



*FastAPI framework, high performance, easy to learn, fast to code, ready for production*

 Test  passing  coverage  100%  pypi package  v0.81.0  python  3.6 |  3.7 |  3.8 |  3.9 |  3.10

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**Documentation:** <https://fastapi.tiangolo.com>

**Source Code:** <https://github.com/tiangolo/fastapi>

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FastAPI is a modern, fast (high-performance), web framework for building APIs with Python 3.6+ based on standard Python type hints.

The key features are:

- **Fast:** Very high performance, on par with **NodeJS** and **Go** (thanks to Starlette and Pydantic). [One of the fastest Python frameworks available](#).
- **Fast to code:** Increase the speed to develop features by about 200% to 300%. \*
- **Fewer bugs:** Reduce about 40% of human (developer) induced errors. \*
- **Intuitive:** Great editor support. Completion everywhere. Less time debugging.
- **Easy:** Designed to be easy to use and learn. Less time reading docs.
- **Short:** Minimize code duplication. Multiple features from each parameter declaration. Fewer bugs.
- **Robust:** Get production-ready code. With automatic interactive documentation.
- **Standards-based:** Based on (and fully compatible with) the open standards for APIs: [OpenAPI](#) (previously known as Swagger) and [JSON Schema](#).

\* estimation based on tests on an internal development team, building production applications.

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## Opinions

"[...] I'm using **FastAPI** a ton these days. [...] I'm actually planning to use it for all of my team's **ML services at Microsoft**. Some of them are getting integrated into the core **Windows** product and some **Office** products."

Kabir Khan - **Microsoft** [\(ref\)](#)

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"We adopted the **FastAPI** library to spawn a **REST** server that can be queried to obtain **predictions**. [for Ludwig]"

Piero Molino, Yaroslav Dudin, and Sai Sumanth Miryala - **Uber** [\(ref\)](#)

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"**Netflix** is pleased to announce the open-source release of our **crisis management** orchestration framework: **Dispatch!** [built with **FastAPI**]"

Kevin Glisson, Marc Vilanova, Forest Monsen - **Netflix** [\(ref\)](#)

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"I'm over the moon excited about **FastAPI**. It's so fun!"

Brian Okken - **Python Bytes** podcast host [\(ref\)](#)

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"Honestly, what you've built looks super solid and polished. In many ways, it's what I wanted **Hug** to be - it's really inspiring to see someone build that."

Timothy Crosley - **Hug** creator [\(ref\)](#)

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"If you're looking to learn one **modern framework** for building REST APIs, check out **FastAPI** [...] It's fast, easy to use and easy to learn [...]"

"We've switched over to **FastAPI** for our **APIs** [...] I think you'll like it [...]"


Ines Montani - Matthew Honnibal - **Explosion AI** founders - **spaCy** creators [\(ref\)](#) - [\(ref\)](#)

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## Typer, the FastAPI of CLIs



If you are building a **CLI** app to be used in the terminal instead of a web API, check out **Typer**.

**Typer** is FastAPI's little sibling. And it's intended to be the **FastAPI of CLIs**.  

## Requirements

Python 3.6+

FastAPI stands on the shoulders of giants:

- [Starlette](#) for the web parts.
- [Pydantic](#) for the data parts.

## Installation

```
$ pip install fastapi
```

```
---> 100%
```

You will also need an ASGI server, for production such as [Uvicorn](#) or [Hypercorn](#).

```
$ pip install "uvicorn[standard]"
```

```
---> 100%
```

## Example

### Create it

- Create a file `main.py` with:

```
from typing import Optional

from fastapi import FastAPI

app = FastAPI()

@app.get("/")
def read_root():
    return {"Hello": "World"}

@app.get("/items/{item_id}")
def read_item(item_id: int, q: Optional[str] = None):
    return {"item_id": item_id, "q": q}
```

- Or use `async def...`

### Run it

Run the server with:

```
$ uvicorn main:app --reload
```

```
INFO:      Uvicorn running on http://127.0.0.1:8000 (Press CTRL+C to quit)
INFO:      Started reloader process [28720]
INFO:      Started server process [28722]
INFO:      Waiting for application startup.
INFO:      Application startup complete.
```

- About the command `uvicorn main:app --reload...`

### Check it

Open your browser at <http://127.0.0.1:8000/items/5?q=somequery>.

