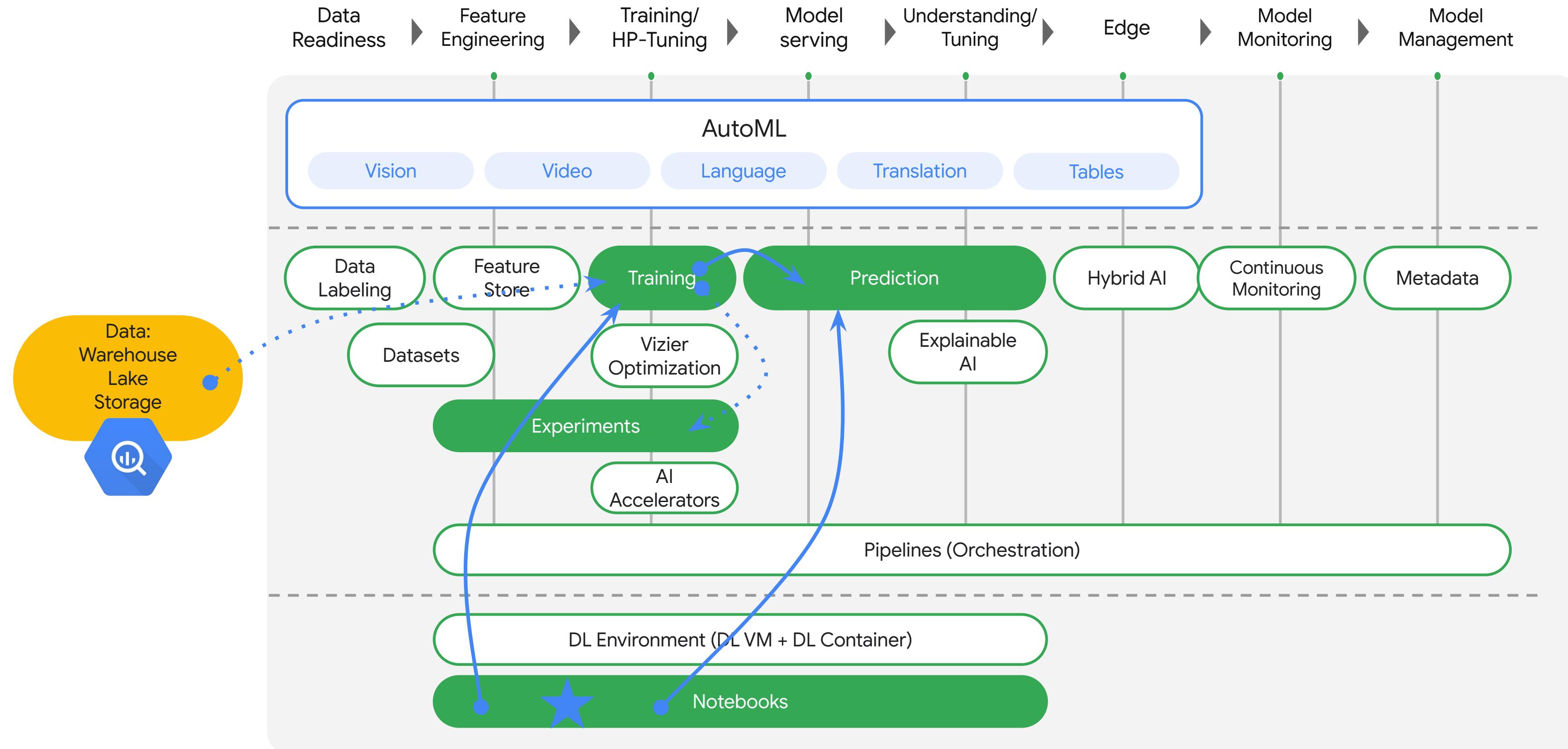


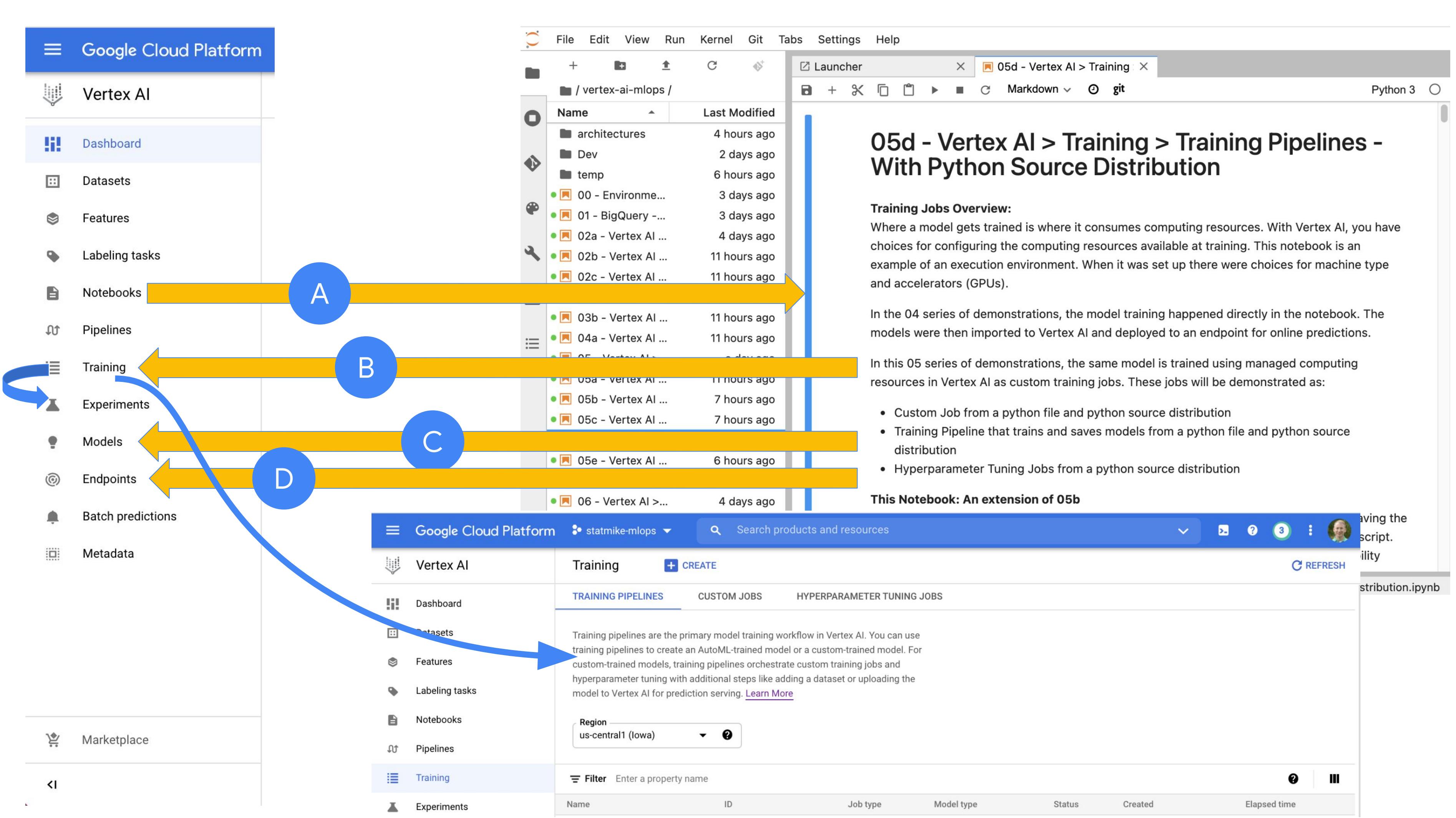


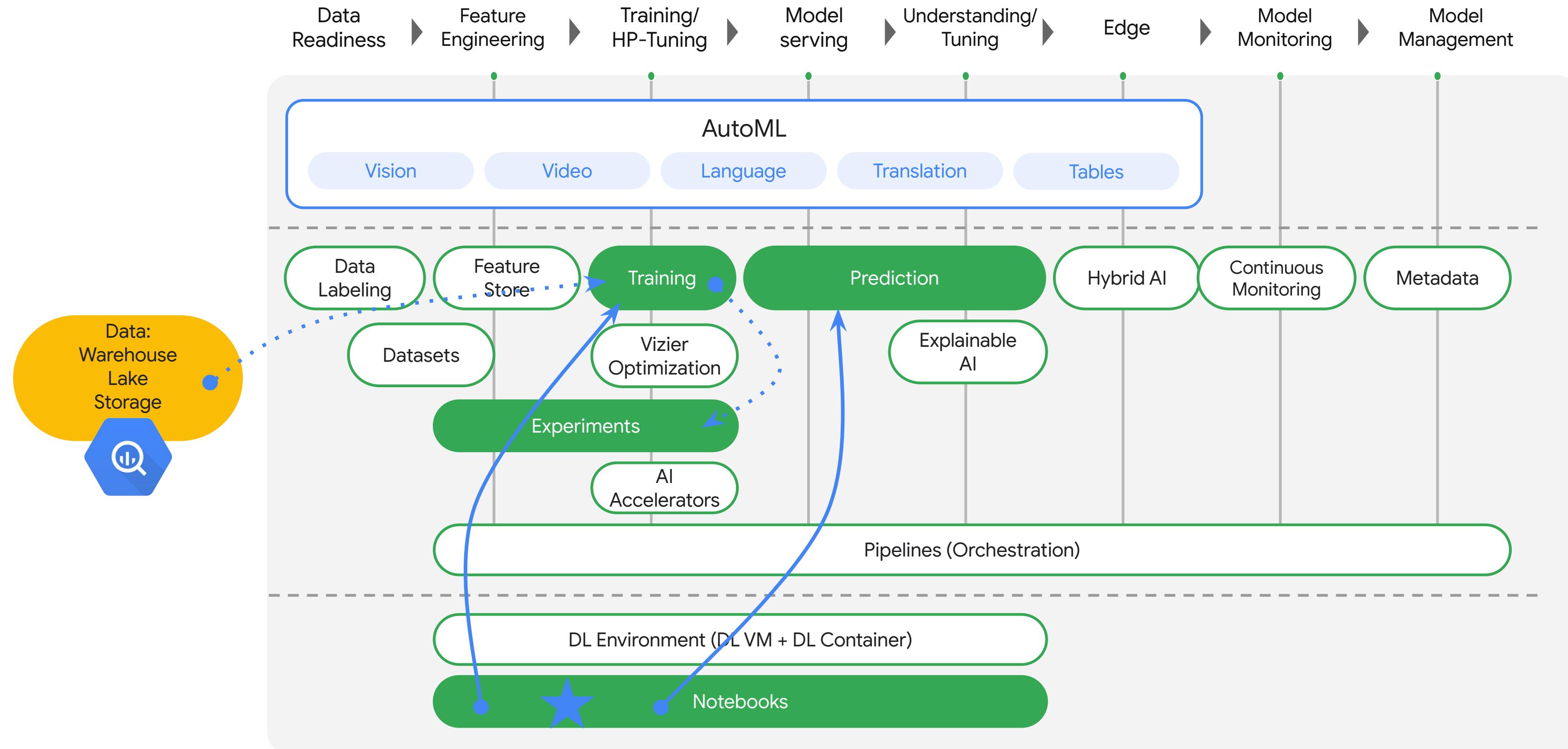


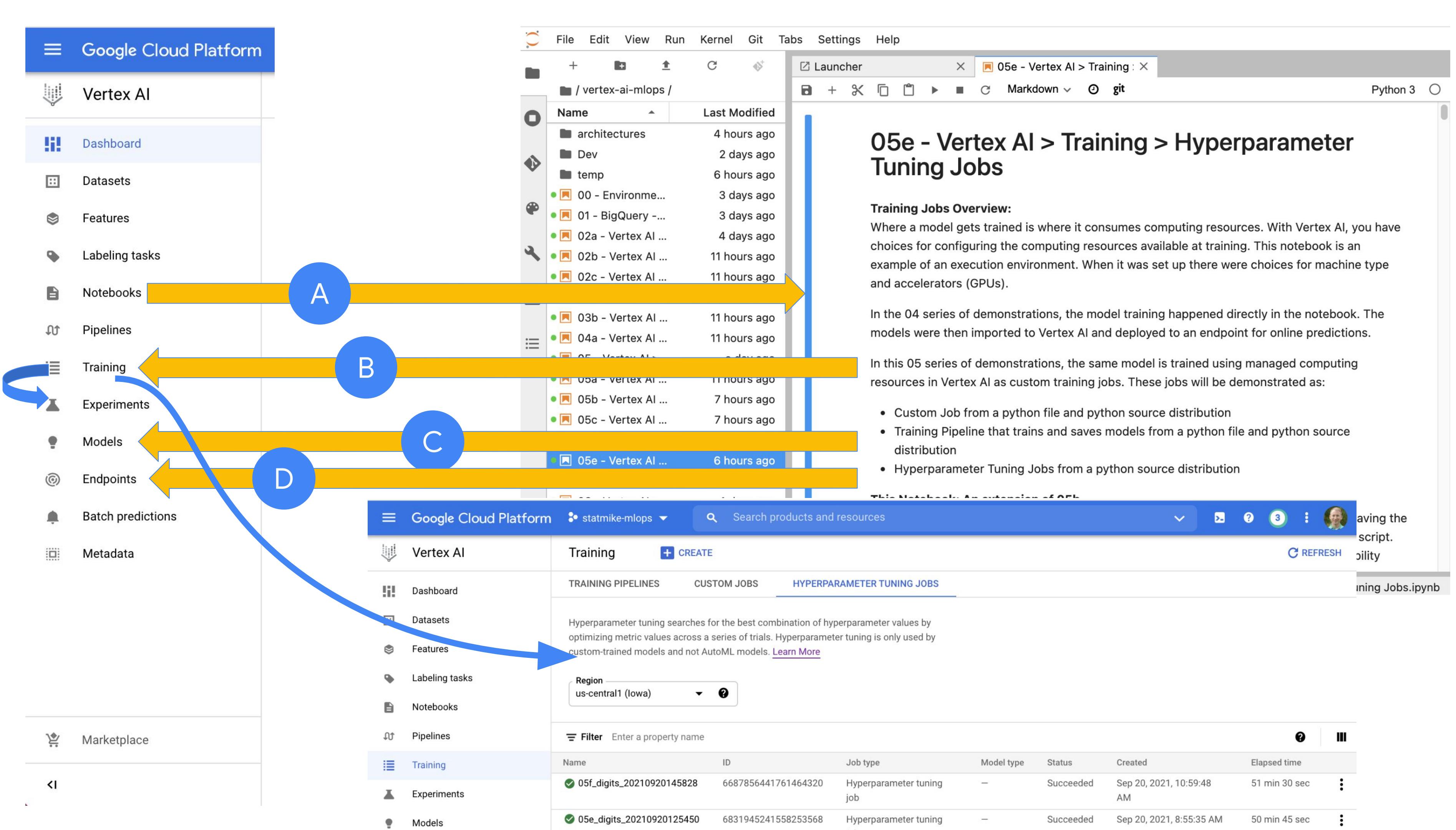


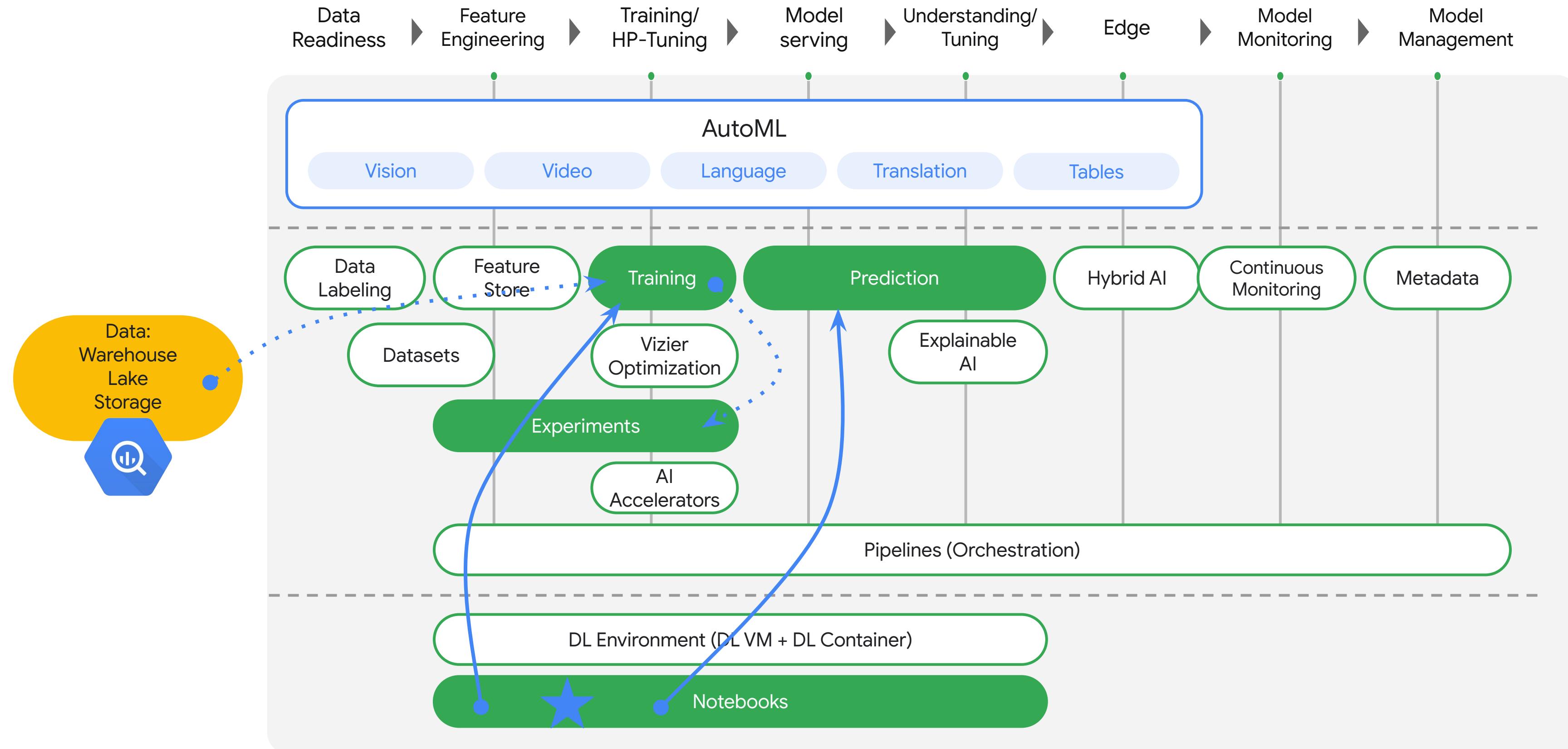


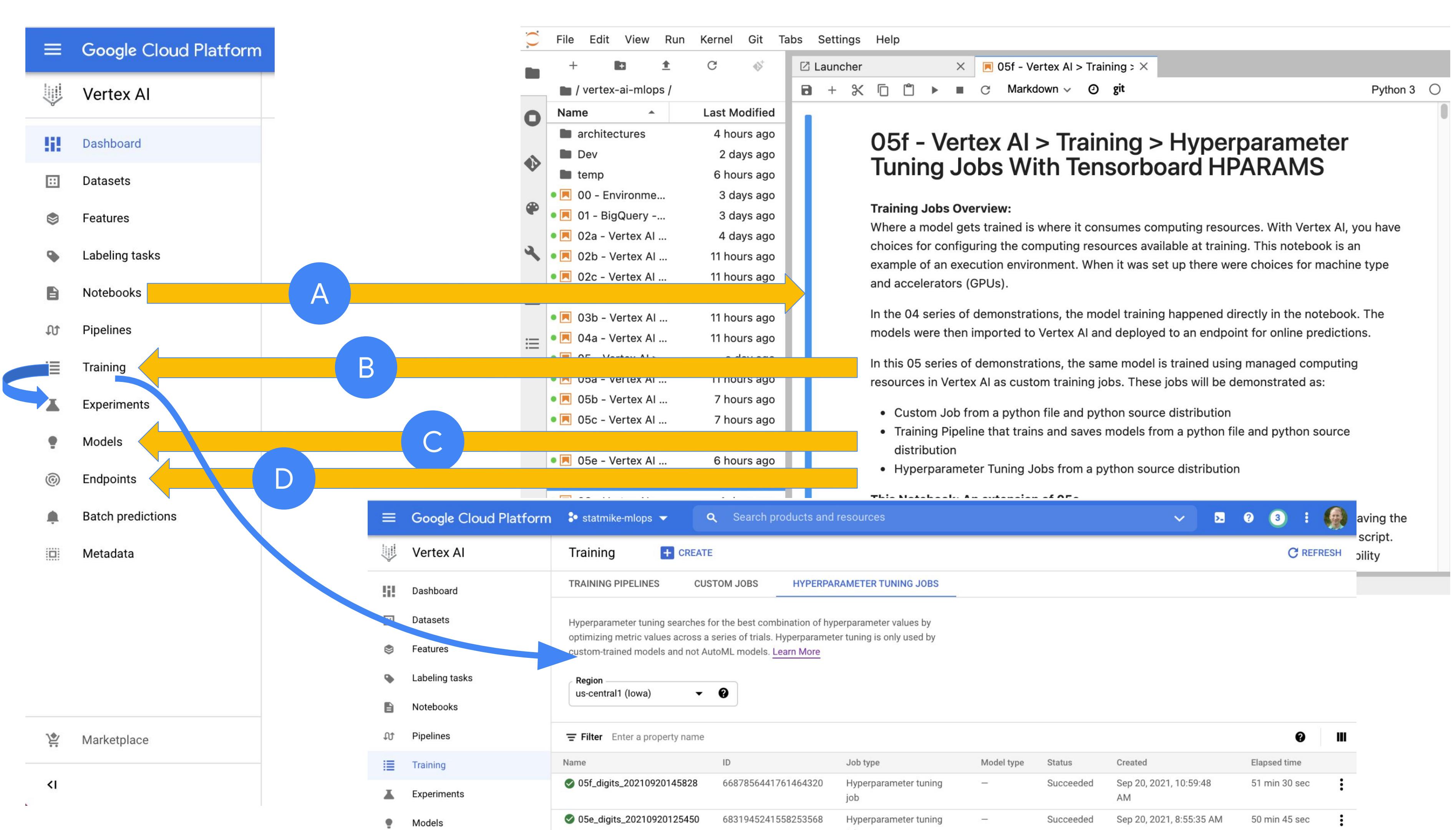






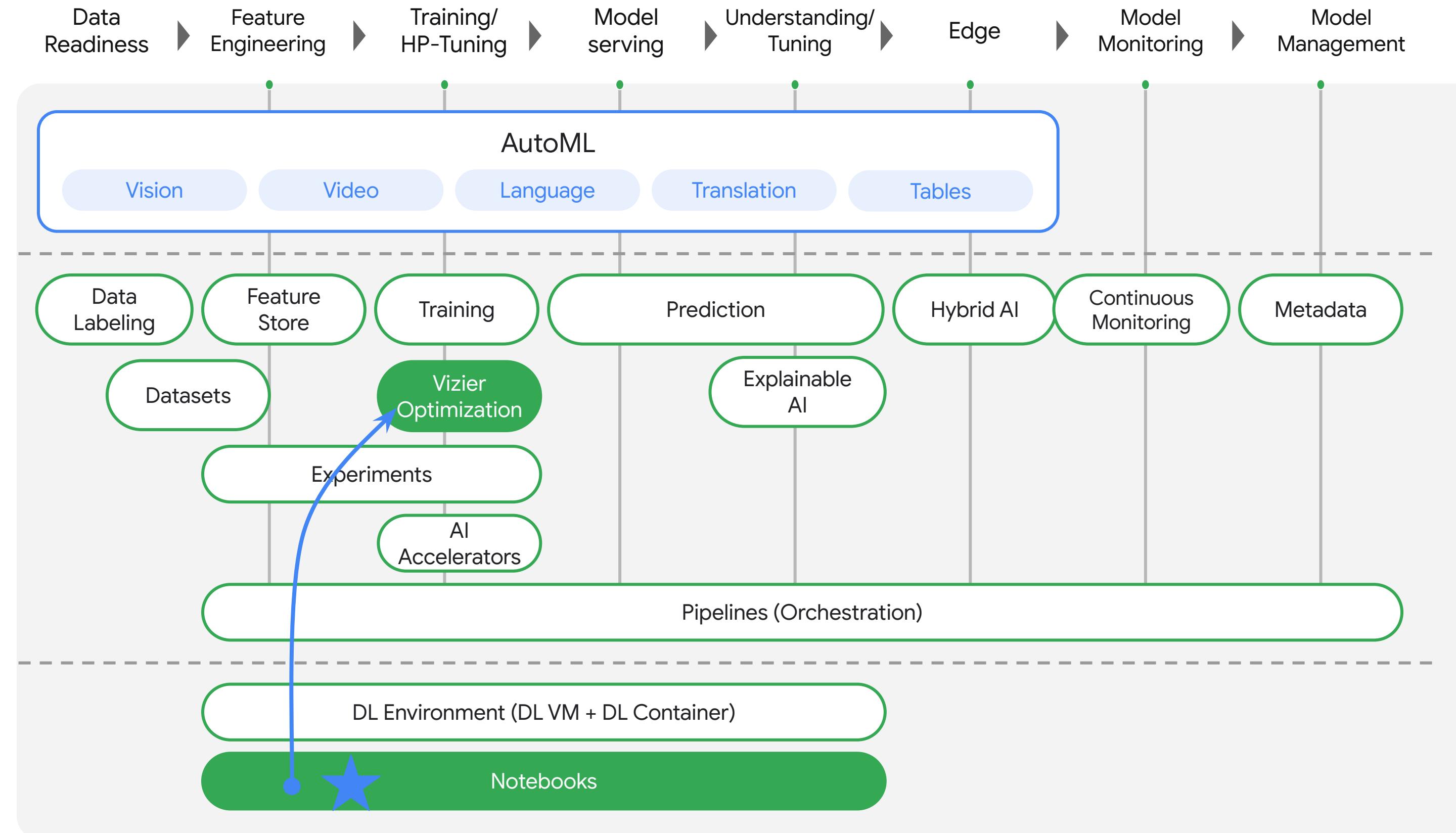






## Notebook: 06

# Vertex AI Overview



The diagram illustrates the workflow for setting up and managing experiments using Vertex AI Vizier. It starts with the Google Cloud