

# Introduction to Pinecone indexes

VECTOR DATABASES FOR EMBEDDINGS WITH PINECONE



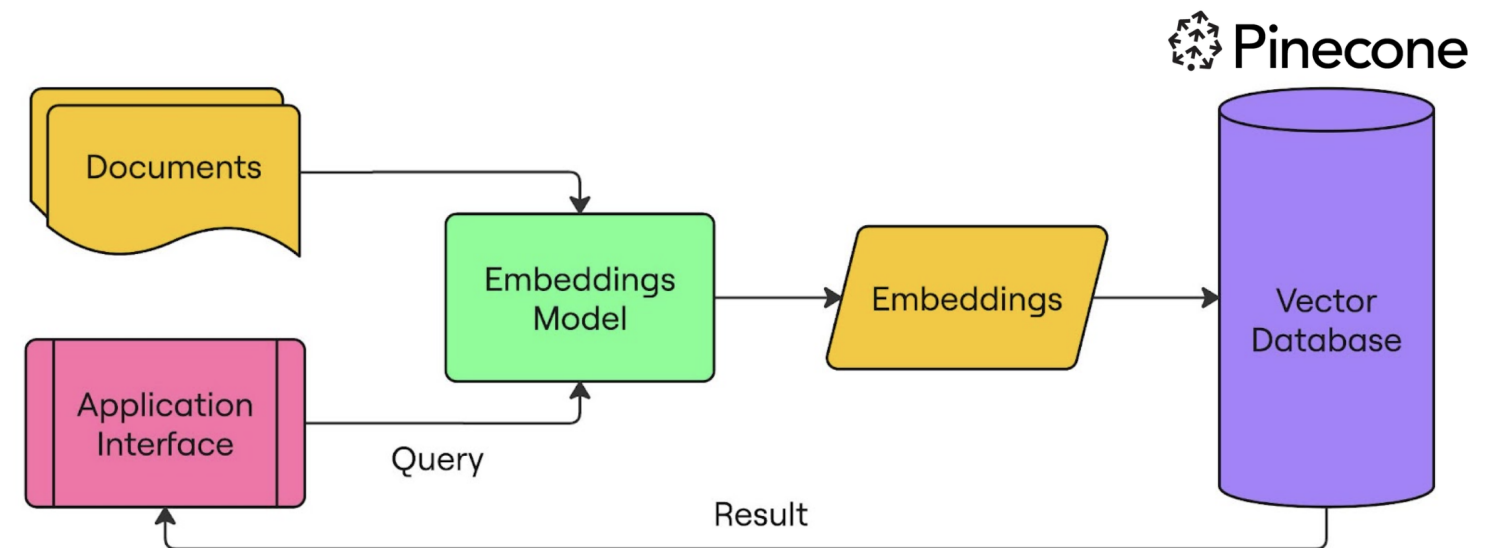
**James Chapman**  
Curriculum Manager, DataCamp



→ Building and *scaling* GenAI applications!

You'll learn to...

- Create indexes and ingest vectors
- Retrieve and query vectors
- Create common AI applications

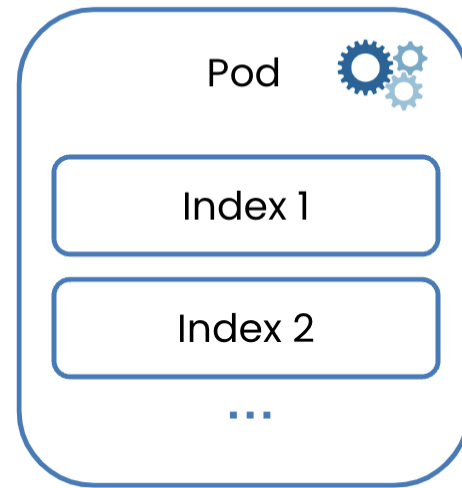


# Indexes

- **Store** vectors
- **Serve** queries and other vector manipulations
- Index contains **records** for each vector, including **metadata**
- Can create multiple indexes