You will see the JSON response as:

```
{"item_id": 5, "q": "somequery"}
```

You already created an API that:

- Receives HTTP requests in the *paths* `/` and `/items/{item_id}` .
- Both *paths* take `GET` *operations* (also known as HTTP *methods*).
- The *path* `/items/{item_id}` has a *path parameter* `item_id` that should be an `int` .
- The *path* `/items/{item_id}` has an optional `str` *query parameter* `q` .

## Interactive API docs

Now go to <http://127.0.0.1:8000/docs>.

You will see the automatic interactive API documentation (provided by [Swagger UI](#)):

The screenshot shows a web browser window with the title "Fast API - Swagger UI". The address bar shows the URL "127.0.0.1:8000/docs". The page displays the Swagger UI for a Fast API endpoint.

**Fast API** 0.1.0 OAS3  
/openapi.json

**default** ✓

**GET** /items/{item\_id} Read Item Get

**Parameters** Try it out

Name	Description
<b>item_id</b> * required integer (path)	
q string (query)	

**Responses**

Code	Description	Links
200	<b>Successful Response</b> application/json Controls Accept header.	No links
422	<b>Validation Error</b> application/json	No links

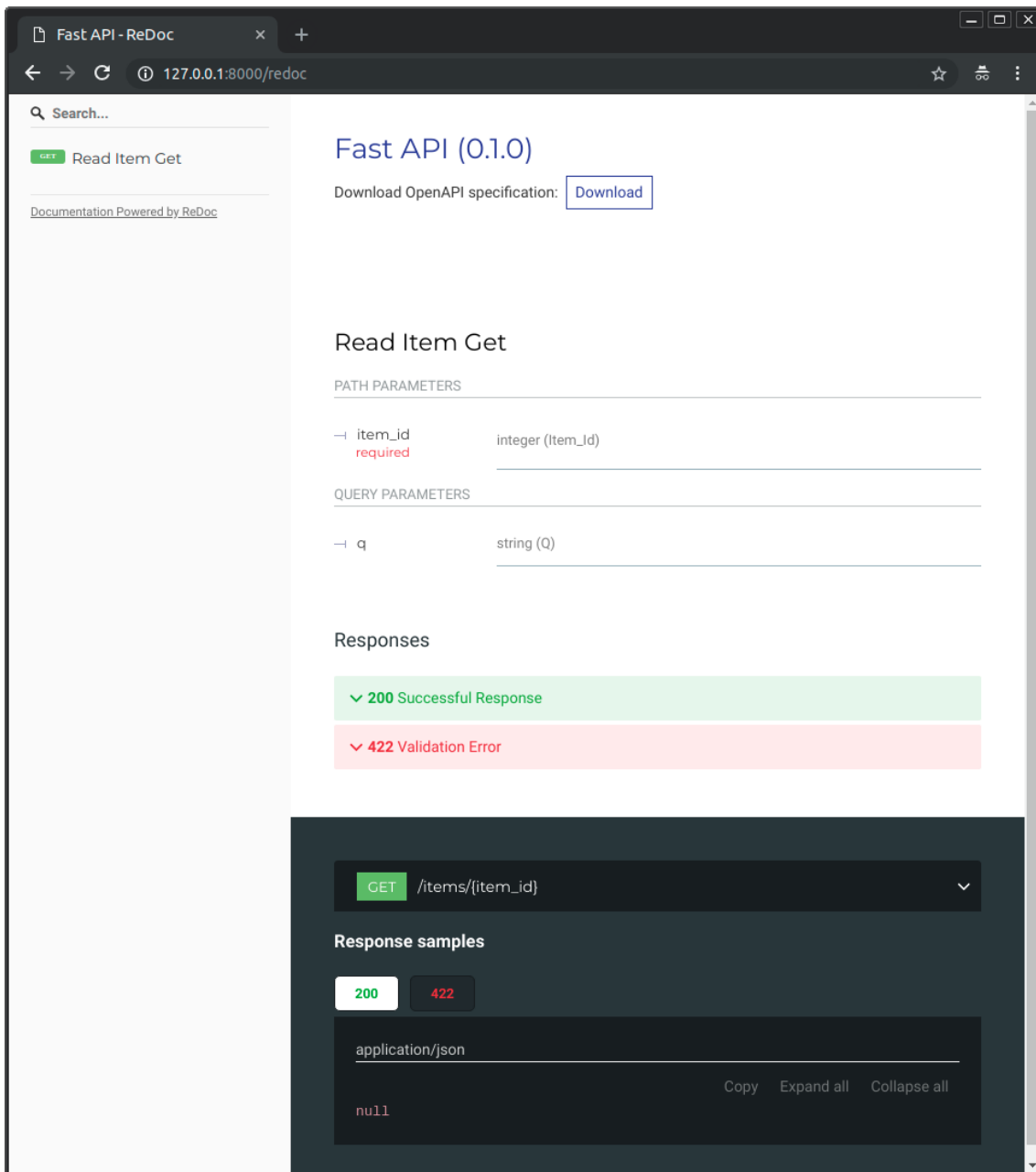
Example Value | Schema

```
{  "detail": [    {      "loc": [        "string"      ]    }  ]}
```

