Introduction to Hugging Face

WORKING WITH HUGGING FACE

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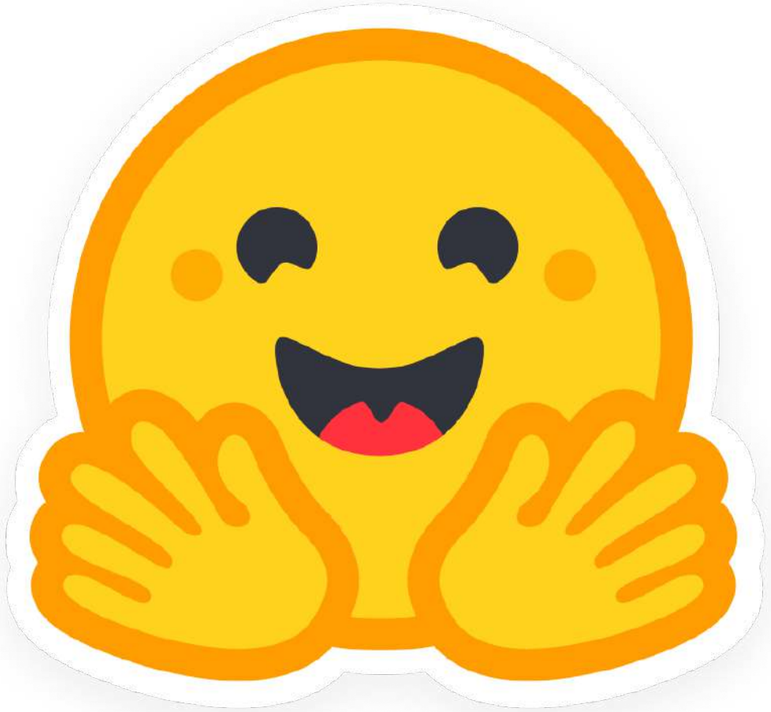
datacamp

What is Hugging Face?



- Collaboration platform
- Open-source machine learning
- Text, vision, and audio tasks
- Models, datasets, frameworks
- Reduce barriers to entry

[1] https://huggingface.co/

In this course

- Navigate and use the Hugging Face Hub
- Explore models and datasets
- Build pipelines for text, image, and audio data
- Fine-tuning, generation, embeddings, and semantic search

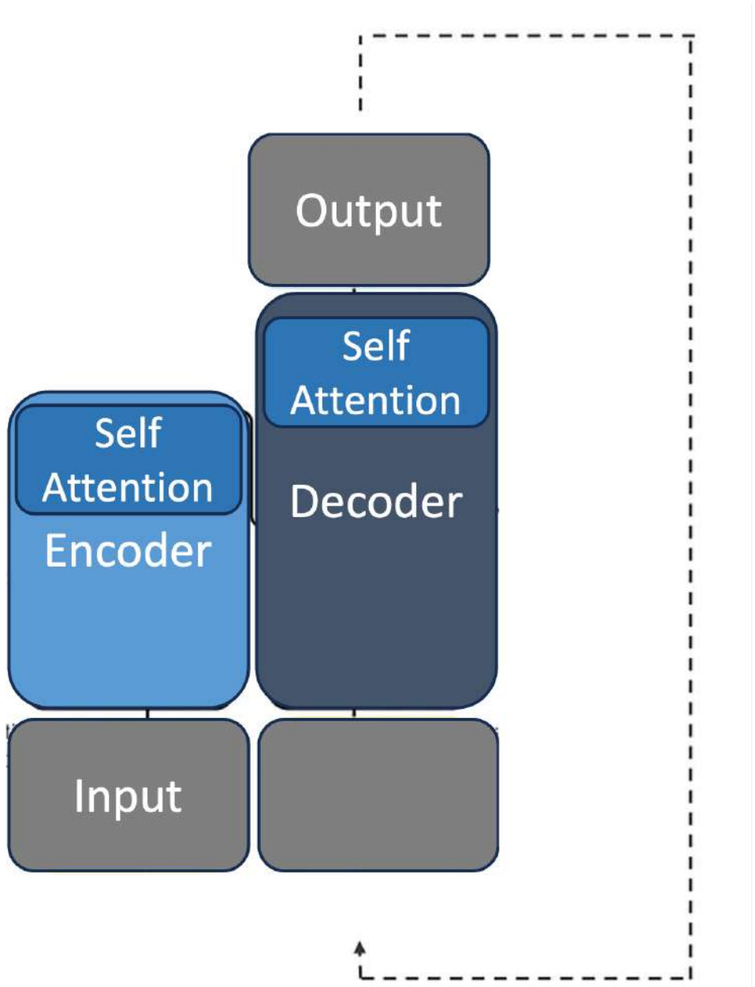
Large Language Models

- LLMs
- Understand and generate human-like text
- Massive amounts of data
- Learn patterns in sequences

[1] https://en.wikipedia.org/wiki/Large_language_model

Large Language Models

- LLMs
- Understand and generate human-like text
- Massive amounts of data
- Learn patterns in sequences
- Transformer architecture



[1] https://towardsdatascience.com/transformers-89034557de14

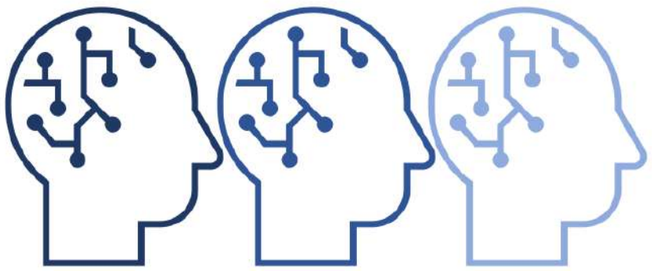
Large Language Models

- LLMs
- Understand and generate human-like text
- Massive amounts of data
- Learn patterns in sequences
- Transformer architecture
- Popular options are GPT and Llama

ChatGPT

LLaMA by Meta

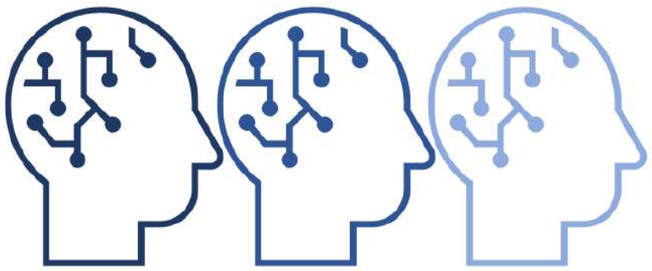
Benefits of Hugging Face



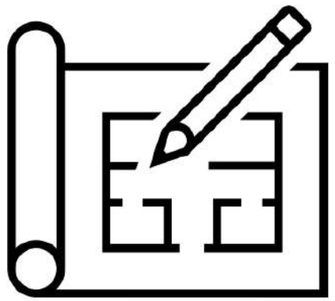
Access to Models

- Faster experimentation

Benefits of Hugging Face



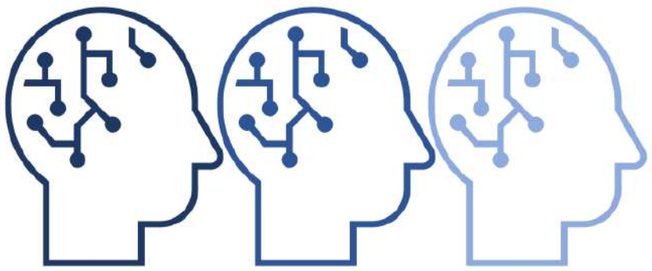
Access to Models



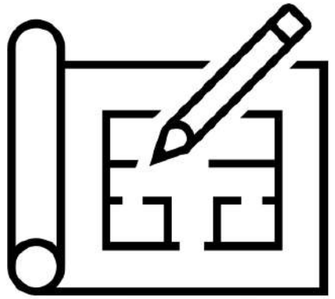
Frameworks

- Faster experimentation
- Supports every step of the process

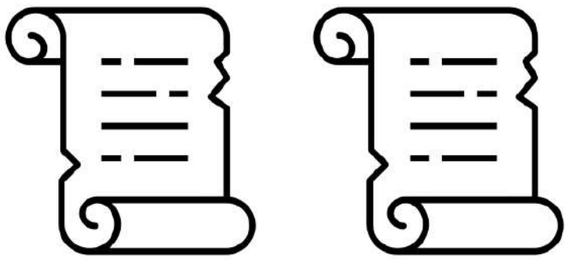
Benefits of Hugging Face



Access to Models



Frameworks



Documentation

- Faster experimentation
- Supports every step of the process
- Smoother adoption

Deciding when to use

Use Hugging Face

- Quick way to use ML tasks
- Don't have deep ML expertise
- Testing several models
- Dataset needed

Use another solution

- Slow computer
- Highly customized architectures
- Domain specific needs not yet met
- Not leveraging advanced ML techniques

Installing Hugging Face

Hugging Face

```
pip install transformers datasets
```

ML Framework

```
pip install torch torchvision torchaudio
```

[1] https://pytorch.org/

Let's practice!