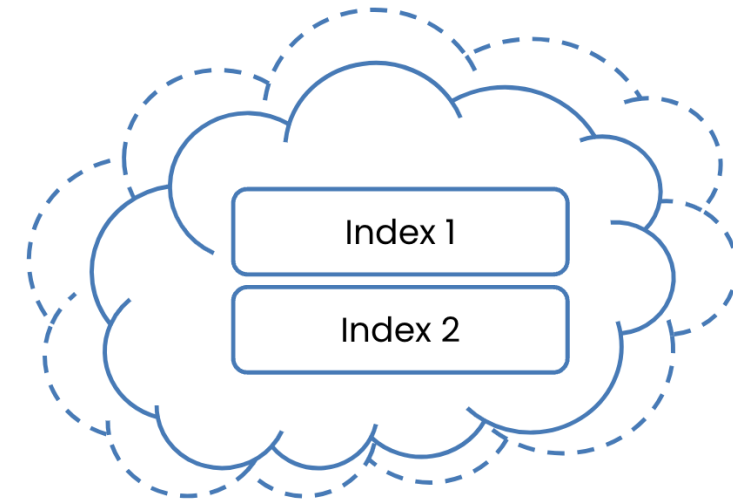


# Pod-Based



- Choose hardware to create the index → **pods**
- **Pod type** determines *storage*, query *latency*, query *throughout*

# Serverless



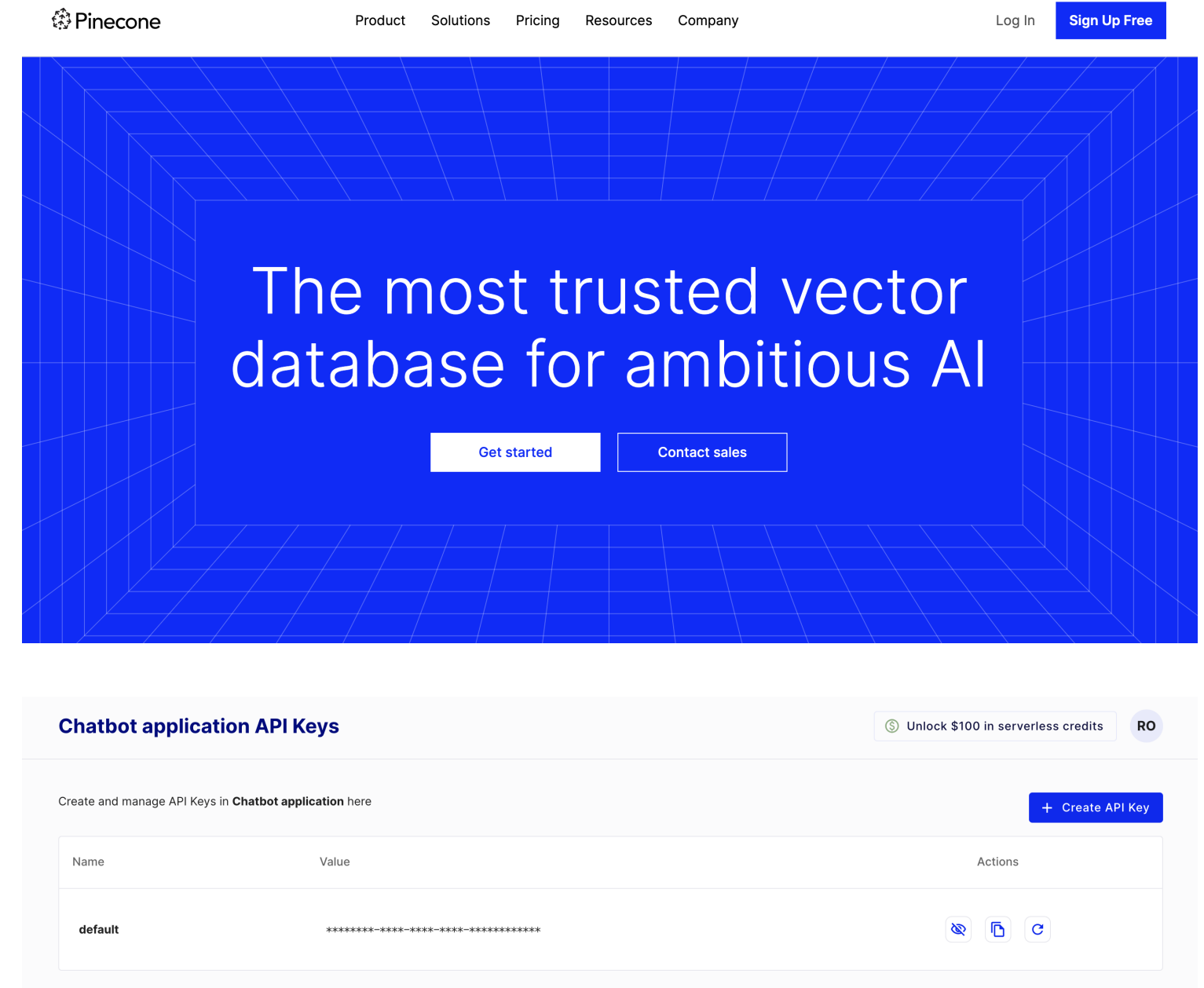
- No resource management
- Indexes *scale automatically*
- Run on *cloud* and store in blob
- Easier to use and often *lower cost*

