



Recommender Workshop

Part 2: Collaborative Filtering

Recommender Workshop Agenda

- Part 1: Introduction
 - Overview of Machine Learning Process, Amazon SageMaker
 - Hands-on: **Data Exploration**
- Part 2: Collaborative Filtering (You Are Here)
 - Core Concepts for Recommendations
 - Hands-on: **K-Means Clustering**
- Part 3: Matrix Factorization
 - Refining Recommendations
 - Hands-on: **Factorization Machine**
- Part 4: Hyperparameter Tuning
 - Key Concepts
 - Hands-on: **Hyperparameter Tuning**

Recommendations

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\$17.33



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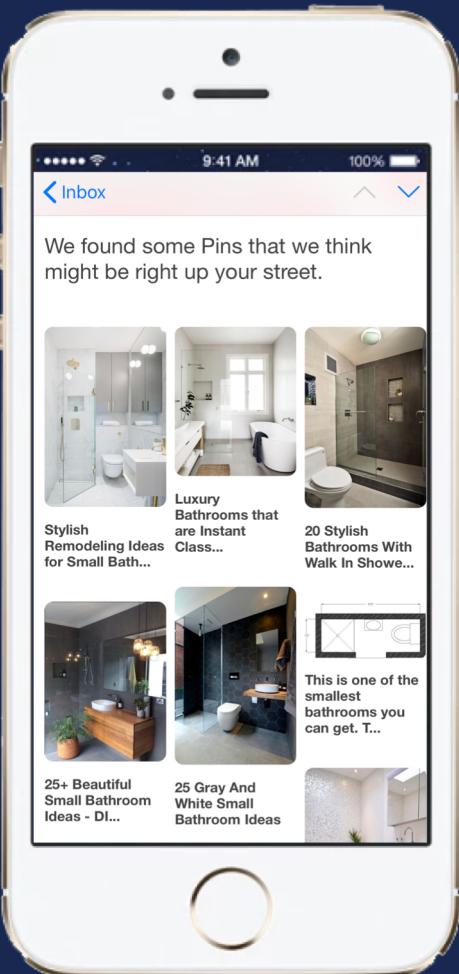
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Huggies Essentials Nappies, Size 2, 54 Count

\$13.00

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Recommender: Features

- What do we know about that user?
 - Demographics
 - Preferences/Behaviour
 - Networks
- What do we know about the products?
 - Category
 - Description/Text
 - Pricing/Sales History

Recommender: Approach

- Find similar users
 - what are *those* individuals buying?
- Find similar products
 - what is associated with preferred products?

Collaborative Filtering

Collaborative Filtering: Defined

"[By mapping user preferences] users help one another to identify interesting items (although they are not aware of the collaboration), thus called collaborative filtering." [1]

[1] Agarwal, Deepak K.. Statistical Methods for Recommender Systems (p. 31). Cambridge University Press. Kindle Edition.