## Alternative API docs

And now, go to <http://127.0.0.1:8000/redoc>.

You will see the alternative automatic documentation (provided by [ReDoc](#)):



## Example upgrade

Now modify the file `main.py` to receive a body from a `PUT` request.

Declare the body using standard Python types, thanks to Pydantic.

```
from typing import Optional

from fastapi import FastAPI
from pydantic import BaseModel

app = FastAPI()
```

```
class Item(BaseModel):
    name: str
    price: float
    is_offer: Optional[bool] = None

@app.get("/")
def read_root():
    return {"Hello": "World"}

@app.get("/items/{item_id}")
def read_item(item_id: int, q: Optional[str] = None):
    return {"item_id": item_id, "q": q}

@app.put("/items/{item_id}")
def update_item(item_id: int, item: Item):
    return {"item_name": item.name, "item_id": item_id}
```

The server should reload automatically (because you added `--reload` to the `uvicorn` command above).

## Interactive API docs upgrade

Now go to <http://127.0.0.1:8000/docs>.

- The interactive API documentation will be automatically updated, including the new body:

Fast API - Swagger UI

127.0.0.1:8000/docs

# Fast API 0.1.0 OAS3

/openapi.json

## default

GET / Read Root Get

GET /items/{item\_id} Read Item Get

PUT /items/{item\_id} Save Item Put

Parameters Try it out

Name	Description
item_id <small>* required</small>	
integer	
(path)	

Request body required application/json

Example Value | Schema

```
{
  "name": "string",
  "price": 0,
  "is_offer": true
}
```

### Responses

Code	Description	Links
200	Successful Response	No links

- Click on the button "Try it out", it allows you to fill the parameters and directly interact with the API:



