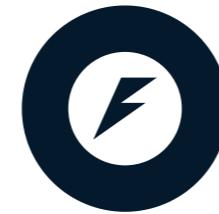


API versioning and documentation

DEPLOYING AI INTO PRODUCTION WITH FASTAPI



Matt Eckerle

Software and Data Engineering Leader

Why API versioning?

- API endpoints as menu items
- Keep old customers happy
- Some customers want new options
- **Iterate without impacting existing customers**



API for cloud AI jobs

```
from pydantic import BaseModel
```

```
class AIJobV1(BaseModel):  
    job_name: str  
    data: bytes
```

```
class AIJobV1(BaseModel):  
    job_name: str  
    data: bytes  
    config: dict
```



Versioned endpoints

```
from pydantic import BaseModel

class AIJobV1(BaseModel):
    job_name: str
    data: bytes

class AIJobV2(BaseModel):
    job_name: str
    data: bytes
    config: dict
```

```
from fastapi import FastAPI

app = FastAPI()

@app.post("/v1/ai-job")
def ai_job_v1(job: AIJobV1):
    ...

@app.post("/v2/ai-job")
def ai_job_v2(job: AIJobV2):
    ...
```

Reasons to update endpoint version

- Breaking change in schema
- Change in underlying function
 - Updated model code
 - Updated model training set
 - Updated pre/post processing

Iteration with optional fields

- Versioning is not always required to iterate
- Optional fields can support additional data without breaking schemas

```
from pydantic import BaseModel

class AIJobV1(BaseModel):
    job_name: str
    data: bytes

from typing import Optional

class AIJobV1(BaseModel):
    job_name: str
    data: bytes
    config: Optional[dict]
```

Documenting APIs with Swagger

- Standard tool for API documentation
 - Keeps track of endpoints and versions
 - Built on OpenAPI standard metadata



Swagger™



OPENAPI

Swagger UI

127.0.0.1:8000/docs

FastAPI 0.1.0 OAS 3.1

/openapi.json

AI Job API

default ^

POST /v1/ai-job Ai Job V1 ▾

POST /v2/ai-job Ai Job V2 ▾

Schemas ^

AIJobV1 > Expand all object

AIJobV2 > Expand all object

HTTPValidationError > Expand all object

ValidationError > Expand all object

The screenshot shows the Swagger UI interface for a FastAPI application. At the top, there's a dark header bar with the URL '127.0.0.1:8000/docs'. Below it, the title 'FastAPI' is followed by its version '0.1.0' and the specification standard 'OAS 3.1'. A link to the 'openapi.json' file is also present. The main content area is divided into sections: 'AI Job API' and 'default'. Under 'default', two POST requests are listed: '/v1/ai-job' (Ai Job V1) and '/v2/ai-job' (Ai Job V2). Both requests have a green button icon. Below these, there's a section titled 'Schemas' which contains four expandable objects: 'AIJobV1', 'AIJobV2', 'HTTPValidationError', and 'ValidationError', each with a 'Expand all' link.

Swagger UI for an endpoint

POST /v1/ai-job Ai Job V1 ^

Parameters

No parameters

Request body required

application/json ▾

[Example Value](#) | [Schema](#)

```
{  
  "job_name": "string",  
  "data": "string"  
}
```

Responses

Code	Description	Links
200	Successful Response	<i>No links</i>

Media type

application/json ▾

Controls Accept header.

Content-Type: application/json

Using FastAPI's description field

```
from fastapi import FastAPI

app = FastAPI(
    description="AI Job API"
)
```

FastAPI 0.1.0 OAS 3.1

</openapi.json>

AI Job API

Let's practice!

DEPLOYING AI INTO PRODUCTION WITH FASTAPI

Advanced input validation and error handling

DEPLOYING AI INTO PRODUCTION WITH FASTAPI



Matt Eckerle

Software and Data Engineering Leader

Why we need advanced input

- API for restaurant orders
- Variable number of items

```
class Order(BaseModel):  
    item1: str  
    item2: str  
    item3: str
```



Nested Pydantic models

```
from pydantic import BaseModel

class Foo(BaseModel):
    count: int

class Bar(BaseModel):
    foo: Foo
```

```
>>> m = Bar(foo={'count': 4})
>>> print(m)
foo=Foo(count=4)
```

```
from pydantic import BaseModel
from typing import List
```

```
class OrderItem(BaseModel):
    name: str
    quantity: int

class RestaurantOrder(BaseModel):
    customer_name: str
    items: List[OrderItem]
```

Custom model validators

```
from fastapi import FastAPI
from fastapi.exceptions import (
    RequestValidationError
)
from pydantic import (
    BaseModel,
    model_validator,
)
from typing import List

class OrderItem(BaseModel):
    name: str
    quantity: int
```

```
class RestaurantOrder(BaseModel):
    customer_name: str
    items: List[OrderItem]

    @model_validator(mode="after")
    def validate_after(self):
        if len(self.items) == 0:
            raise RequestValidationError(
                "No items in order!"
            )
        return self
```

```
{"detail": "No items in order!"}
```

Global exception handlers

```
from fastapi import FastAPI
from fastapi.exceptions import RequestValidationError
from fastapi.responses import PlainTextResponse

app = FastAPI()

@app.exception_handler(RequestValidationError)
async def validation_exception_handler(request, exc):
    msg = "Input validation error. See the documentation: http://127.0.0.1:8000/docs"
    return PlainTextResponse(msg, status_code=422)
```

Input validation error. See the documentation: <http://127.0.0.1:8000/docs>

Let's practice!