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Transformers and the Hub

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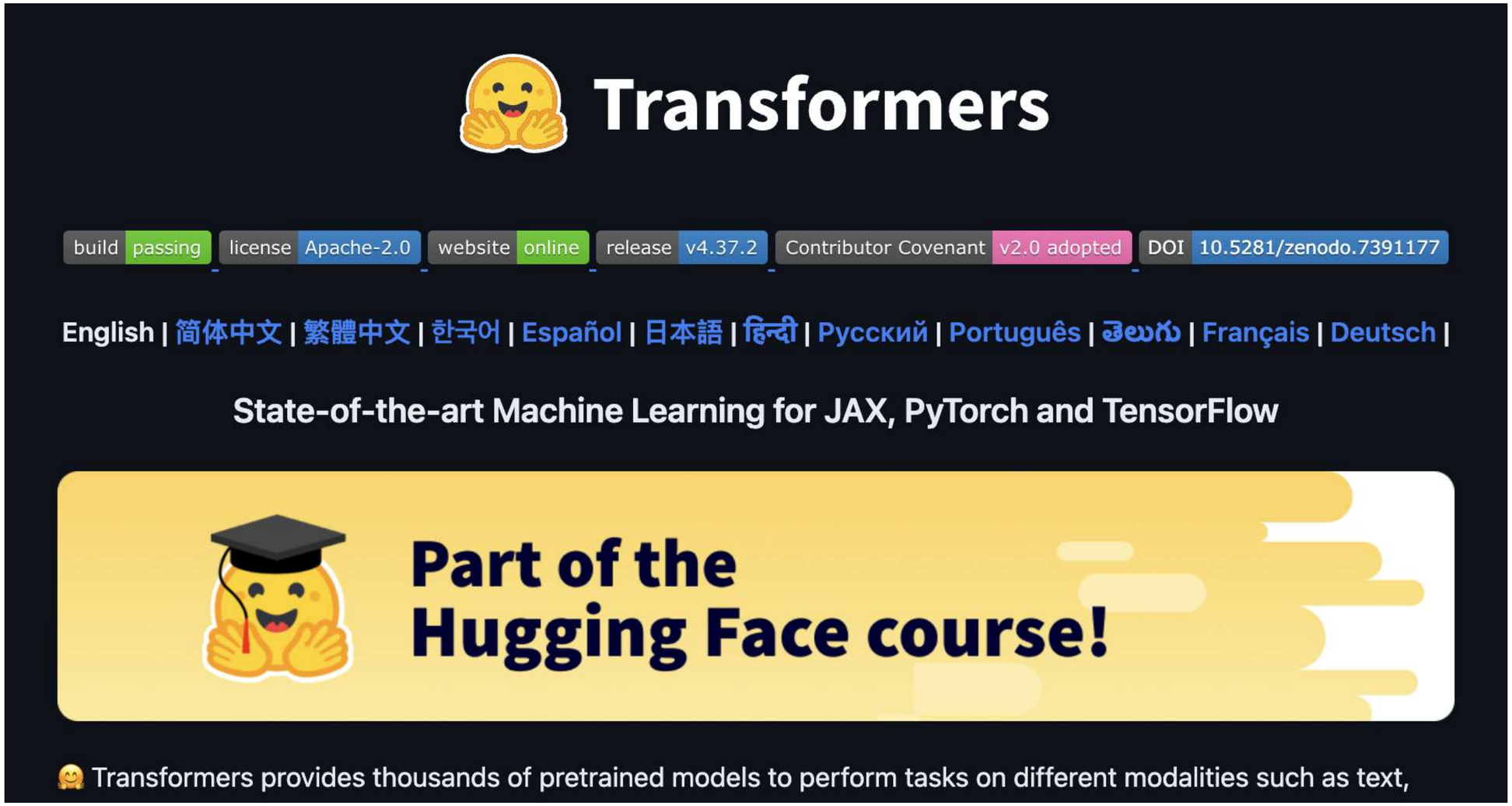
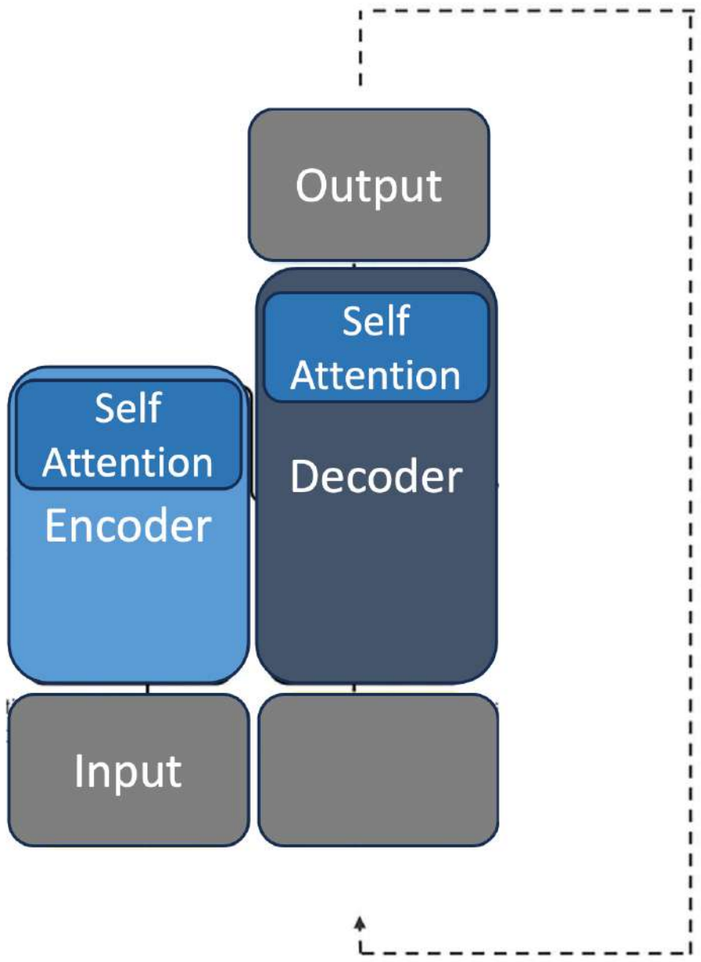
Transformers - the Hugging Face package



[1] https://github.com/huggingface/transformers

Transformers - the model architecture

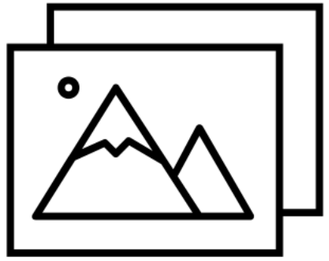
- Neural network models
- Learn context and understanding
- Core components:
  - Encoder
  - Decoder
  - Self-attention mechanism
- Transform input to numerical representations
- Helps model understand context of the input



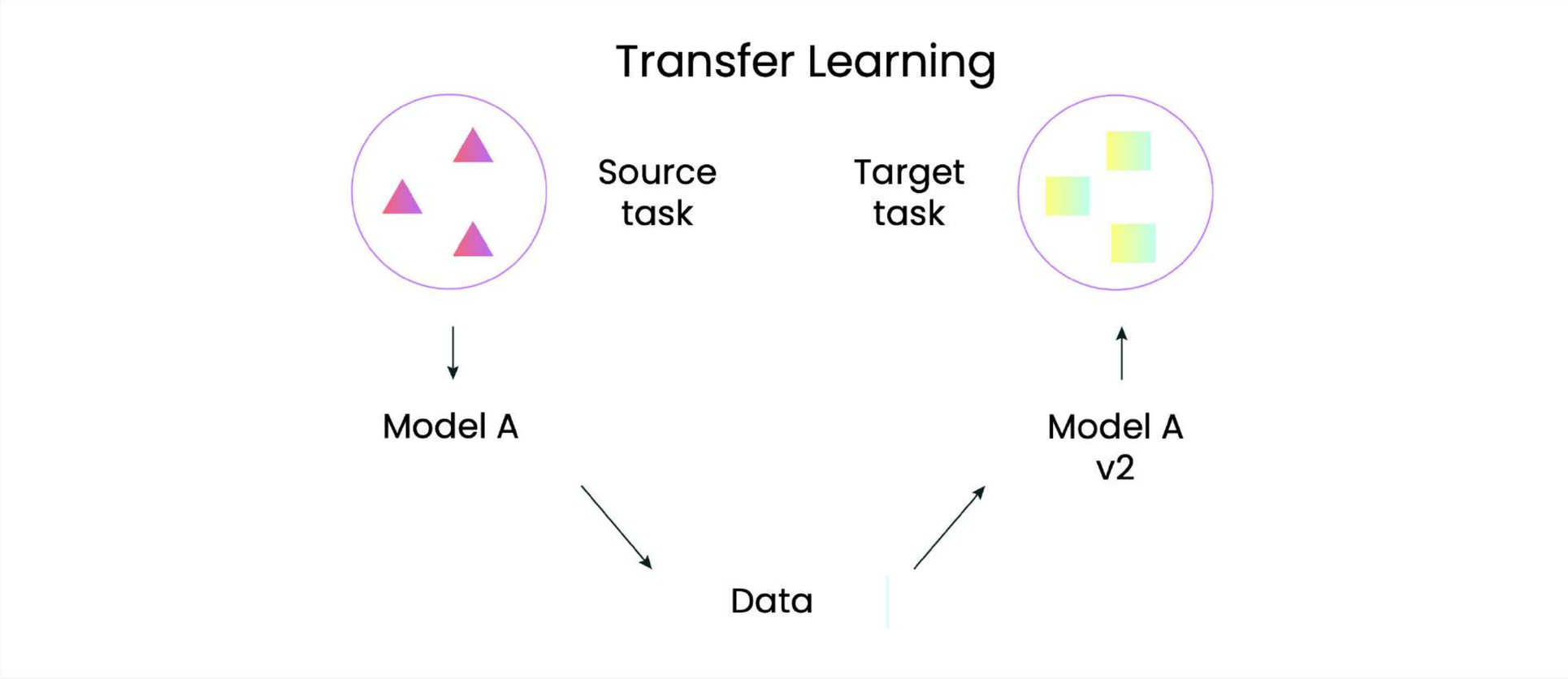
[1] https://www.turing.com/kb/brief-introduction-to-transformers-and-their-power

