

## Flight Price Tracker System

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Course: Advanced Database Systems - 5th Semester BSCS

### Project Overview

This system tracks flight ticket prices over time and provides APIs to search and retrieve historical pricing data. It supports hybrid search combining keyword and semantic search capabilities.

### Technology Stack

- Language: Python 3.10
- Framework: FastAPI
- Database: MongoDB (Community Edition)
- Search: Hybrid (Keyword + Semantic using sentence-transformers)
- Embeddings: all-MiniLM-L6-v2 model

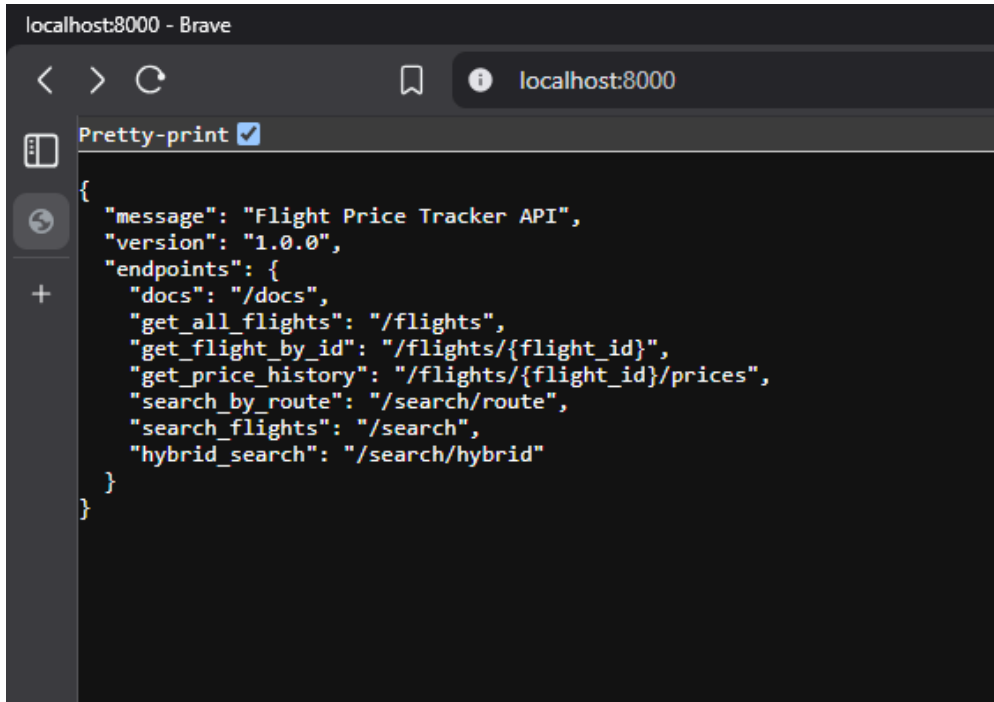
### API Testing Using Postman

Below are the endpoints tested in Postman. Inserted screenshots for each one show the request URL, method, and JSON response.