Platform Vertex AI dashboard, where the 'Notebooks' section is highlighted (A). A blue arrow points from the dashboard to a Jupyter Notebook interface titled '06 - Vertex AI > Experim...'. In the Jupyter notebook, the 'Notebooks' directory is shown, containing various Vertex AI-related notebooks. A second blue arrow points from the Jupyter notebook interface to the Google Cloud Platform Vertex AI Studies page (B). On the Studies page, the 'STUDIES' tab is selected, showing two studies: 'Study\_06\_Bayesian\_Optimization' and 'Study\_06\_Random'. Both studies have the same objective: 'Minimize "blue" and Maximize "green"'. The 'Created' column indicates they were both created on Sep 16, 2021.

Google Cloud Platform

Vertex AI

Dashboard

Datasets

Features

Labeling tasks

Notebooks

Pipelines

Training

Experiments

Models

Endpoints

Batch predictions

Metadata

Marketplace

A

B

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/ vertex-ai-mlops /

Name Last Modified

- architectures 4 hours ago
- Dev 2 days ago
- temp 6 hours ago
- 00 - Environme... 3 days ago
- 01 - BigQuery -... 3 days ago
- 02a - Vertex AI ... 4 days ago
- 02b - Vertex AI ... 12 hours ago
- 02c - Vertex AI ... 12 hours ago
- 03b - Vertex AI ... 11 hours ago
- 04a - Vertex AI ... 11 hours ago
- 05 - Vertex AI >... a day ago
- 05a - Vertex AI ... 11 hours ago
- 05c - Vertex AI ... 7 hours ago
- 05d - Vertex AI ... 7 hours ago
- 05e - Vertex AI ... 7 hours ago