Uses cases of transformers

- Use cases for text, image, and vision
- Classification for all three
- Automatic speech recognition
- Text summarization
- Object detection for autonomous driving



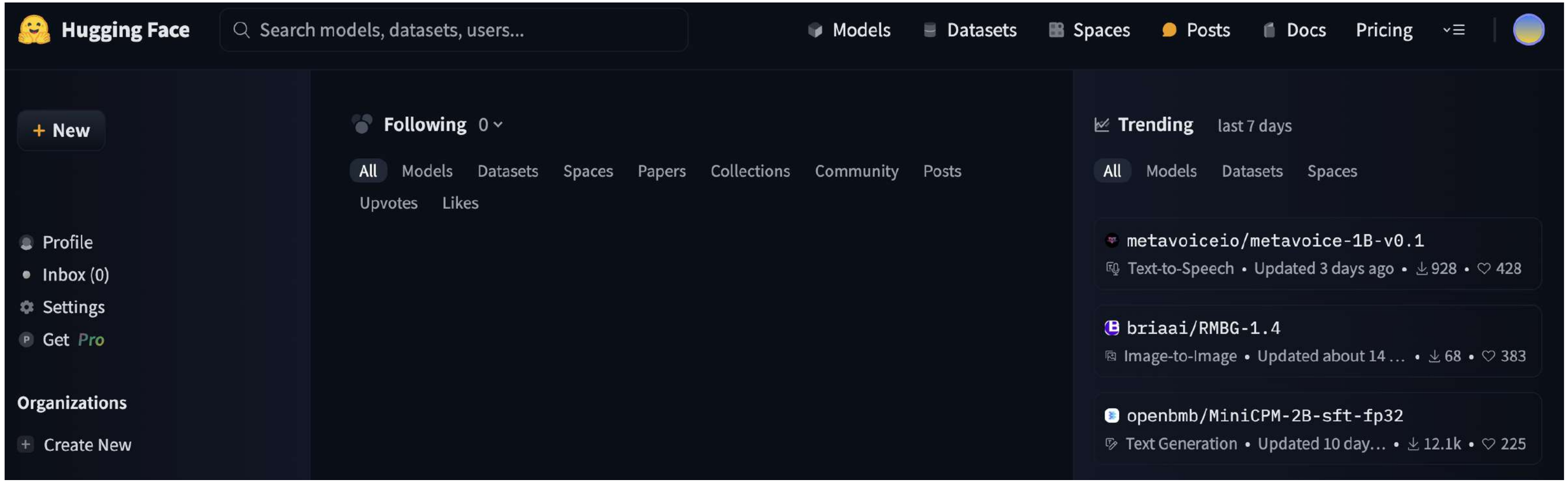
A key benefit of transformers



- Enables Hugging Face models to perform well on new tasks with little data

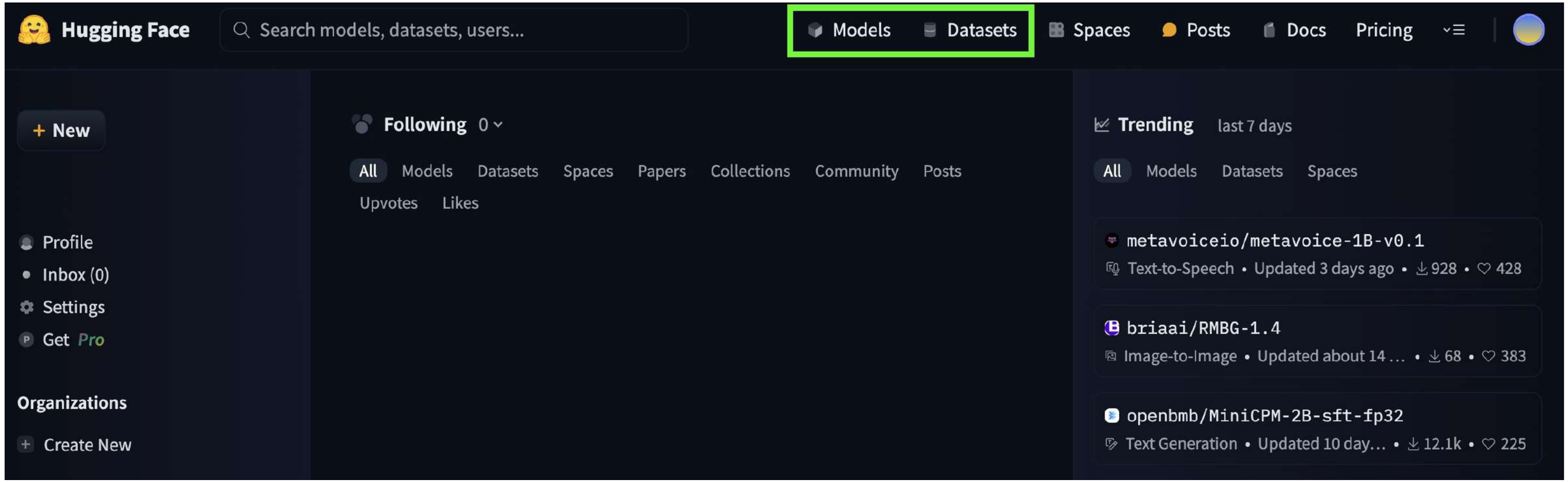
[1] https://www.topbots.com/transfer-learning-in-nlp/#transfer-learning