Github Link: <https://github.com/wdymabdu/adbMidProject>

## 1 Root Endpoint

Endpoint: GET <http://localhost:8000/>

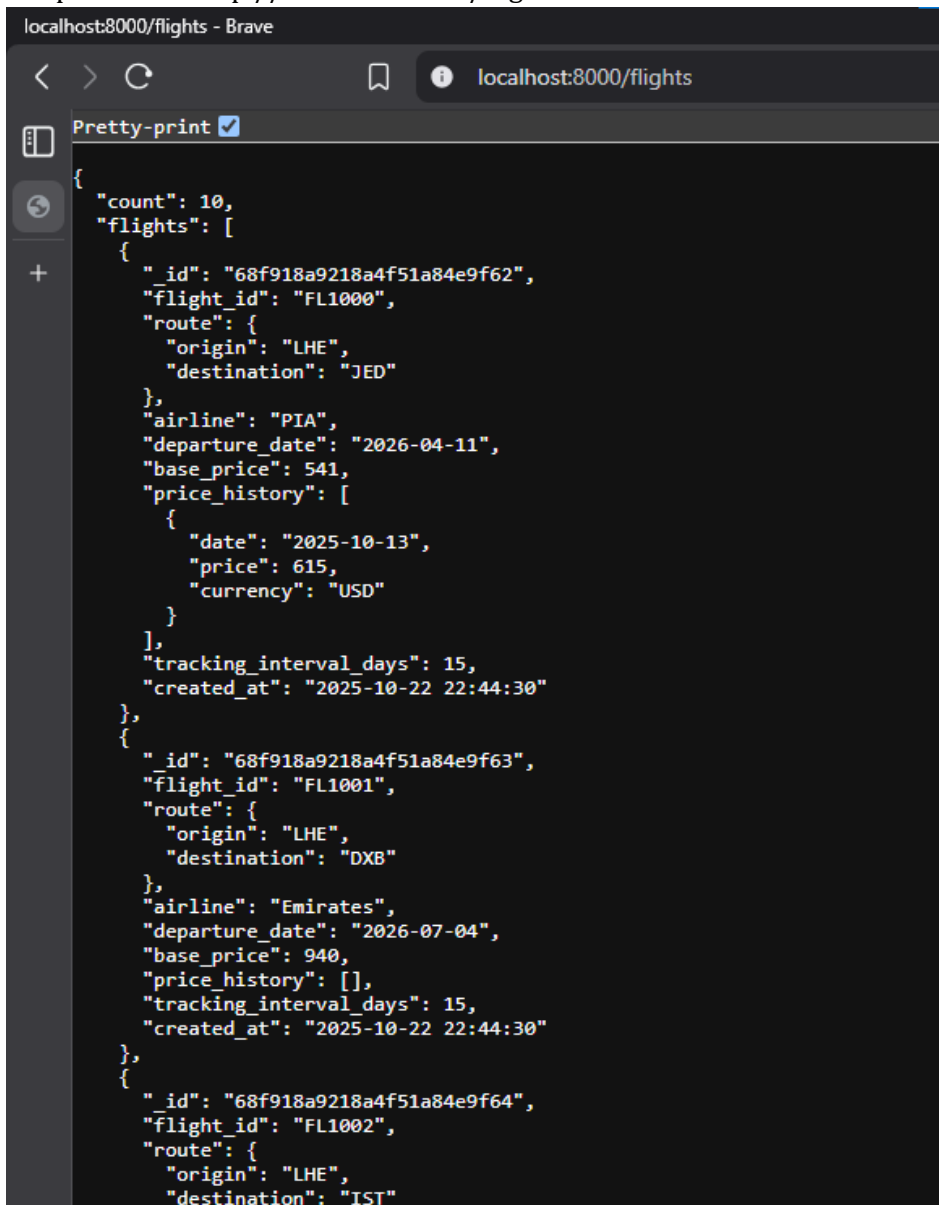


The screenshot shows a web browser window titled "localhost:8000 - Brave". The address bar displays "localhost:8000". The page content is a JSON response from the root endpoint, formatted with "Pretty-print" checked. The JSON object contains a message, a version number, and a list of endpoints.

```
{
  "message": "Flight Price Tracker API",
  "version": "1.0.0",
  "endpoints": {
    "docs": "/docs",
    "get_all_flights": "/flights",
    "get_flight_by_id": "/flights/{flight_id}",
    "get_price_history": "/flights/{flight_id}/prices",
    "search_by_route": "/search/route",
    "search_flights": "/search",
    "hybrid_search": "/search/hybrid"
  }
}
```