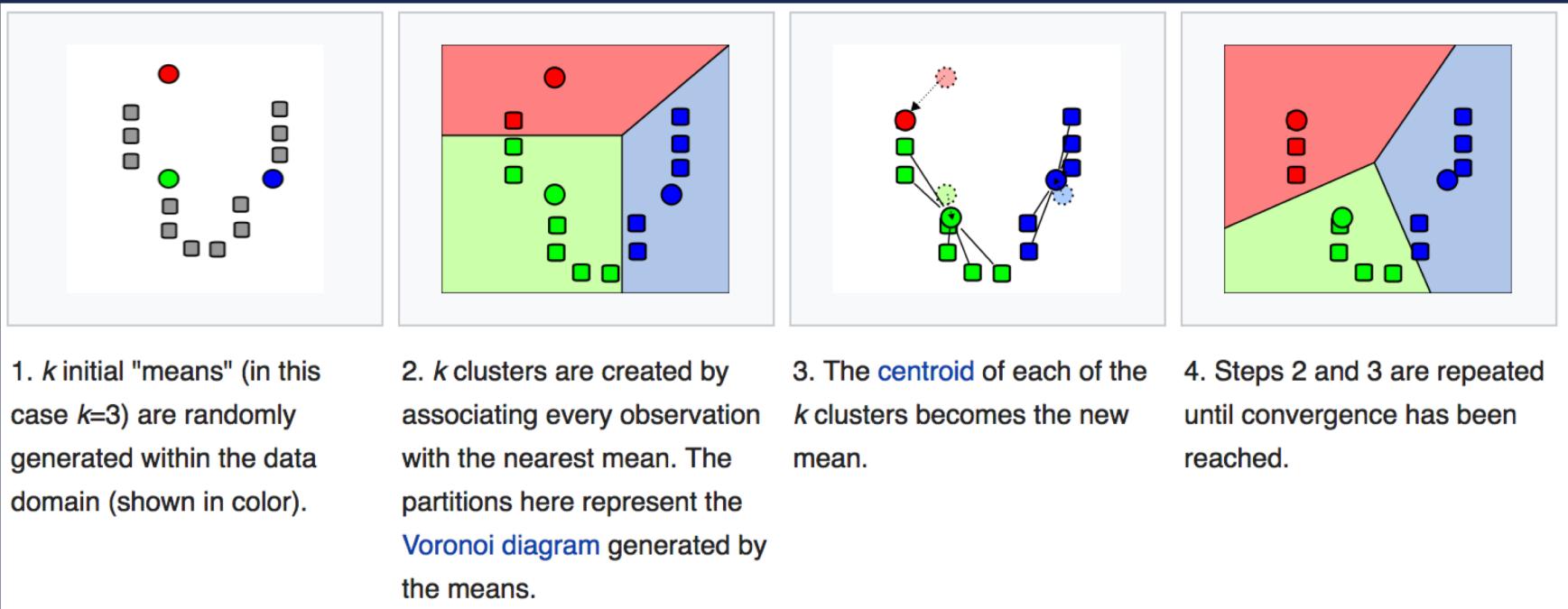
Collaborative Filtering: Why?

- Define similarity measures of interest
 - User-User
 - Item-Item

Why User-User?

- Scale
- Cold-Start problems
- Simplifying the problem space

How: K-Means



https://en.wikipedia.org/wiki/K-means_clustering

Data Preparation

Our Data Set: MovieLens

- Public Data Set produced by **GroupLens Research**
- <https://grouplens.org/datasets/movielens/>

```
In [15]: data = pd.read_csv("u.data", sep='\t', header=None,
                           names=['userid', 'movieid', 'rating', 'timestamp'])
data.head()
```

Out[15]:

	userid	movieid	rating	timestamp
0	196	242	3	881250949
1	186	302	3	891717742
2	22	377	1	878887116
3	244	51	2	880606923
4	166	346	1	886397596

Data Preparation: One-Hot Encoding



Data Preparation: One-Hot Encoding

UserId	Movield	Rating
2	4	5
2	7	2

Users						Movies									Rating		
0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	
0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	

Data Preparation: One-Hot Encoding

UserId	Movield	Rating
2	4	5
2	7	2
4	5	4

Users						Movies									Rating			
0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0

Sparse Data

Users						Movies						Rating		
0	1	0	0	0	0	0	0	0	1	0	0	0	0	0
0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
0	0	0	1	0	0	0	0	0	0	1	0	0	0	1

- One-Hot Encoding produces a a **2625x90,570** matrix for our training set
- This data set is **99.92% zeros**.
- Use a **memory efficient** data structure: **scipy.lil_matrix**

Recommender Workshop Activity

- Log into the AWS console
- Change to **us-east-1** region
- Find the Amazon SageMaker service
- Find **Notebooks**
- Find your existing notebook instance (or create another instance)
 - Recommended: ml.m4 type
- Open the notebook instance and find within the repo path:
 - **02_clustering_users.ipynb**

Wait.... What did we just do?