The Hub



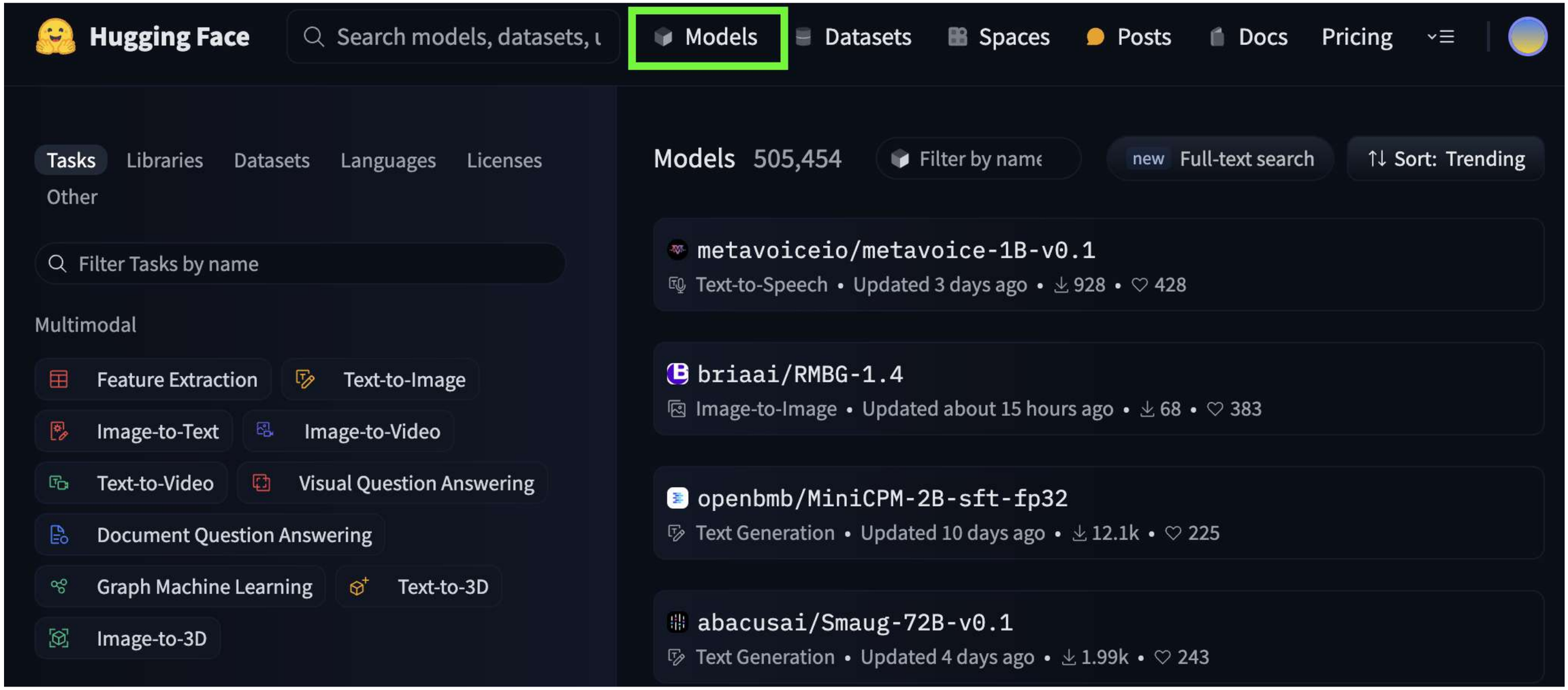
[1] https://huggingface.co/

Navigating the Hub



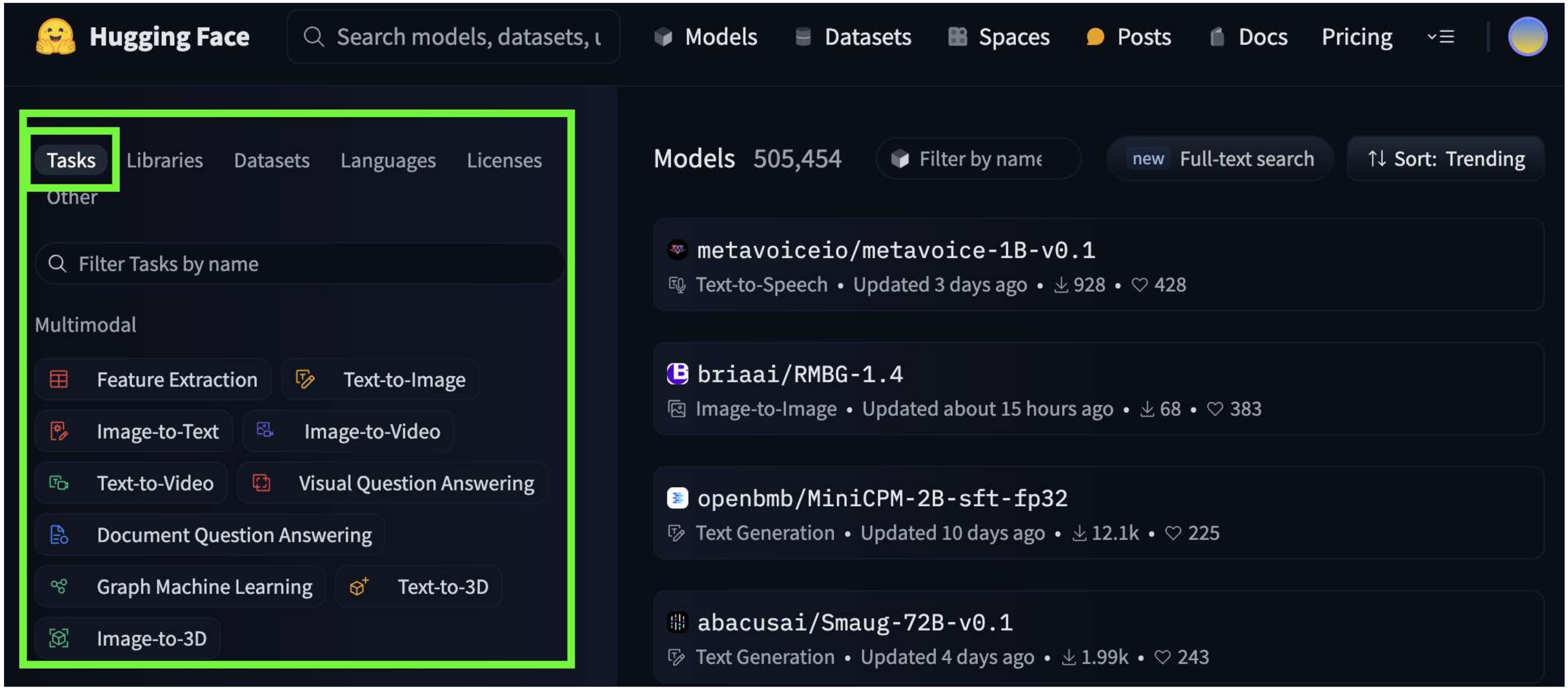
[1] https://huggingface.co/

Searching for models



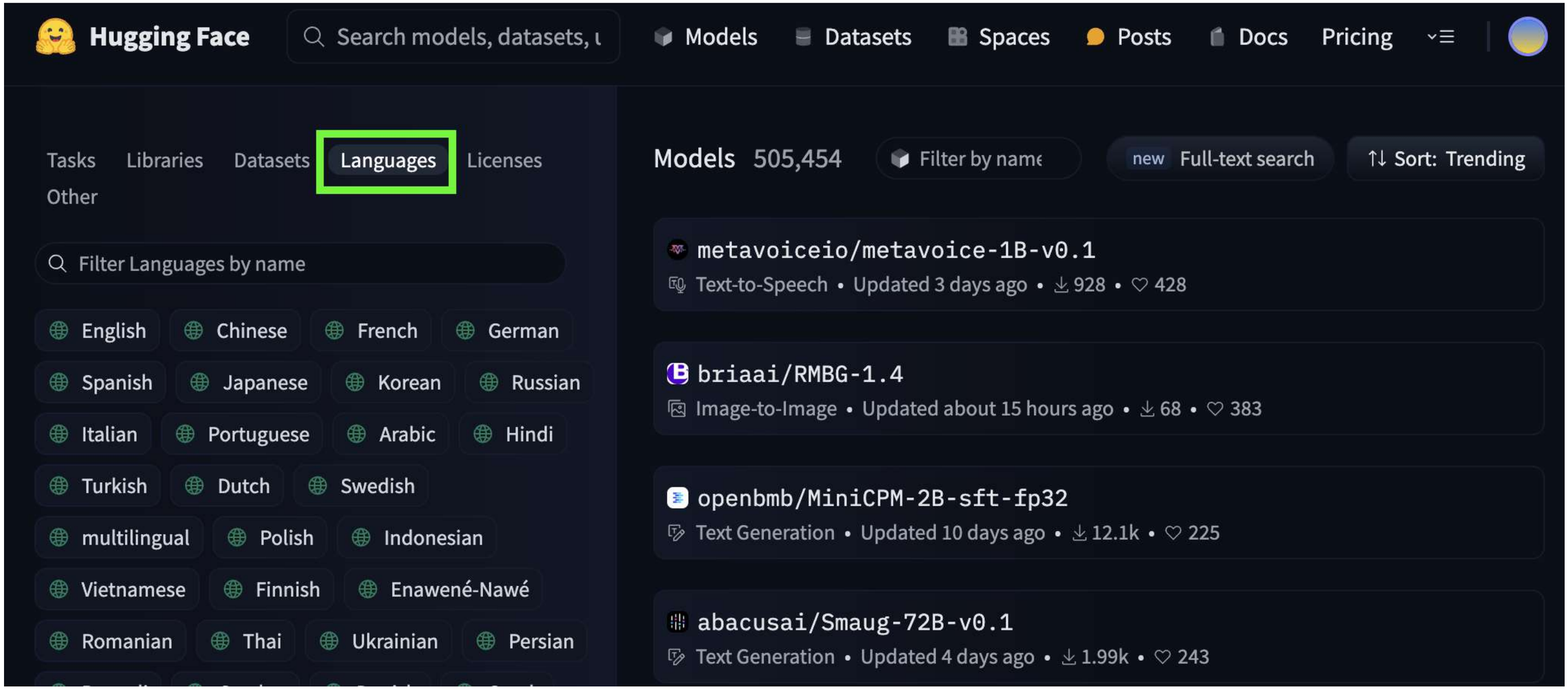
[1] https://huggingface.co/models

Searching for models



[1] https://huggingface.co/models

Searching for models



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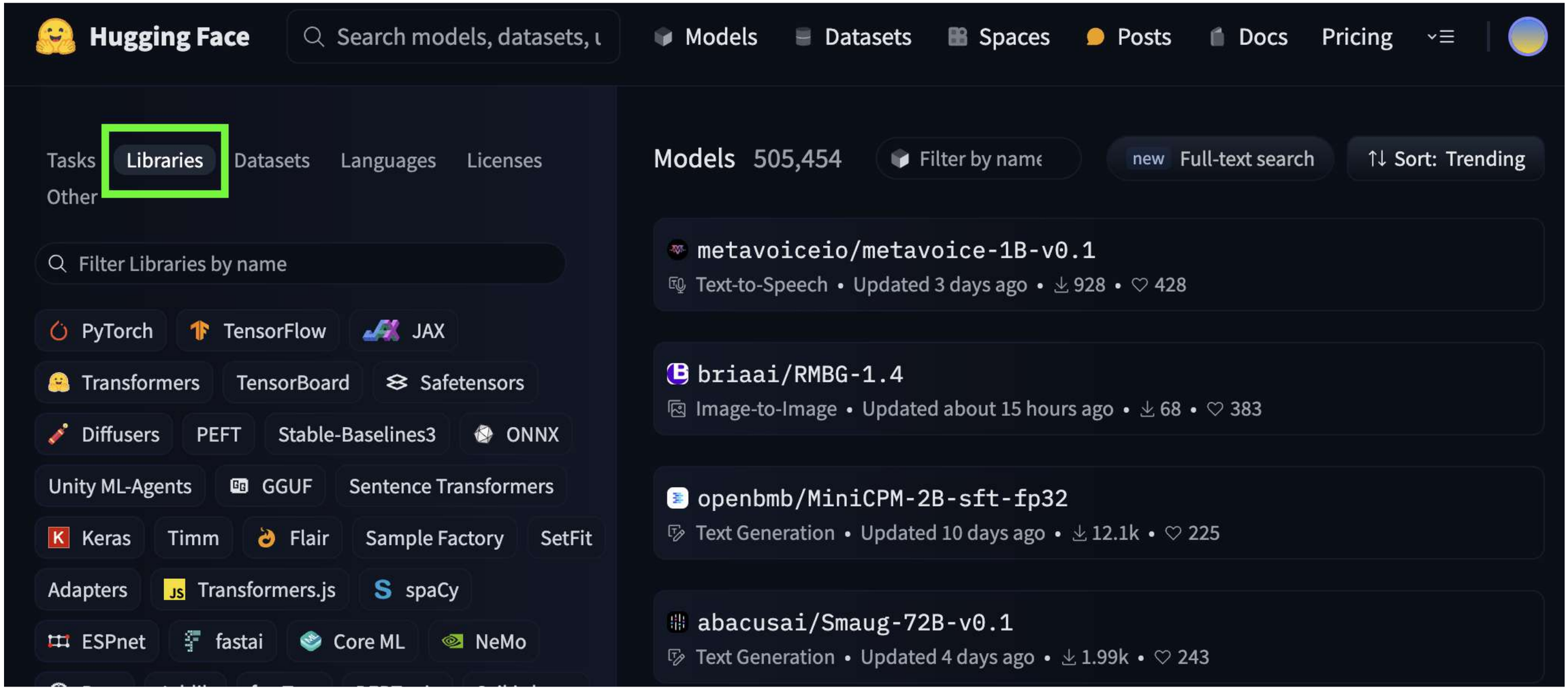
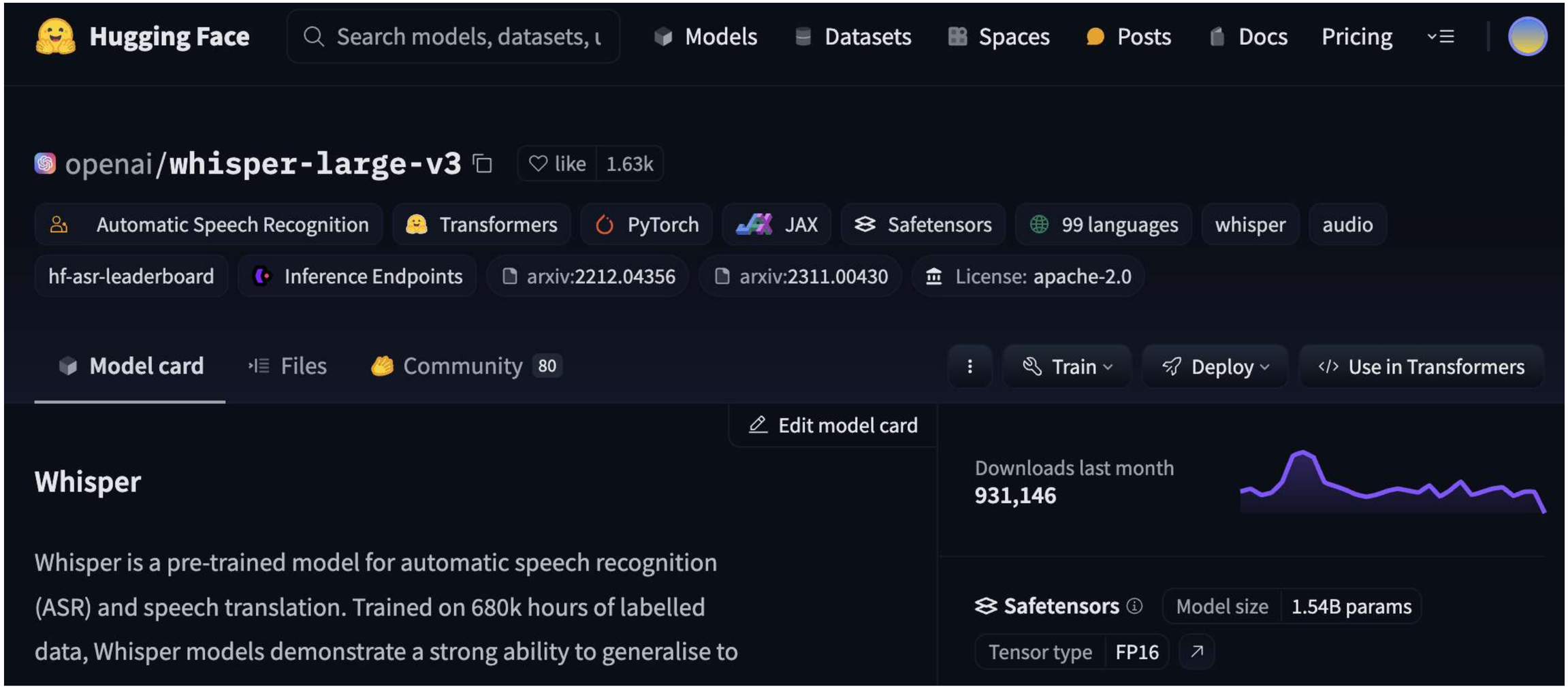
Searching for models



[1] https://huggingface.co/models

Model cards



[1] https://huggingface.co/openai/whisper-large-v3

Using huggingface_hub

```
pip install huggingface_hub
```

```
from huggingface_hub import HfApi
api = HfApi()
list(api.list_models())
```

```
[ModelInfo: {
  {'_id': '622fea36174feb5439c2e4be',
   'author': 'cardiffnlp',
   ...}]
```

[1] https://github.com/huggingface/huggingface_hub

Using huggingface_hub

```
models = api.list_models(
    filter=ModelFilter(
        task="text-classification"),
        sort="downloads",
        direction=-1,
        limit=5
    )
)

modelList = list(models)

print(modelList[0])
```

```
Model Name: albert/albert-base-v1, Tags: [...]
```

- `task` searches for specified task
- `sort` will order the list
- `direction` provides the direction of the sorted order
  - -1 for descending
  - all other numbers for ascending
- `limit` will limit the number of models returned

[1] https://github.com/huggingface/huggingface_hub

Saving a model locally

```
# Import AutoModel
from transformers import AutoModel

modelId = "distilbert-base-uncased-finetuned-sst-2-english"

# Download model using the modelId
model = AutoModel.from_pretrained(modelId)

# Save the model to a local directory
model.save_pretrained(save_directory=f"models/{modelId}")
```

- Be mindful of storage!

[1] https://huggingface.co/docs/transformers/model_doc/auto#transformers.AutoModel

Let's practice!