Fast API 0.1.0 OAS3

/openapi.json

default

GET / Read Root Get

GET /items/{item\_id} Read Item Get

PUT /items/{item\_id} Save Item Put

Parameters

Name	Description
item_id * required integer (path)	1234

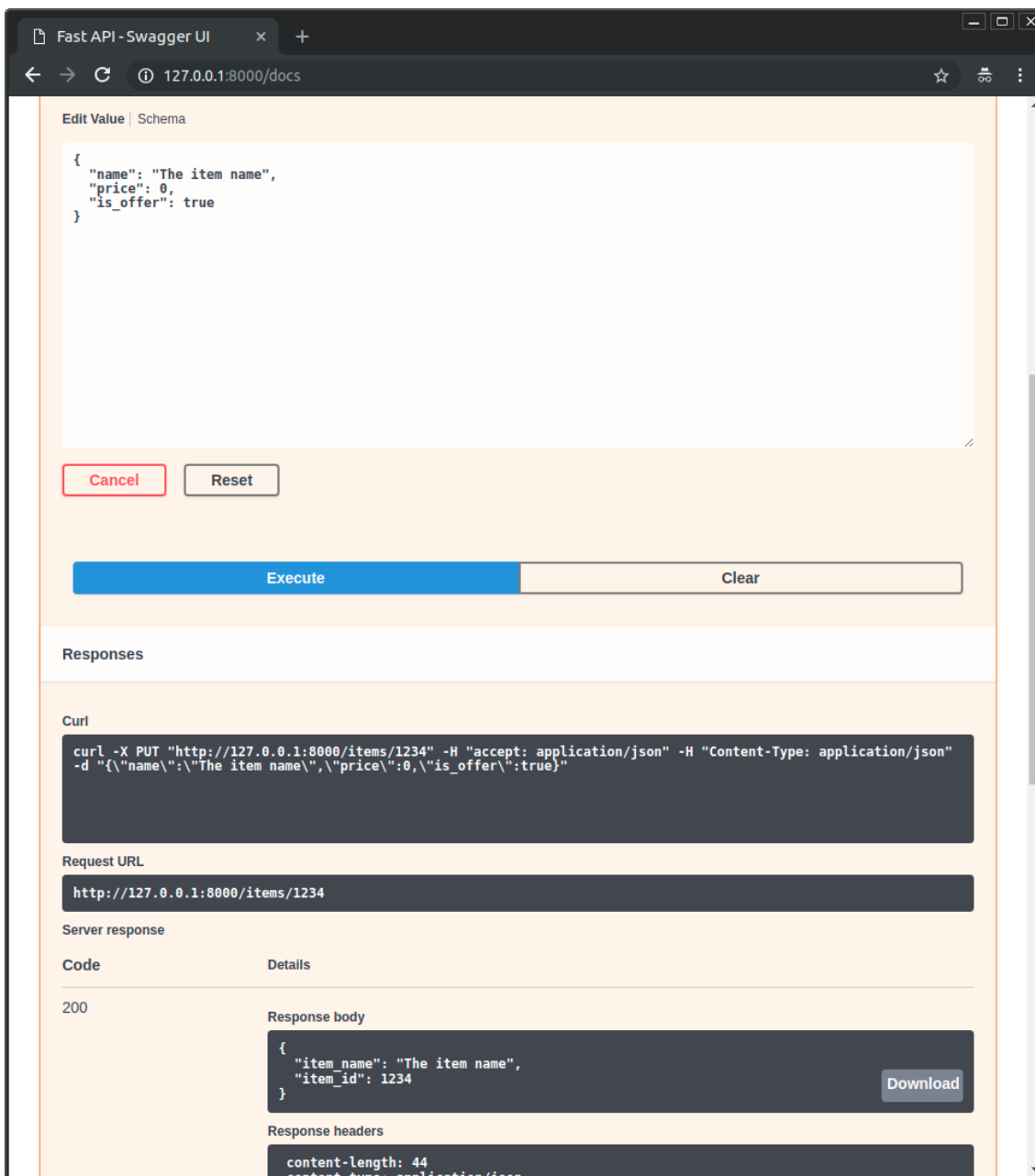
Request body required application/json

Edit Value | Schema

```
{
  "name": "The item name",
  "price": 0,
  "is_offer": true
}
```

Cancel Reset

- Then click on the "Execute" button, the user interface will communicate with your API, send the parameters, get the results and show them on the screen:



## Alternative API docs upgrade

And now, go to <http://127.0.0.1:8000/redoc>.

- The alternative documentation will also reflect the new query parameter and body:

Fast API - ReDoc

127.0.0.1:8000/redoc#operation/save\_item\_items\_\_item\_id\_\_put

Search...

GET Read Root Get

GET Read Item Get

PUT Save Item Put

Documentation Powered by ReDoc

### Save Item Put

PATH PARAMETERS

item\_id integer (Item\_Id)  
required

REQUEST BODY SCHEMA: application/json

name string (Name)  
required

price number (Price)  
required

is\_offer boolean (Is\_Offer)

### Responses

✓ 200 Successful Response

✓ 422 Validation Error

PUT /items/{item\_id}

### Request samples

Payload

application/json

Copy Expand all Collapse all

```
{
  "name": "string",
  "price": 0,
  "is_offer": true
}
```

## Recap

In summary, you declare **once** the types of parameters, body, etc. as function parameters.

You do that with standard modern Python types.

You don't have to learn a new syntax, the methods or classes of a specific library, etc.

Just standard **Python 3.6+**.

For example, for an `int`:

```
item_id: int
```

or for a more complex `Item` model:

```
item: Item
```

...and with that single declaration you get:

- Editor support, including:
  - Completion.
  - Type checks.
- Validation of data:
  - Automatic and clear errors when the data is invalid.
  - Validation even for deeply nested JSON objects.
- Conversion of input data: coming from the network to Python data and types. Reading from:
  - JSON.
  - Path parameters.
  - Query parameters.
  - Cookies.
  - Headers.
  - Forms.
  - Files.
- Conversion of output data: converting from Python data and types to network data (as JSON):
  - Convert Python types ( `str` , `int` , `float` , `bool` , `list` , etc).
  - `datetime` objects.
  - `UUID` objects.
  - Database models.
  - ...and many more.
- Automatic interactive API documentation, including 2 alternative user interfaces:
  - Swagger UI.
  - ReDoc.