## 2 Get All Flights

Endpoint: GET <http://localhost:8000/flights>



```
localhost:8000/flights - Brave
localhost:8000/flights
Pretty-print
{
  "count": 10,
  "flights": [
    {
      "_id": "68f918a9218a4f51a84e9f62",
      "flight_id": "FL1000",
      "route": {
        "origin": "LHE",
        "destination": "JED"
      },
      "airline": "PIA",
      "departure_date": "2026-04-11",
      "base_price": 541,
      "price_history": [
        {
          "date": "2025-10-13",
          "price": 615,
          "currency": "USD"
        }
      ],
      "tracking_interval_days": 15,
      "created_at": "2025-10-22 22:44:30"
    },
    {
      "_id": "68f918a9218a4f51a84e9f63",
      "flight_id": "FL1001",
      "route": {
        "origin": "LHE",
        "destination": "DXB"
      },
      "airline": "Emirates",
      "departure_date": "2026-07-04",
      "base_price": 940,
      "price_history": [],
      "tracking_interval_days": 15,
      "created_at": "2025-10-22 22:44:30"
    },
    {
      "_id": "68f918a9218a4f51a84e9f64",
      "flight_id": "FL1002",
      "route": {
        "origin": "LHE",
        "destination": "IST"
      },
      "airline": "Turkish Airlines",
      "departure_date": "2026-05-15",
      "base_price": 780,
      "price_history": [
        {
          "date": "2025-10-13",
          "price": 850,
          "currency": "USD"
        }
      ],
      "tracking_interval_days": 15,
      "created_at": "2025-10-22 22:44:30"
    }
  ]
}
```

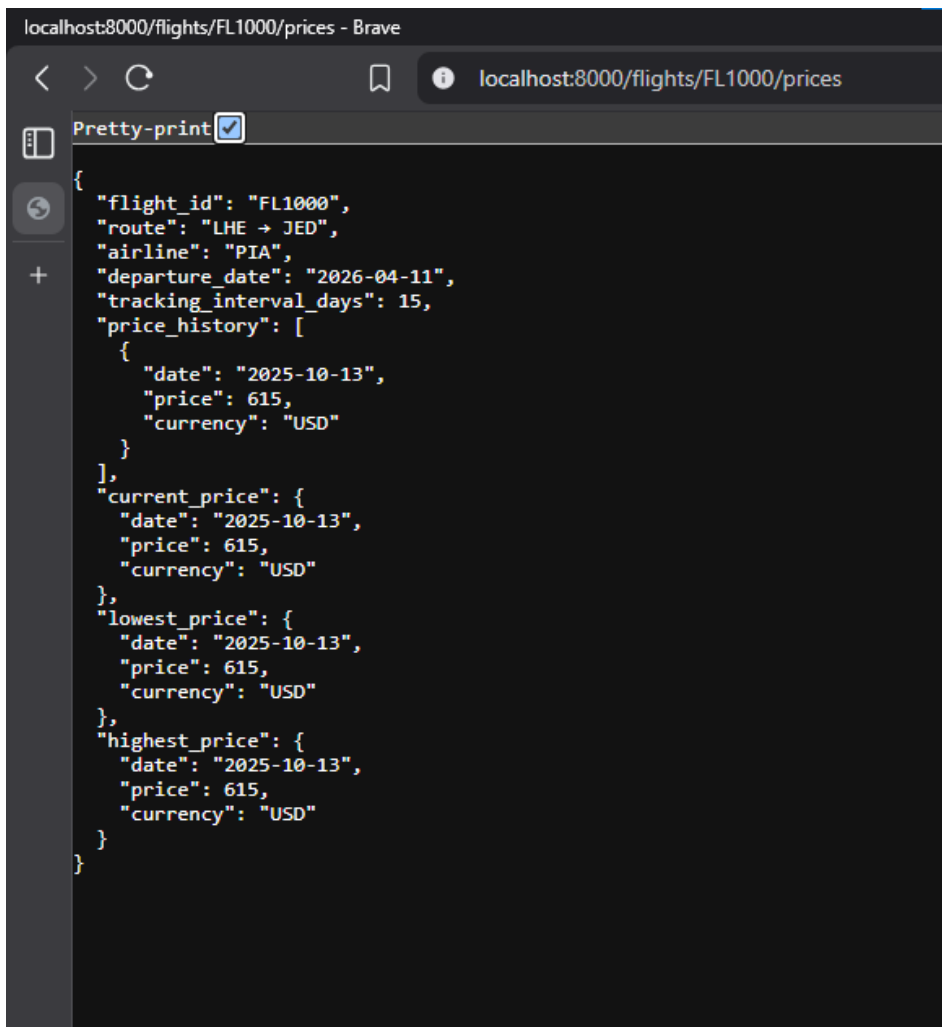
```

"route": {
  "origin": "LHE",
  "destination": "IST"
},
"airline": "Turkish Airlines",
"departure_date": "2026-03-02",
"base_price": 839,
"price_history": [
  {
    "date": "2025-09-03",
    "price": 959,
    "currency": "USD"
  },
  {
    "date": "2025-09-18",
    "price": 800,
    "currency": "USD"
  },
  {
    "date": "2025-10-03",
    "price": 982,
    "currency": "USD"
  },
  {
    "date": "2025-10-18",
    "price": 873,
    "currency": "USD"
  }
],
"tracking_interval_days": 15,
"created_at": "2025-10-22 22:44:30"
},
{
  "_id": "68f918a9218a4f51a84e9f65",
  "flight_id": "FL1003",
  "route": {
    "origin": "KHI",
    "destination": "LHR"
  },
  "airline": "British Airways",
  "departure_date": "2026-02-23",
  "base_price": 1489,
  "price_history": [
    {