WORKING WITH HUGGING FACE

Working with datasets

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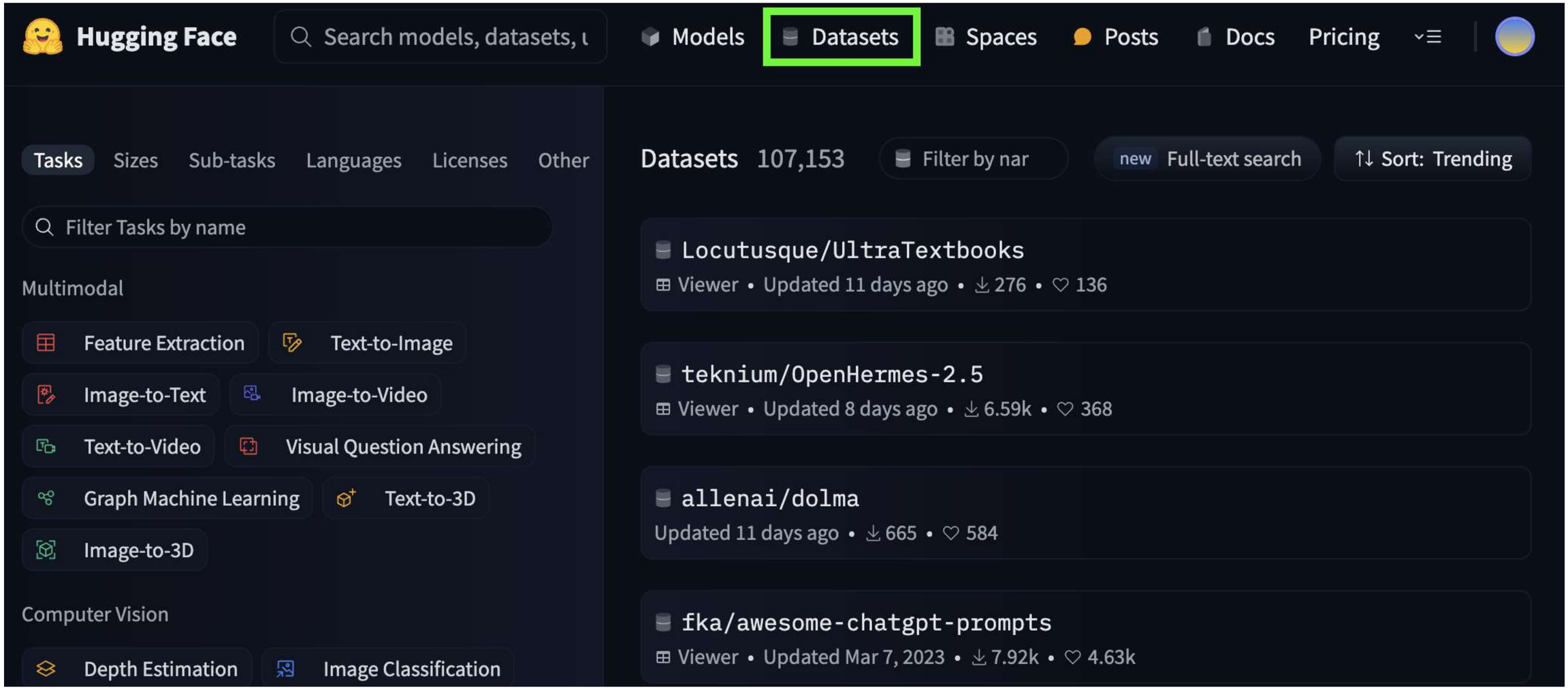
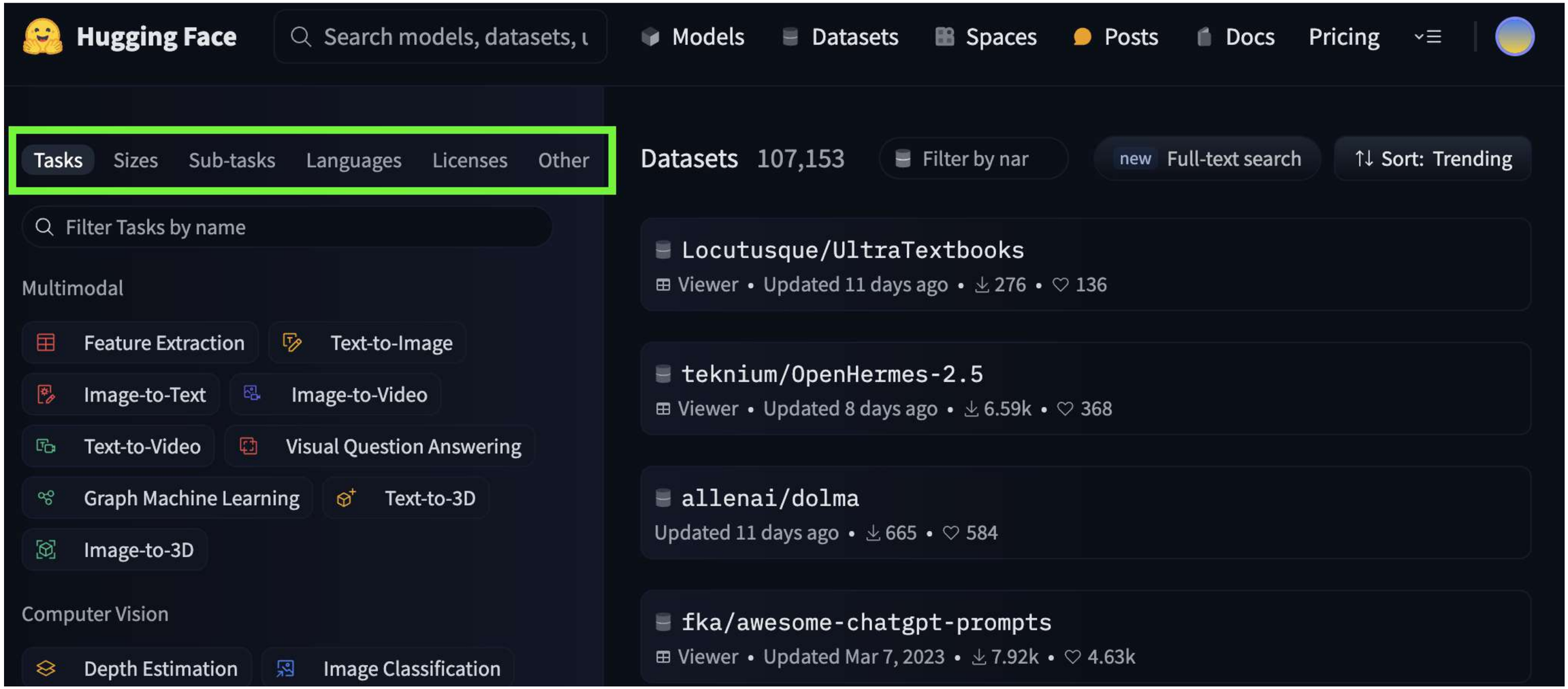
Datasets in Hugging Face