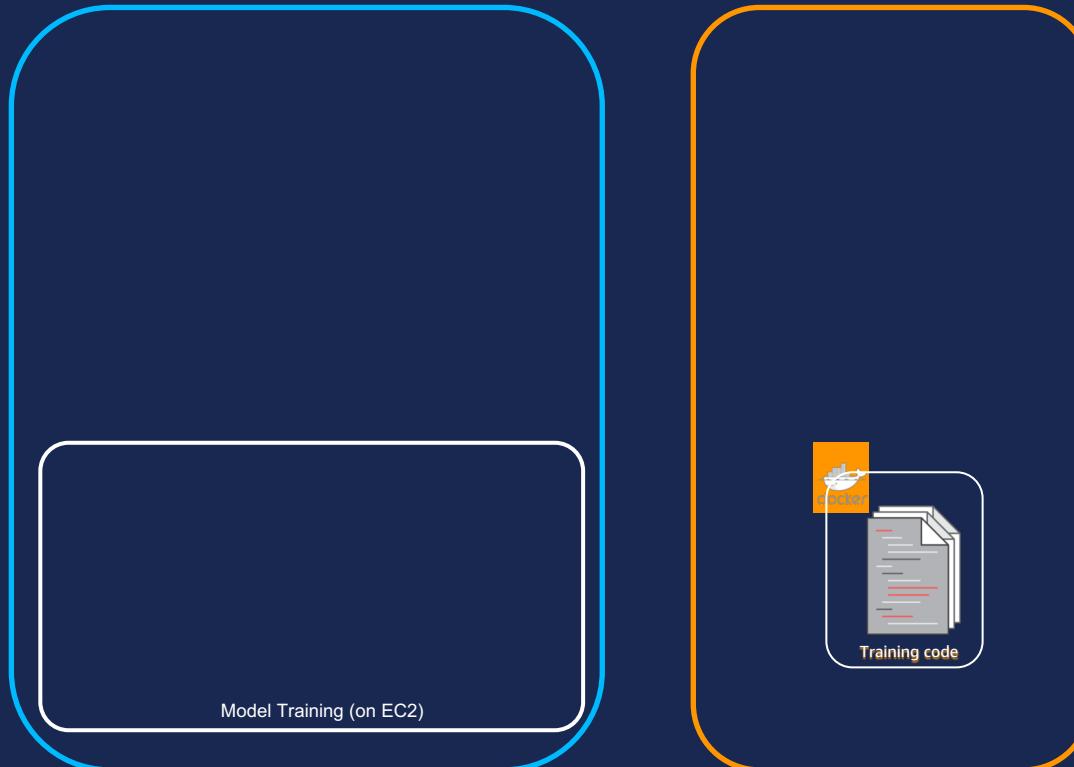
Client application