```

### 3 Get Flight Price History

Endpoint: GET <http://localhost:8000/flights/FL1000/prices>

A screenshot of a web browser window with the address bar showing 'localhost:8000/flights/FL1000/prices'. The page content is a JSON object displayed in a 'Pretty-print' view. The JSON object contains flight details for flight ID 'FL1000', route 'LHE → JED', airline 'PIA', departure date '2026-04-11', and tracking interval of 15 days. It also includes a price history array with one entry for date '2025-10-13' at price 615 USD, and fields for current, lowest, and highest prices, all with the same date and value.

```
{
  "flight_id": "FL1000",
  "route": "LHE → JED",
  "airline": "PIA",
  "departure_date": "2026-04-11",
  "tracking_interval_days": 15,
  "price_history": [
    {
      "date": "2025-10-13",
      "price": 615,
      "currency": "USD"
    }
  ],
  "current_price": {
    "date": "2025-10-13",
    "price": 615,
    "currency": "USD"
  },
  "lowest_price": {
    "date": "2025-10-13",
    "price": 615,
    "currency": "USD"
  },
  "highest_price": {
    "date": "2025-10-13",
    "price": 615,
    "currency": "USD"
  }
}
```

#### 4 Search by Route

Endpoint: GET <http://localhost:8000/search/route?origin=LHE&destination=JED>

```
{
  "count": 1,
  "query": {
    "route.origin": "LHE",
    "route.destination": "JED"
  },
  "flights": [
    {
      "_id": "68f918a9218a4f51a84e9f62",
      "flight_id": "FL1000",
      "route": {
        "origin": "LHE",
        "destination": "JED"
      },
      "airline": "PIA",
      "departure_date": "2026-04-11",
      "base_price": 541,
      "price_history": [
        {
          "date": "2025-10-13",
          "price": 615,
          "currency": "USD"
        }
      ],
      "tracking_interval_days": 15,
      "created_at": "2025-10-22 22:44:30"
    }
  ]
}
```