**What we'll use in this course**

<sup>1</sup> <https://docs.pinecone.io/guides/indexes/understanding-indexes>

# Creating a Pinecone API key

1. Create a Pinecone Starter account → [pinecone.io](https://pinecone.io)
2. Head to "API Keys"
3. Copy your API key



# Creating a serverless index

```
from pinecone import Pinecone, ServerlessSpec

pc = Pinecone(api_key="API_KEY")

pc.create_index(
    name='datacamp-index',
    dimension=1536,
    spec=ServerlessSpec(
        cloud='aws',
        region='us-east-1'
    )
)
```

# Checking our indexes

```
pc.list_indexes()
```

```
{'indexes': [{ 'dimension': 1536,  
               'host': 'datacamp-index-1eef0f4.svc.aped-4627-b74a.pinecone.io',  
               'metric': 'cosine',  
               'name': 'datacamp-index',  
               'spec': {'serverless': {'cloud': 'aws', 'region': 'us-east-1'}},  
               'status': {'ready': True, 'state': 'Ready'}}]}
```

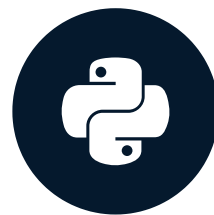
# Let's practice!

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# Managing indexes

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# Connecting to the index

```
pc = Pinecone(api_key="API_KEY")

pc.create_index(
    name='datacamp-index',
    dimension=1536,
    spec=ServerlessSpec(
        cloud='aws',
        region='us-east-1'
    )
)

index = pc.Index('datacamp-index')
```

# Connecting to the index

```
index = pc.Index('datacamp-first')
```

```
...
```

```
pinecone.core.client.exceptions.NotFoundException: (404)
```

```
Reason: Not Found
```

```
HTTP response headers: HTTPHeaderDict({'content-type': 'text/plain; charset=...
```

```
HTTP response body: {"error":{"code":"NOT_FOUND","message":"Resource datacamp-first  
not found"},"status":404}
```