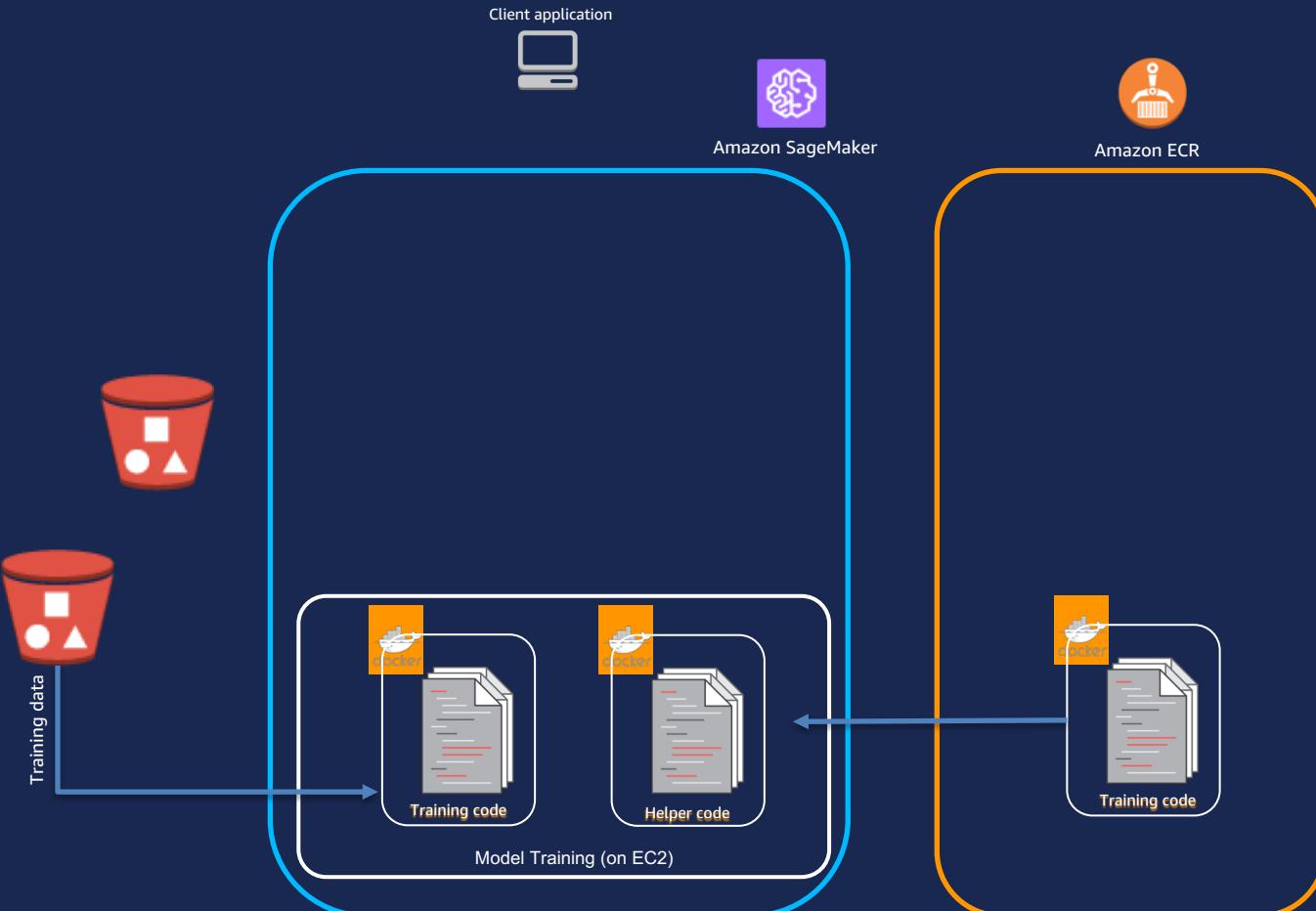


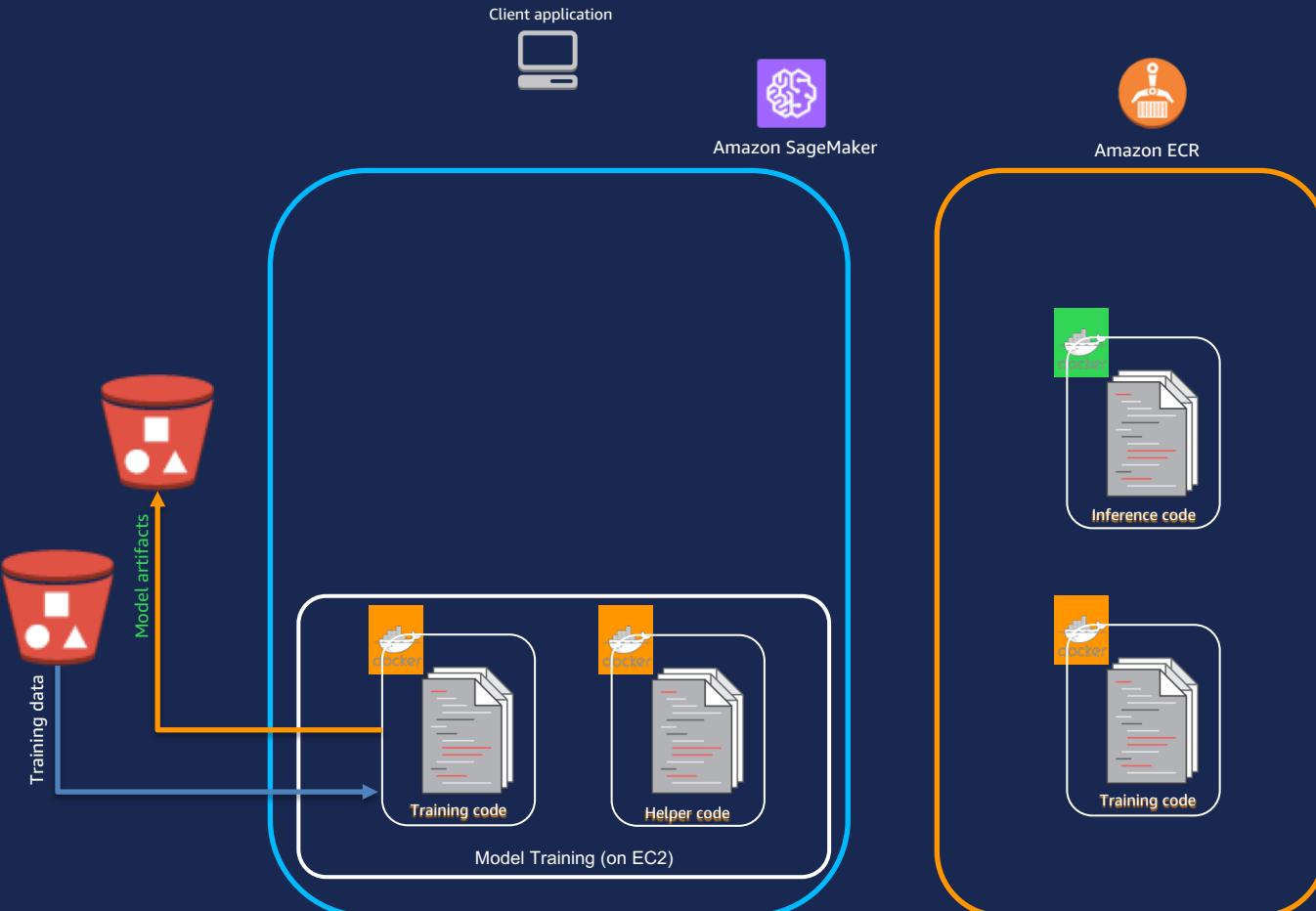