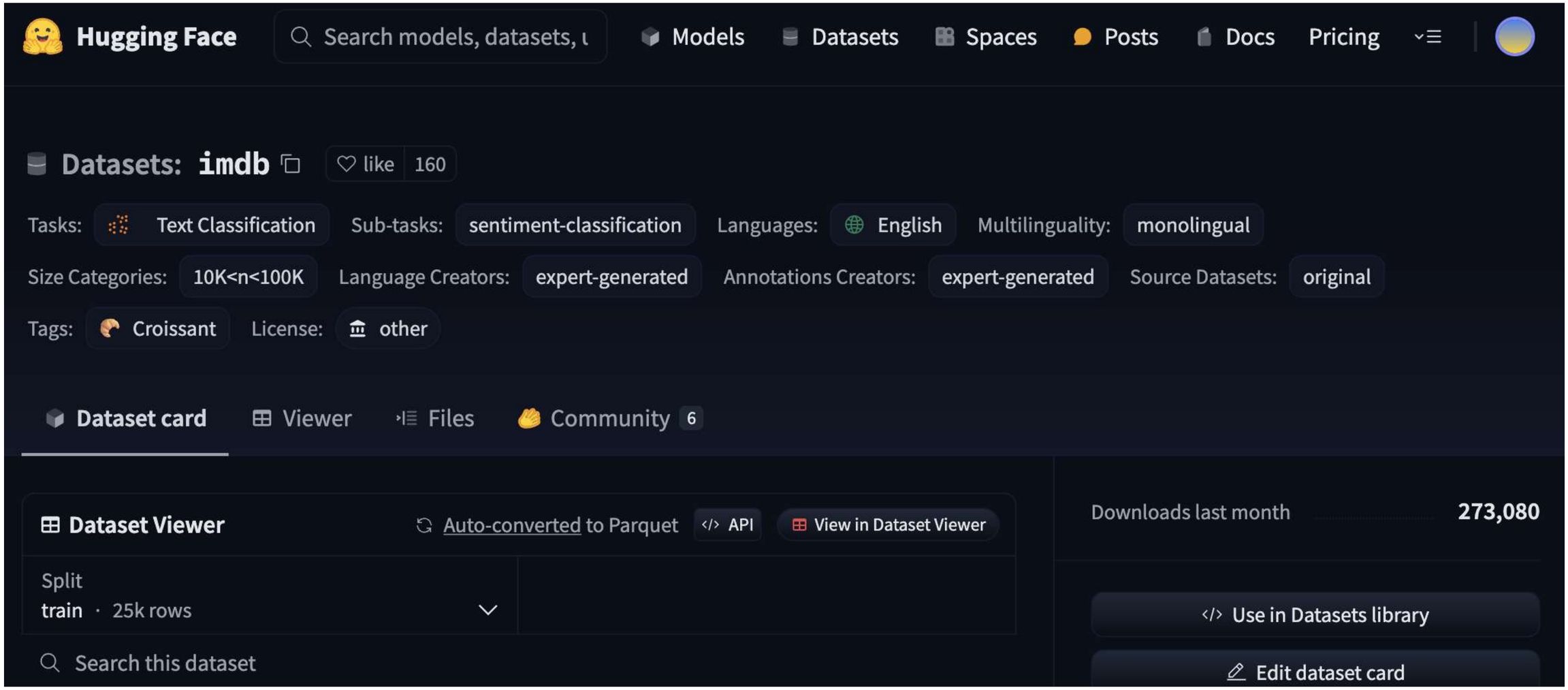
[1] https://huggingface.co/datasets

Searching for datasets



[1] https://huggingface.co/datasets

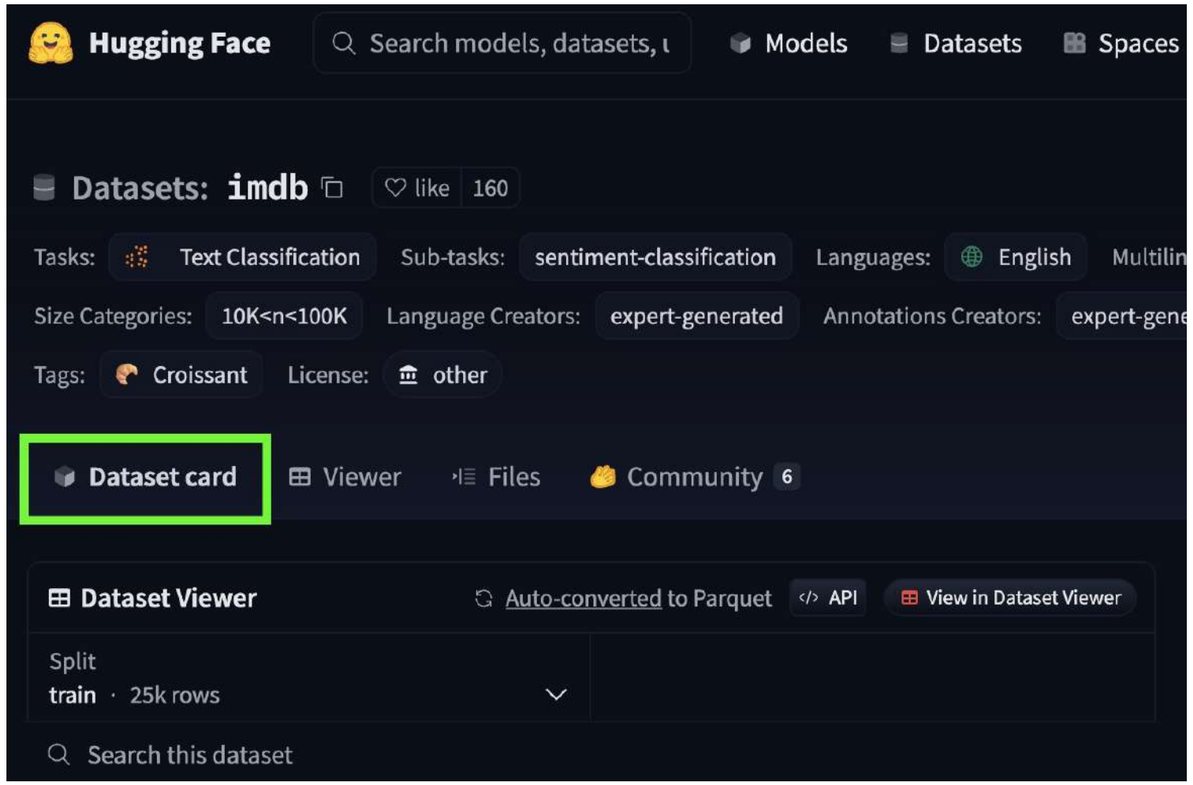
Dataset cards



[1] https://huggingface.co/datasets/imdb

Dataset cards

- Description
- Dataset structure
- An example
- Field metadata
- Training and testing splits



[1] https://huggingface.co/datasets/imdb

Dataset cards

Datasets: imdb like 160

Dataset card | Viewer | Files | Community 6

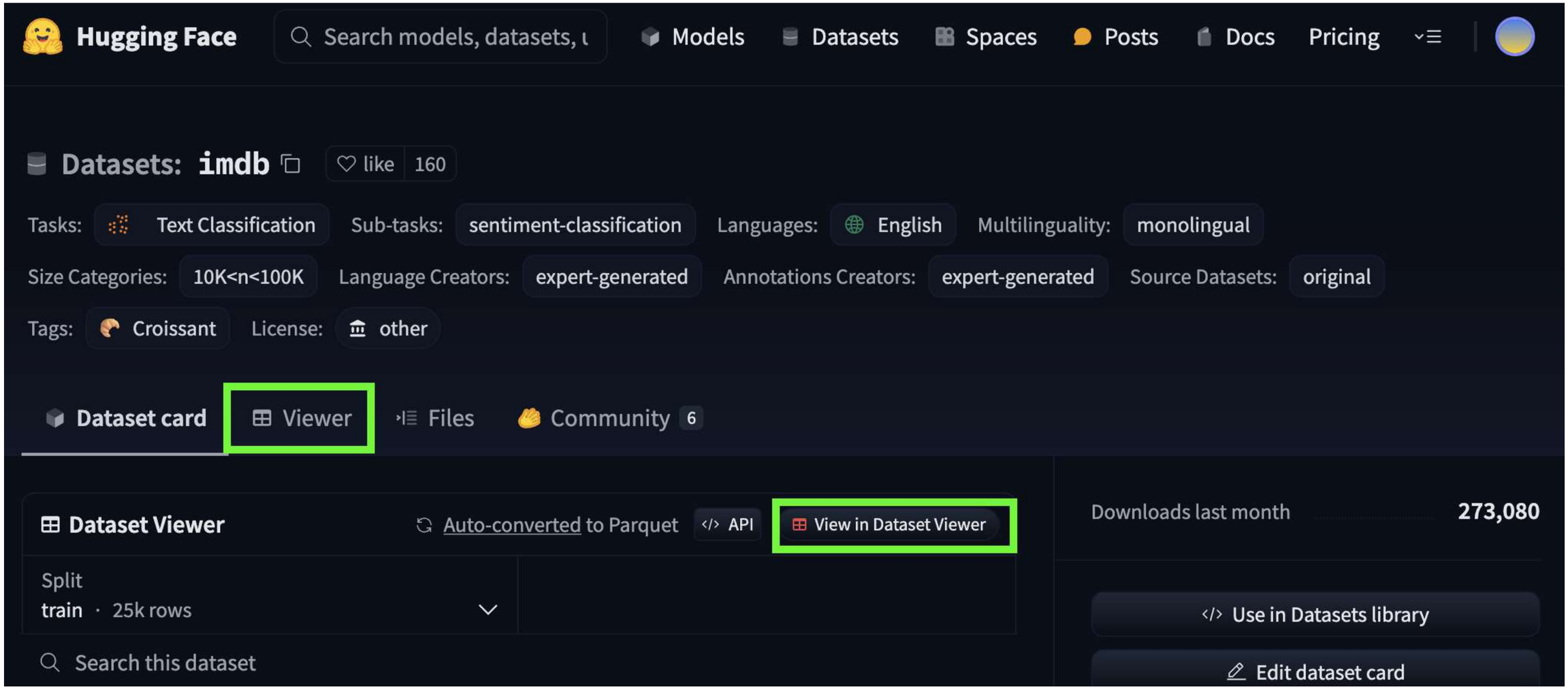
Split
train · 25k rows

Search this dataset

text string · *lengths* 52 13.7k	label class label 2 classes
I rented I AM CURIOUS-YELLOW from my video store because of all the controversy that surrounded it when it was first released in 1967. I also heard that at first it was seized by U.S. customs if it ever tried to enter this country,…	0 neg
"I Am Curious: Yellow" is a risible and pretentious steaming pile. It doesn't matter what one's political views are because this film can hardly be taken seriously on any level. As for the claim that frontal male nudity is an…	0 neg
If only to avoid making this type of film in the future. This film is interesting as an experiment but tells no cogent story. One might feel virtuous for sitting thru it because it touches on so many IMPORTANT issues but it…	0 neg
This film was probably inspired by Godard's Masculin, féminin and I urge you to see that film instead. The film has two strong elements and those are, (1) the realistic acting (2) the impressive, undeservedly good, photo.…	0 neg

[1] https://huggingface.co/datasets/imdb

Dataset cards



[1] https://huggingface.co/datasets/imdb

datasets package

```
pip install datasets
```

- Access
- Download
- Mutate
- Use
- Share

[1] https://huggingface.co/docs/datasets/index

Inspecting a dataset

```python
from datasets import load_dataset_builder

data_builder = load_dataset_builder("imdb")
```

```python
print(data_builder.info.description)
```

```
Large Movie Review Dataset. This is a dataset for sentiment classification...
```

```python
print(data_builder.info.features)
```

```
{'text': Value(dtype='string', id=None), 'label': Value(dtype='string', id=None)}
```

[1] https://huggingface.co/docs/datasets/load_hub

Downloading a dataset

```
from datasets import load_dataset

data = load_dataset("imdb")
```

Split parameter

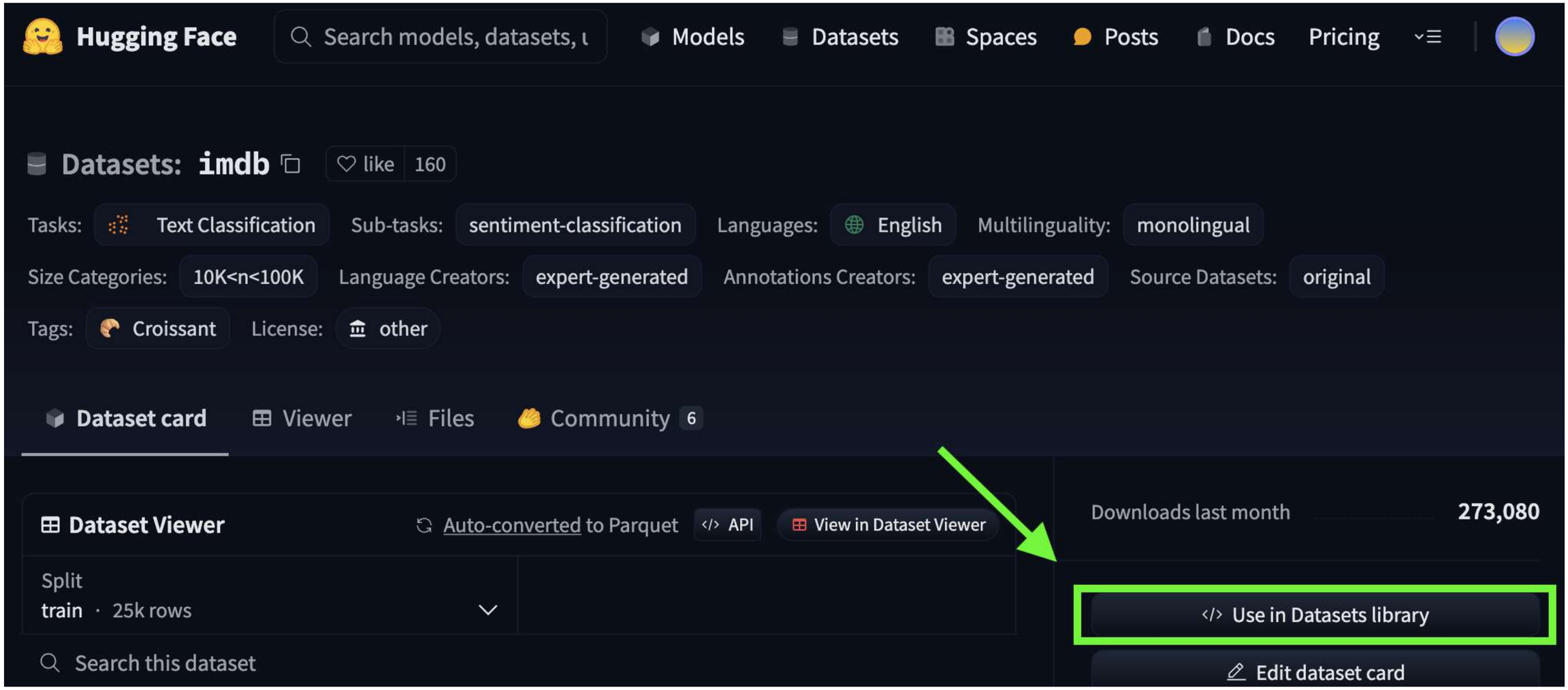
```
data = load_dataset("imdb", split="train")
```