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Coming back to the previous code example, **FastAPI** will:

- Validate that there is an `item_id` in the path for `GET` and `PUT` requests.
- Validate that the `item_id` is of type `int` for `GET` and `PUT` requests.
  - If it is not, the client will see a useful, clear error.
- Check if there is an optional query parameter named `q` (as in `http://127.0.0.1:8000/items/foo?q=somequery` ) for `GET` requests.
  - As the `q` parameter is declared with `= None` , it is optional.
  - Without the `None` it would be required (as is the body in the case with `PUT` ).
- For `PUT` requests to `/items/{item_id}` , Read the body as JSON:
  - Check that it has a required attribute `name` that should be a `str` .
  - Check that it has a required attribute `price` that has to be a `float` .
  - Check that it has an optional attribute `is_offer` , that should be a `bool` , if present.
  - All this would also work for deeply nested JSON objects.
- Convert from and to JSON automatically.
- Document everything with OpenAPI, that can be used by:
  - Interactive documentation systems.

- Automatic client code generation systems, for many languages.
- Provide 2 interactive documentation web interfaces directly.

We just scratched the surface, but you already get the idea of how it all works.

Try changing the line with:

```
return {"item_name": item.name, "item_id": item_id}
```

...from:

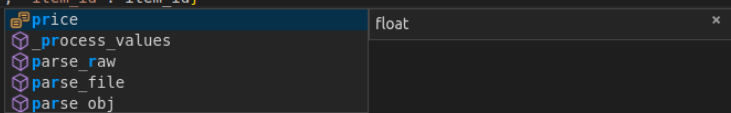
```
... "item_name": item.name ...
```

...to:

```
... "item_price": item.price ...
```

...and see how your editor will auto-complete the attributes and know their types:

```
1  from fastapi import FastAPI
2  from pydantic import BaseModel
3
4  app = FastAPI()
5
6
7  class Item(BaseModel):
8      name: str
9      price: float
10     is_offer: bool = None
11
12
13 @app.get("/")
14 def read_root():
15     return {"Hello": "World"}
16
17
18 @app.get("/items/{item_id}")
19 def read_item(item_id: int, q: str = None):
20     return {"item_id": item_id, "q": q}
21
22
23 @app.put("/items/{item_id}")
24 def save_item(item_id: int, item: Item):
25     return {"item_name": item.pr, "item_id": item_id}
26
```



For a more complete example including more features, see the [Tutorial - User Guide](#).

**Spoiler alert:** the tutorial - user guide includes:

- Declaration of **parameters** from other different places as: **headers**, **cookies**, **form fields** and **files**.
- How to set **validation constraints** as `maximum_length` or `regex`.
- A very powerful and easy to use **Dependency Injection** system.
- Security and authentication, including support for **OAuth2** with **JWT tokens** and **HTTP Basic** auth.
- More advanced (but equally easy) techniques for declaring **deeply nested JSON models** (thanks to Pydantic).

- **GraphQL** integration with [Strawberry](#) and other libraries.
- Many extra features (thanks to Starlette) as:
  - **WebSockets**
  - extremely easy tests based on `requests` and `pytest`
  - **CORS**
  - **Cookie Sessions**
  - ...and more.

## Performance

Independent TechEmpower benchmarks show **FastAPI** applications running under Uvicorn as [one of the fastest Python frameworks available](#), only below Starlette and Uvicorn themselves (used internally by FastAPI). (\*)

To understand more about it, see the section [Benchmarks](#).

## Optional Dependencies

Used by Pydantic:

- [ujson](#) - for faster JSON `"parsing"`.
- [email\\_validator](#) - for email validation.

Used by Starlette:

- [requests](#) - Required if you want to use the `TestClient`.
- [jinja2](#) - Required if you want to use the default template configuration.
- [python-multipart](#) - Required if you want to support form `"parsing"`, with `request.form()`.
- [itsdangerous](#) - Required for `SessionMiddleware` support.
- [pyyaml](#) - Required for Starlette's `SchemaGenerator` support (you probably don't need it with FastAPI).
- [ujson](#) - Required if you want to use `UJSONResponse`.

Used by FastAPI / Starlette:

- [uvicorn](#) - for the server that loads and serves your application.
- [orjson](#) - Required if you want to use `ORJSONResponse`.

You can install all of these with `pip install "fastapi[all]"`.

## License

This project is licensed under the terms of the MIT license.