Amazon SageMaker

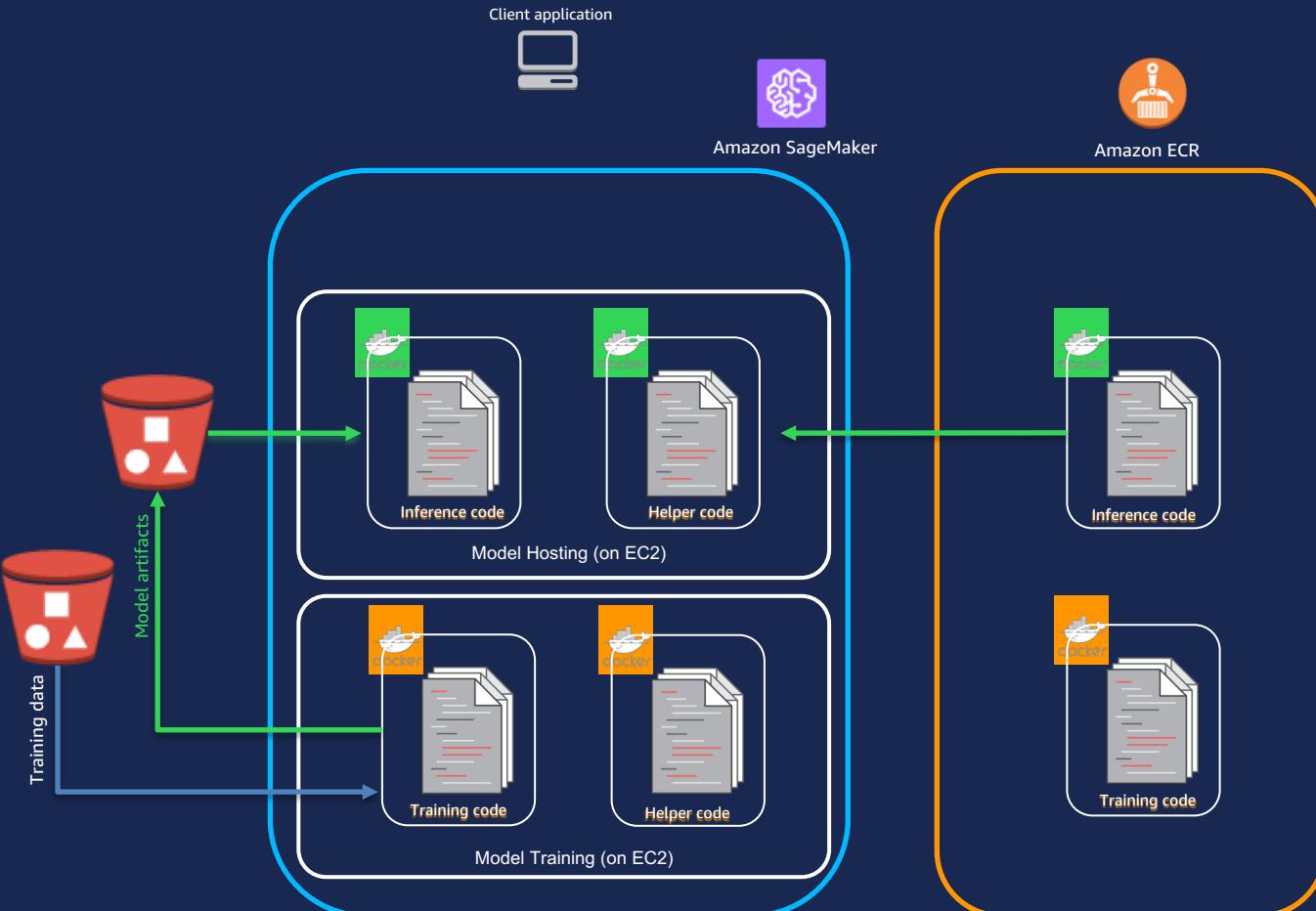