# Index statistics

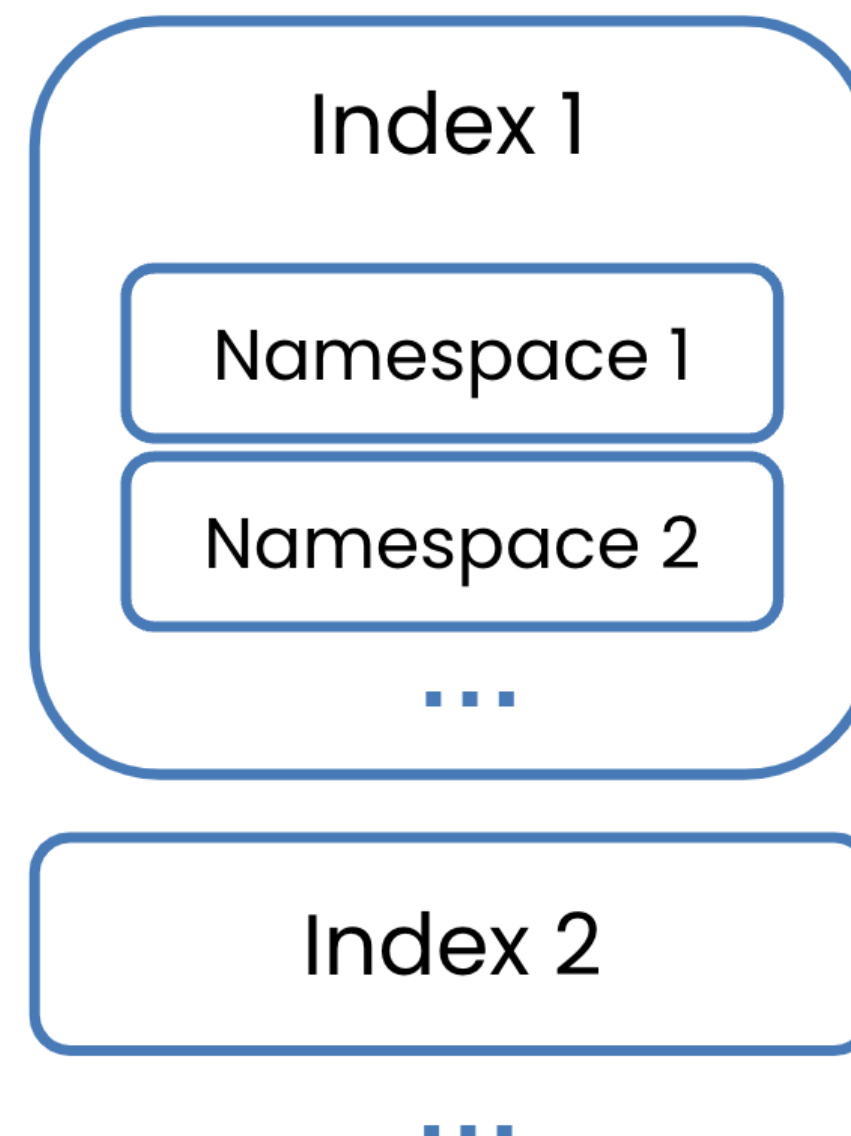
```
index.describe_index_stats()
```

```
{'dimension': 1536,  
 'index_fullness': 0.0,  
 'namespaces': {},  
 'total_vector_count': 0}
```

# Namespaces

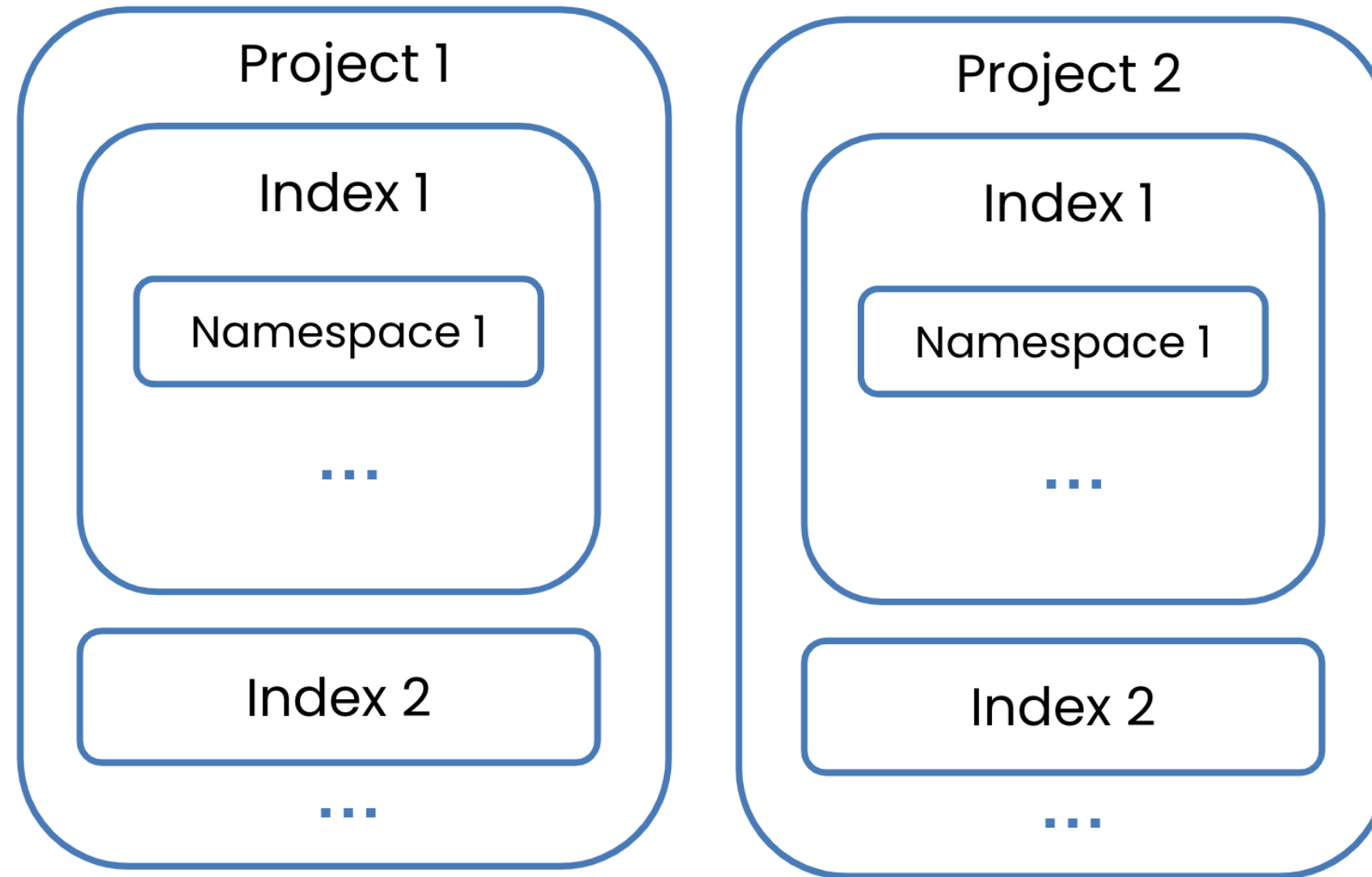
- Containers for *partitioning* indexes
  - Separate datasets
  - Data versioning
  - Separate groups