Launcher 06 - Vertex AI > Experim...

Markdown git

Python 3

## 06 - Vertex AI > Experiments > Studies - Vizier Optimization Service

Vertex AI Vizier is an optimization service. It is used to optimize hyperparameters for machine learning models - called hyperparameter tuning. It can also optimize any system that can be evaluated. Even systems with multiple objectives.

In this demonstration, multiple objectives are set and the Vizier service is used to conduct a random search and a default search (Bayesian Optimization) for comparison.

To see an example of hyperparameter tuning see notebook 05e or 05f. Those notebooks use the `aiplatform.HyperparameterTuningJob()` to manage the process rather than interacting with the Vertex AI Vizier service directly. Also see [this example](#).

**Prerequisites:**

- None

**Overview:**

Google Cloud Platform statmike-mlops Search products and resources REFRESH ynb

Vertex AI Studies

EXPERIMENTS PREVIEW STUDIES PREVIEW TENSORBOARD INSTANCES PREVIEW

Vertex Vizier is an optimization service that helps you tune hyperparameters in complex machine learning models. [Learn more](#)

Region us-central1 (Iowa)

Filter Enter property name or value

Study name	ID	Objective	Created
Study_06_Bayesian_Optimization	4214226082825	Minimize "blue" and Maximize "green"	Sep 16, 2021, 11:51:29 AM
Study_06_Random	639592116037	Minimize "blue" and Maximize "green"	Sep 16, 2021, 11:44:46 AM

## Notebook: 07

# Vertex AI Overview