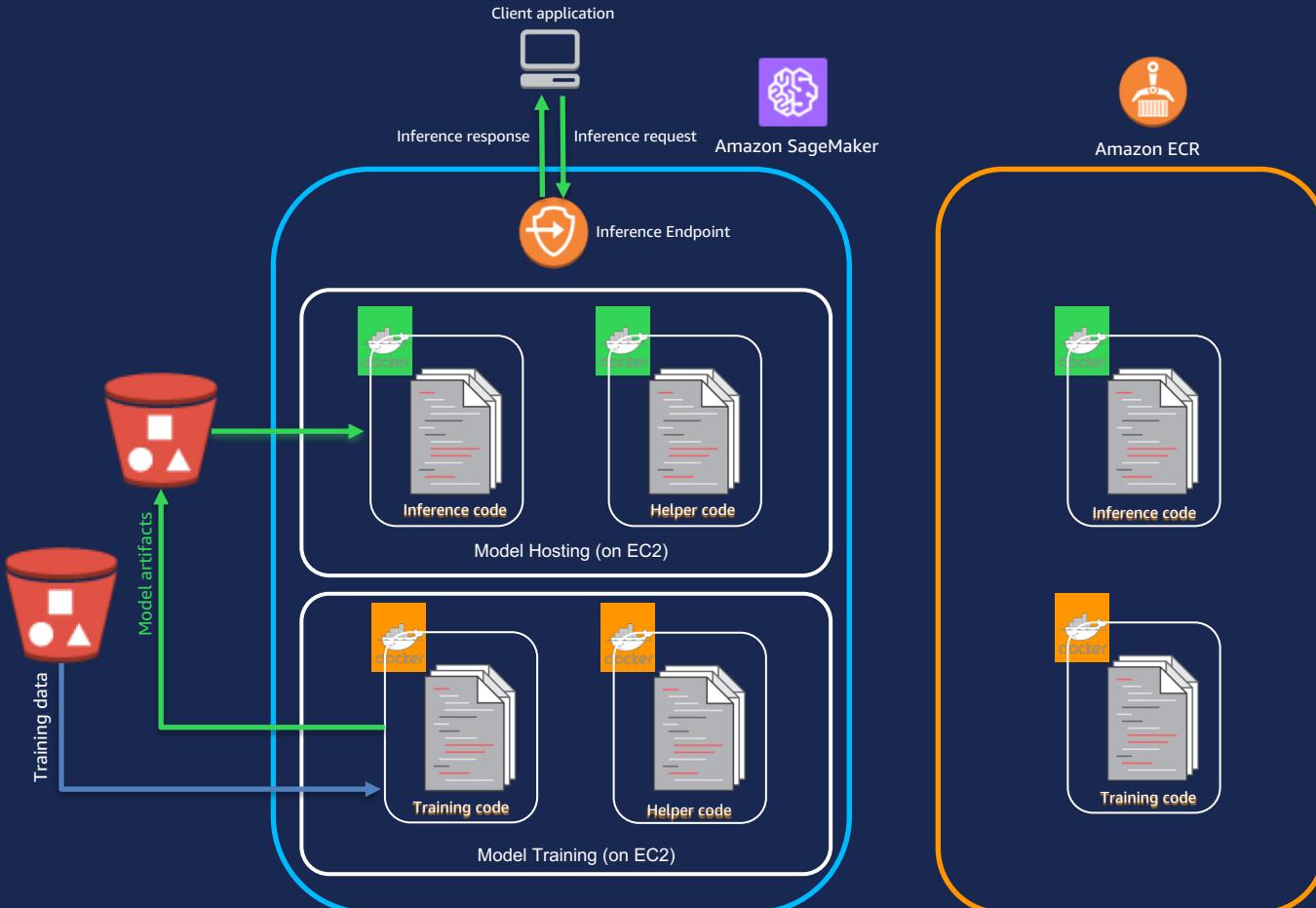
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