FASTAPI 快速参考

路径操作、验证、依赖注入、认证、测试

初始化

最简应用

```
from fastapi import FastAPI
app = FastAPI()

@app.get("/")
async def root():
    return {"message": "Hello, World!"}
```

运行应用

```
pip install "fastapi[standard]"
fastapi dev main.py    # dev with auto-reload
fastapi run main.py    # production
```

核心特性

`Async native`	async/await，ASGI（Uvicorn）
`Auto docs`	Swagger UI 在 `/docs`，ReDoc 在 `/redoc`
`Type validation`	Pydantic 模型验证请求/响应
`OpenAPI`	自动生成 OpenAPI schema
`Dependency injection`	内置依赖注入系统

路径操作

HTTP 方法

```
@app.get("/items")
@app.post("/items")
@app.put("/items/{item_id}")
@app.patch("/items/{item_id}")
@app.delete("/items/{item_id}")
```

路径参数

```
@app.get("/users/{user_id}")
async def get_user(user_id: int):
    return {"user_id": user_id}

# Enum constraint
from enum import Enum
class Color(str, Enum):
    red = "red"
    blue = "blue"
```

状态码与标签

```
from fastapi import status

@app.post("/items", status_code=status.HTTP_201_CREATED,
          tags=["items"])
async def create_item(item: Item):
    return item
```

请求体

Pydantic 模型

```
from pydantic import BaseModel, Field

class Item(BaseModel):
    name: str
    price: float = Field(gt=0, description="Must be positive")
    tags: list[str] = []
```

嵌套模型

```
class Address(BaseModel):
    street: str
    city: str
    zip_code: str

class User(BaseModel):
    name: str
    address: Address
```

在端点中使用

```
@app.post("/items")
async def create_item(item: Item):
    return {"name": item.name, "price": item.price}
```

验证特性

`Field(gt=0)`	大于 0
`Field(min_length=1)`	最小字符串长度
`Field(max_length=100)`	最大字符串长度
`Field(pattern='^[a-z]+$')`	正则模式匹配
`Field(default=None)`	带默认值的可选字段
`EmailStr`	邮箱验证（pydantic[email]）

查询参数

基础查询参数

```
@app.get("/items")
async def list_items(skip: int = 0, limit: int = 10):
    return items[skip : skip + limit]
# GET /items?skip=0&limit=20
```

查询验证

```
from fastapi import Query

@app.get("/search")
async def search(
    q: str = Query(min_length=3, max_length=50),
    page: int = Query(default=1, ge=1),
):
    return {"q": q, "page": page}
```

可选与必填

```
async def read_items(
    q: str | None = None,   # optional
    name: str = ...,        # required (Ellipsis)
    tags: list[str] = Query(default=[]),
):
    return {"q": q, "name": name}
```

Header 与 Cookie

```
from fastapi import Header, Cookie

async def read(
    user_agent: str | None = Header(default=None),
    session_id: str | None = Cookie(default=None),
):
    return {"ua": user_agent}
```

响应模型

响应模型

```
class ItemOut(BaseModel):
    name: str
    price: float

@app.get("/items/{id}", response_model=ItemOut)
async def get_item(id: int):
    return items[id]  # filters out extra fields
```

多种响应类型

```
from fastapi.responses import JSONResponse, HTMLResponse

@app.get("/html", response_class=HTMLResponse)
async def get_html():
    return "<h1>Hello</h1>"
```

响应模型选项

`response_model`	用于输出过滤的 Pydantic 模型
`response_model_exclude_unset`	省略未显式设置的字段
`response_model_include`	白名单特定字段
`response_model_exclude`	黑名单特定字段

错误响应

```
from fastapi import HTTPException

@app.get("/items/{id}")
async def get_item(id: int):
    if id not in items:
        raise HTTPException(status_code=404, detail="Not found")
    return items[id]
```

依赖注入

函数依赖

```
from fastapi import Depends

async def get_db():
    db = SessionLocal()
    try:
        yield db
    finally:
        db.close()
```

在端点中使用

```
@app.get("/users")
async def list_users(db: Session = Depends(get_db)):
    return db.query(User).all()
```