Focus on the single namespace case for now



# Organizations

## Organization



# Organizations

## Organization Owner



- Permissions across entire org.
- Manage billing, users, *all* projects

## Organization User



- *Restricted* org-level permissions
- Invited to *specific projects*
- Become owner to those projects

# Deleting indexes

```
pc.delete_index('datacamp-index')
```

```
pc.list_indexes()
```

```
{'indexes': []}
```



# Let's practice!

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# Vector ingestion

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# Creating and connecting to an index

```
pc = Pinecone(api_key="API_KEY")

pc.create_index(
    name='datacamp-index',
    dimension=1536,
    spec=ServerlessSpec(
        cloud='aws',
        region='us-east-1'
    )
)

index = pc.Index('datacamp-index')
```

# Ingesting vectors

```
vectors = [  
    {  
        "id": "0",  
        "values": [0.025525547564029694, ..., 0.0188823901116848]  
    },  
    ...,  
    {  
        "id": "9",  
        "values": [0.020712468773126602, ..., 0.006418442353606224]  
    },  
]
```

# Checking dimensionality

```
vector_dims = [len(vector['values']) == 1536 for vector in vectors]  
all(vector_dims)
```

True

PineconeApiException: (400)

Reason: Bad Request

HTTP response headers: HTTPHeaderDict({'Date': 'Fri, 17 May 2024 10:54:57 GMT', ...

HTTP response body: {"code":3,"message":"Vector dimension 256 does not match the dimension of the index 1536","details":[]}

# Upserting vectors

- `.upsert()` : Update or insert

```
index.upsert(  
    vectors=vectors  
)
```

```
index.describe_index_stats()
```

```
{'dimension': 1536,  
 'index_fullness': 0.0,  
 'namespaces': {'': {'vector_count': 10}},  
 'total_vector_count': 10}
```

# Ingesting vectors with metadata

```
vectors = [  
    {  
        "id": "0",  
        "values": [0.025525547564029694, ..., 0.0188823901116848]  
        "metadata": {"genre": "productivity", "year": 2020}  
    },  
    ...,  
]
```

- **Metadata:** data about data!
  - Can be utilized for *metadata filtering* → Chapter 2

# Upserting vectors with metadata

```
index.upsert(  
    vectors=vectors  
)
```

Remember to use the structure:

```
{  
    "id": "0",  
    "values": [0.025525547564029694, ..., 0.0188823901116848]  
    "metadata": {"genre": "productivity", "year": 2020}  
},  
    ...,
```



# Let's practice!

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