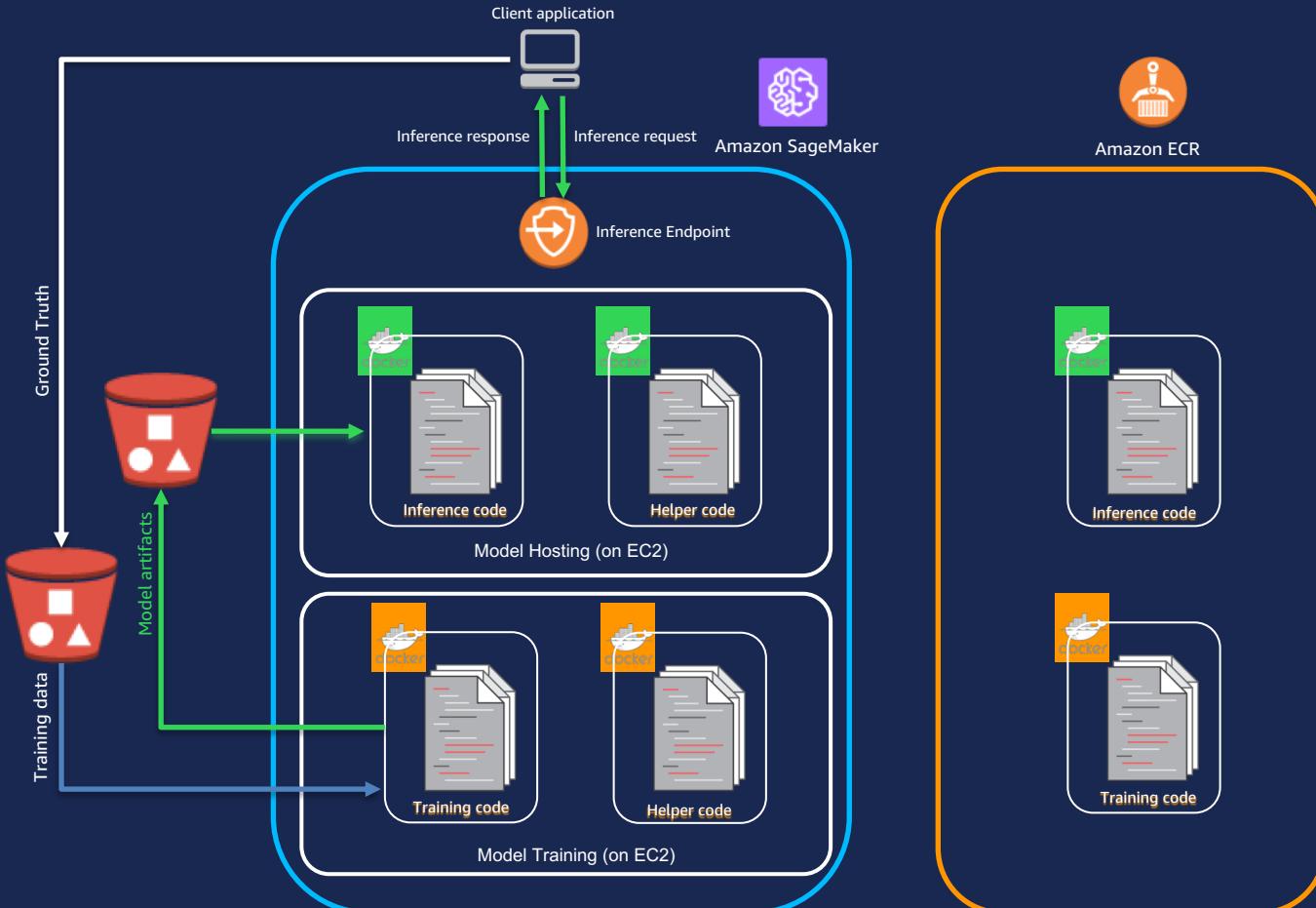












Next: Part 3