类依赖

```
class Pagination:
    def __init__(self, skip: int = 0, limit: int = 10):
        self.skip = skip
        self.limit = limit

@app.get("/items")
async def list_items(pg: Pagination = Depends()):
    return items[pg.skip : pg.skip + pg.limit]
```

依赖作用域

`Depends(func)`	端点级依赖
`app = FastAPI(dependencies=[...])`	所有路由的全局依赖
`APIRouter(dependencies=[...])`	Router 级依赖
`yield`	安装/拆卸（DB session、锁）

认证

OAuth2 密码 Bearer

```
from fastapi.security import OAuth2PasswordBearer

oauth2_scheme = OAuth2PasswordBearer(tokenUrl="token")

@app.get("/users/me")
async def read_me(token: str = Depends(oauth2_scheme)):
    user = decode_token(token)
    return user
```

JWT Token 流程

```
from jose import jwt
SECRET = "your-secret-key"

def create_token(data: dict):
    return jwt.encode(data, SECRET, algorithm="HS256")

def decode_token(token: str):
    return jwt.decode(token, SECRET, algorithms=["HS256"])
```

Token 端点

```
from fastapi.security import OAuth2PasswordRequestForm

@app.post("/token")
async def login(form: OAuth2PasswordRequestForm = Depends()):
    user = authenticate(form.username, form.password)
    if not user:
        raise HTTPException(status_code=401)
    return {"access_token": create_token({"sub": user.id})}
```

安全方案

`OAuth2PasswordBearer`	通过表单登录的 Bearer token
`HTTPBasic`	基础用户名/密码认证
`APIKeyHeader`	Header 中的 API key
`APIKeyCookie`	Cookie 中的 API key

后台任务

简单后台任务

```
from fastapi import BackgroundTasks

def send_email(to: str, body: str):
    # slow operation runs after response
    email_client.send(to, body)

@app.post("/notify")
async def notify(bg: BackgroundTasks):
    bg.add_task(send_email, "user@example.com", "Hello!")
    return {"status": "queued"}
```

依赖中使用后台任务

```
async def log_request(bg: BackgroundTasks):
    bg.add_task(write_log, "request received")

@app.get("/items", dependencies=[Depends(log_request)])
async def list_items():
    return items
```

后台任务 vs Worker

`BackgroundTasks`	响应后的轻量任务（邮件、日志）
`Celery / ARQ`	需要独立 worker 的重任务
`asyncio.create_task`	即发即忘的异步协程

中间件

自定义中间件

```
import time
from starlette.middleware.base import BaseHTTPMiddleware

class TimingMiddleware(BaseHTTPMiddleware):
    async def dispatch(self, request, call_next):
        start = time.time()
        response = await call_next(request)
        duration = time.time() - start
        response.headers["X-Process-Time"] = str(duration)
        return response
```

添加中间件

```
app.add_middleware(TimingMiddleware)
```

CORS

```
from fastapi.middleware.cors import CORSMiddleware

app.add_middleware(
    CORSMiddleware,
    allow_origins=["https://example.com"],
    allow_methods=["*"],
    allow_headers=["*"],
)
```

内置中间件

`CORSMiddleware`	跨域资源共享
`TrustedHostMiddleware`	限制允许的主机名
`GZipMiddleware`	Gzip 响应压缩
`HTTPSRedirectMiddleware`	HTTP 重定向到 HTTPS

测试

测试客户端

```
from fastapi.testclient import TestClient

client = TestClient(app)

def test_read_root():
    resp = client.get("/")
    assert resp.status_code == 200
    assert resp.json() == {"message": "Hello, World!"}
```

测试 POST

```
def test_create_item():
    resp = client.post("/items", json={
        "name": "Widget",
        "price": 9.99,
    })
    assert resp.status_code == 201
    assert resp.json()["name"] == "Widget"
```

覆盖依赖

```
async def mock_db():
    return FakeDB()

app.dependency_overrides[get_db] = mock_db

def test_with_mock_db():
    resp = client.get("/users")
    assert resp.status_code == 200
```

异步测试

```
import pytest
from httpx import AsyncClient, ASGITransport

@pytest.mark.anyio
async def test_async():
    transport = ASGITransport(app=app)
    async with AsyncClient(transport=transport) as ac:
        resp = await ac.get("/")
    assert resp.status_code == 200
```