DEPLOYING AI INTO PRODUCTION WITH FASTAPI

Monitoring and logging

DEPLOYING AI INTO PRODUCTION WITH FASTAPI



Matt Eckerle

Software and Data Engineering Leader

Why monitoring and logging?

- Can't debug in production
- App supervisor needs a simple health check
- Logging key metrics over time



Setting up custom logging

- Load the uvicorn error logger
- Add custom logs to app startup
- Add custom logs to endpoints

```
from fastapi import FastAPI
import logging

logger = logging.getLogger(
    'uvicorn.error'
)
app = FastAPI()
logger.info("App is running!")

@app.get('/')
async def main():
    logger.debug('GET /')
    return 'ok'
```

Logging a when a model is loaded

```
from fastapi import FastAPI  
import logging  
import joblib  
  
logger = logging.getLogger('uvicorn.error')  
  
model = joblib.load('penguin_classifier.pkl')  
logger.info("Penguin classifier loaded successfully.")  
  
app = FastAPI()
```

Logging process time with middleware

```
from fastapi import FastAPI, Request
import logging
import time
logger = logging.getLogger('uvicorn.error')
app = FastAPI()

@app.middleware("http")
async def log_process_time(request: Request, call_next):
    start_time = time.perf_counter()
    response = await call_next(request)
    process_time = time.perf_counter() - start_time
    logger.info(f"Process time was {process_time} seconds.")
    return response
```

¹ <https://fastapi.tiangolo.com/tutorial/middleware/>

Setting the logging level

Log Level	Numeric Value
debug	10
info	20
warning	30
error	40
critical	50

```
uvicorn main:app --log-level debug
```

Monitoring

```
from fastapi import FastAPI

app = FastAPI()

@app.get("/health")
async def get_health():
    return {"status": "OK"}
```

- "I'm ok!"

Sharing model parameters with monitoring

```
from fastapi import FastAPI  
import joblib  
  
model = joblib.load(  
    'penguin_classifier.pkl'  
)  
  
app = FastAPI()  
  
@app.get("/health")  
async def get_health():  
    params = model.get_params()  
    return {"status": "OK",  
            "params": params}
```

- "I'm ok!"
- "Here are some fun facts about me!"

Let's practice!

DEPLOYING AI INTO PRODUCTION WITH FASTAPI

Wrap-up

DEPLOYING AI INTO PRODUCTION WITH FASTAPI



Matt Eckerle

Software and Data Engineering Leader

Introduction to FastAPI for Model Deployment

Chapter 1

- Basic GET and POST requests
- Loading a pre-trained model
- Running the `uvicorn` server
- Pydantic models for requests and responses



Integrating AI models

Chapter 2

- More structured input types
- Loading a pre-trained model in the app
- Structured prediction results



Field Validators

The `Field` function is used to customize and add metadata to fields of models



Custom Domain-Specific Validators

Create and apply custom validator functions



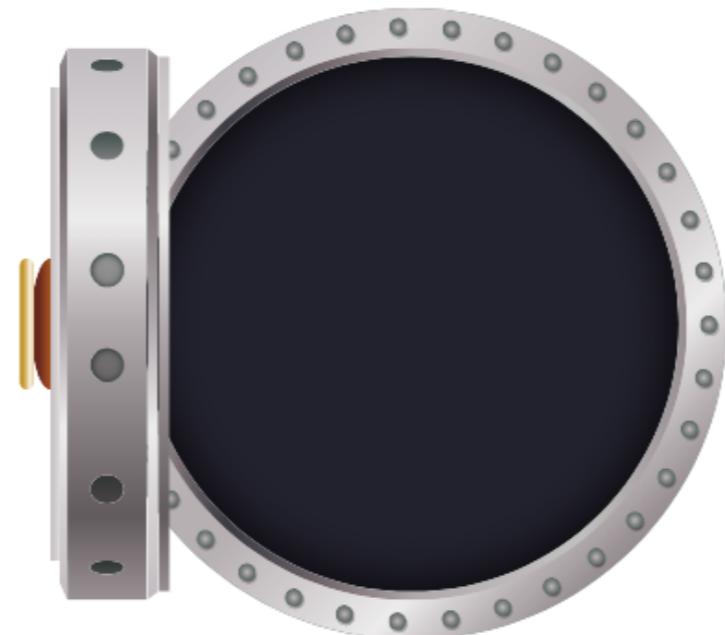
Validation Error Handling

Custom messages and user-friendly reporting

Securing and optimizing the API

Chapter 3

- API key authentication
- Rate limiting
- Async processing



API versioning, monitoring and logging

Chapter 4

- API versioning and documentation
- Advanced input validation and error handling
- Monitoring and logging



Congratulations!

DEPLOYING AI INTO PRODUCTION WITH FASTAPI