Configuration parameter

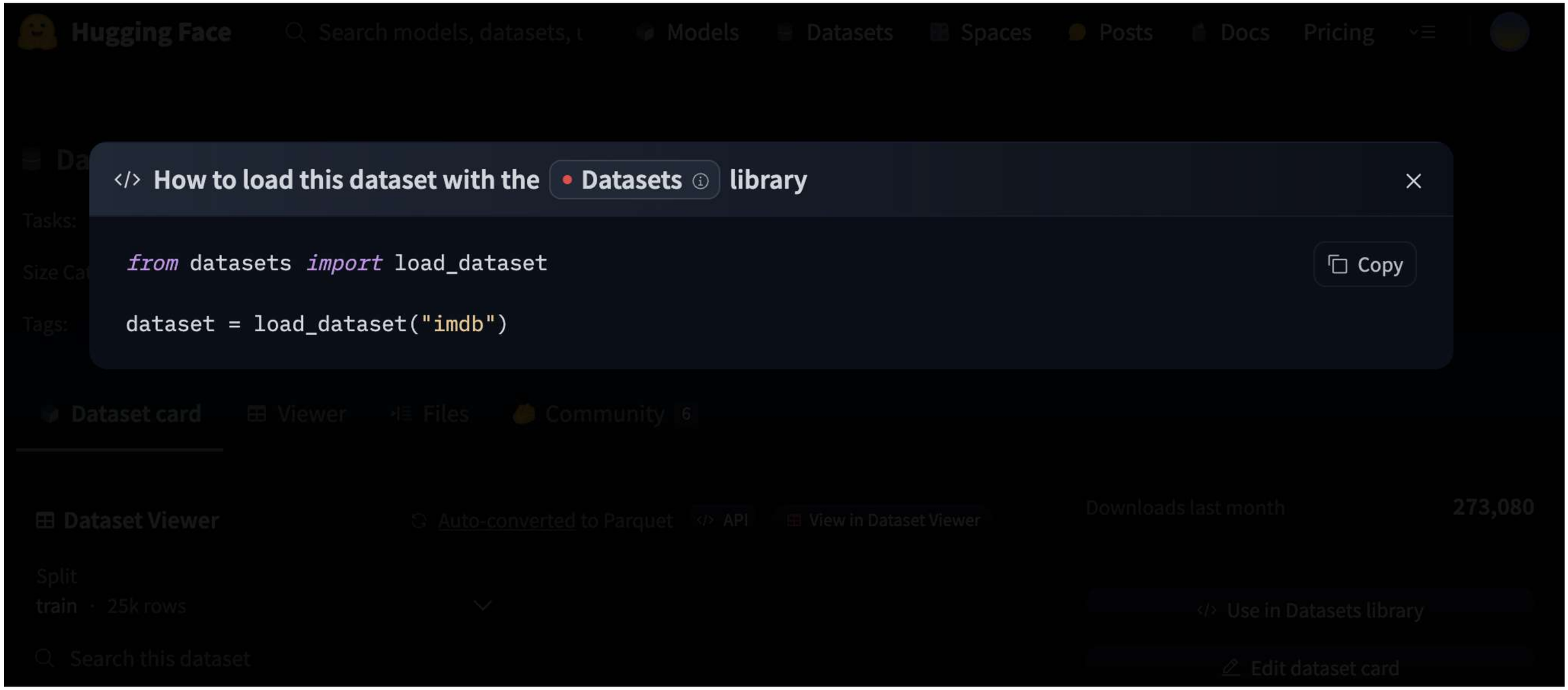
```
data = load_dataset("wikipedia", "20231101.en")
```

[1] https://huggingface.co/docs/datasets/v2.15.0/loading

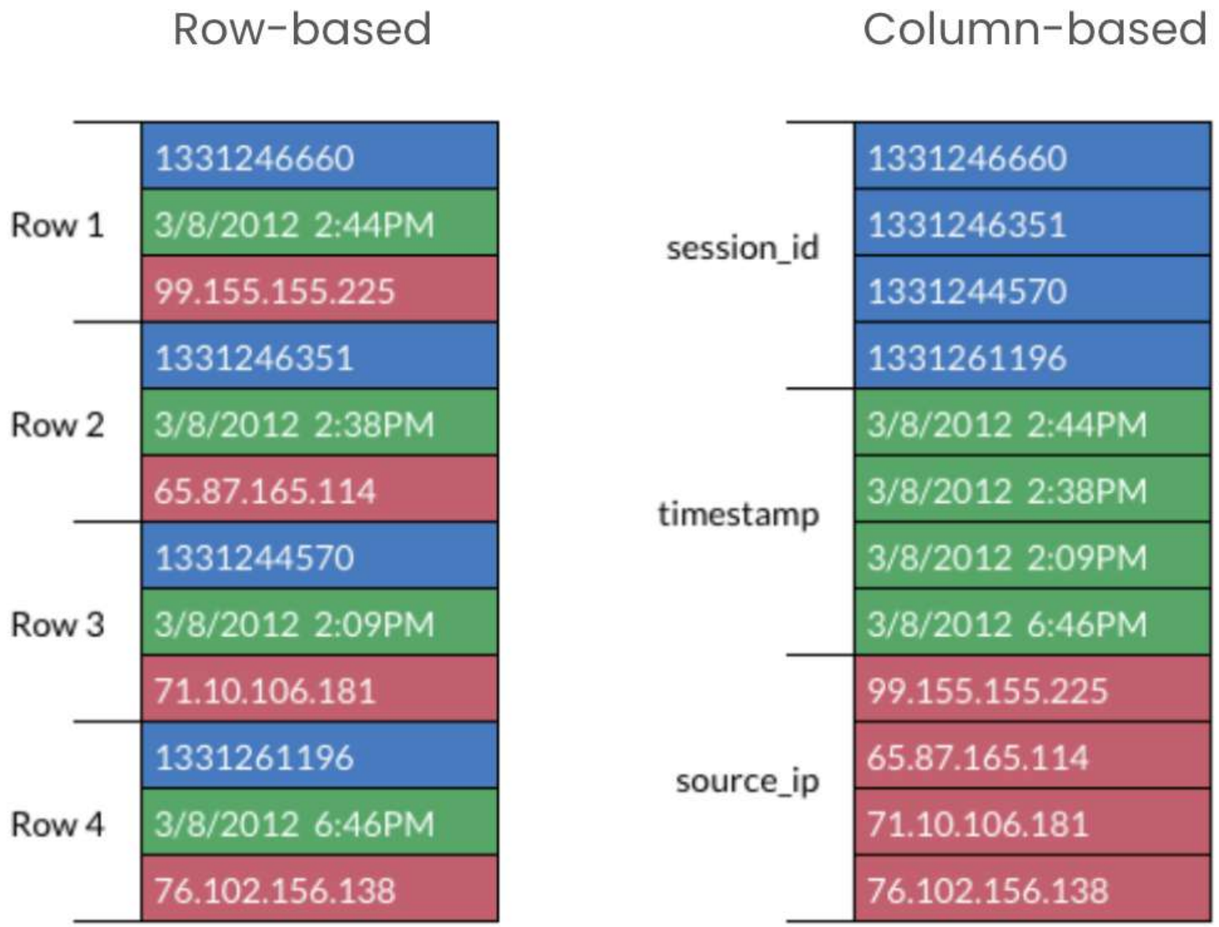
Use in datasets



Use in datasets



Apache Arrow dataset formats



[1] https://arrow.apache.org/overview/

Mutating a dataset

```
imdb = load_dataset("imdb", split="train")


# Filter imdb
filtered = imdb.filter(lambda row: row['label']==0)
```

```
{'text': 'I rented I AM CURIOUS-YELLOW...''}
```

[1] https://huggingface.co/docs/datasets/process#select-and-filter

Mutating a dataset

```
# Slicing
sliced = filtered.select(range(2))
```

```
print(sliced)
```

```
Dataset({features: ['id', 'url', 'title', 'text'], num_rows: 2})
```

```
print(sliced[0]['text'])
```

[1] https://huggingface.co/docs/datasets/process#select-and-filter

Benefits of datasets

- Accessible and shareable
- Relevant to common ML tasks
- Efficient processing on large data
- Faster querying
- Convenient complimentary `datasets` package

Let's practice!

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