## 5 General Search

Endpoint: GET [http://localhost:8000/search?q=Emirates Dubai](http://localhost:8000/search?q=Emirates%20Dubai)

```
localhost:8000/search?q=Emirates Dubai - Brave
localhost:8000/search?q=Emirates%20Dubai
Pretty-print
{
  "query": "Emirates Dubai",
  "method": "hybrid",
  "count": 5,
  "results": [
    {
      "_id": "68f918a9218a4f51a84e9f63",
      "flight_id": "FL1001",
      "route": {
        "origin": "LHE",
        "destination": "DXB"
      },
      "airline": "Emirates",
      "departure_date": "2026-07-04",
      "base_price": 940,
      "price_history": [],
      "tracking_interval_days": 15,
      "created_at": "2025-10-22 22:44:30",
      "score": 1,
      "keyword_score": 1,
      "semantic_score": 0.611,
      "hybrid_score": 0.806
    },
    {
      "_id": "68f918a9218a4f51a84e9f62",
      "flight_id": "FL1000",
      "route": {
        "origin": "LHE",
        "destination": "JED"
      },
      "airline": "PIA",
      "departure_date": "2026-04-11",
      "base_price": 541,
      "price_history": [
        {
          "date": "2025-10-13",
          "price": 615,
          "currency": "USD"
        }
      ],
      "tracking_interval_days": 15,
      "created_at": "2025-10-22 22:44:30",
      "semantic_score": 0.298,
      "keyword_score": 0,
      "hybrid_score": 0.149
    }
  ]
}
```

```
localhost:8000/search?q=Emirates Dubai - Brave
localhost:8000/search?q=Emirates%20Dubai
Pretty-print ☒
},
  "tracking_interval_days": 15,
  "created_at": "2025-10-22 22:44:30",
  "semantic_score": 0.298,
  "keyword_score": 0,
  "hybrid_score": 0.149
},
{
  "id": "68f918a9218a4f51a84e9f64",
  "flight_id": "FL1002",
  "route": {
    "origin": "LHE",
    "destination": "IST"
  },
  "airline": "Turkish Airlines",
  "departure_date": "2026-03-02",
  "base_price": 839,
  "price_history": [
    {
      "date": "2025-09-03",
      "price": 959,
      "currency": "USD"
    },
    {
      "date": "2025-09-18",
      "price": 800,
      "currency": "USD"
    },
    {
      "date": "2025-10-03",
      "price": 982,
      "currency": "USD"
    },
    {
      "date": "2025-10-18",
      "price": 873,
      "currency": "USD"
    }
  ],
  "tracking_interval_days": 15,
  "created_at": "2025-10-22 22:44:30",
  "semantic_score": 0.276,
  "keyword_score": 0,
  "hybrid_score": 0.138
},
]
```

## 6 Hybrid Search

Endpoint: GET <http://localhost:8000/search/hybrid?q=Bangkok&alpha=0.3>



```
localhost:8000/search/hybrid?q=Bangkok&alpha=0.3 - Brave
localhost:8000/search/hybrid?q=Bangkok&alpha=0.3
Pretty-print ☒
{
  "query": "Bangkok",
  "alpha": 0.3,
  "explanation": "Using 30% keyword search and 70% semantic search",
  "count": 5,
  "results": [
    {
      "_id": "68f918a9218a4f51a84e9f66",
      "flight_id": "FL1004",
      "route": {
        "origin": "ISB",
        "destination": "BKK"
      },
      "airline": "Thai Airways",
      "departure_date": "2026-05-07",
      "base_price": 1292,
      "price_history": [],
      "tracking_interval_days": 15,
      "created_at": "2025-10-22 22:44:30",
      "semantic_score": 0.555,
      "keyword_score": 0,
      "hybrid_score": 0.388
    },
    {
      "_id": "68f918a9218a4f51a84e9f68",
      "flight_id": "FL1006",
      "route": {
        "origin": "KHI",
        "destination": "JFK"
      },
      "airline": "Qatar Airways",
      "departure_date": "2026-06-03",
      "base_price": 795,
      "price_history": [],
      "tracking_interval_days": 15,
      "created_at": "2025-10-22 22:44:30",
      "semantic_score": 0.407,
      "keyword_score": 0,
      "hybrid_score": 0.285
    },
    {
      "_id": "68f918a9218a4f51a84e9f6a",
      "flight_id": "FL1008",
      "route": {
        "origin": "LHE"
      }
    }
  ]
}
```

```
localhost:8000/search/hybrid?q=Bangkok&alpha=0.3 - Brave
< > ↻
localhost:8000/search/hybrid?q=Bat
Pretty-print
},
{
  "_id": "68f918a9218a4f51a84e9f6a",
  "flight_id": "FL1008",
  "route": {
    "origin": "LHE",
    "destination": "KUL"
  },
  "airline": "Malaysia Airlines",
  "departure_date": "2026-03-08",
  "base_price": 525,
  "price_history": [
    {
      "date": "2025-09-09",
      "price": 583,
      "currency": "USD"
    },
    {
      "date": "2025-09-24",
      "price": 590,
      "currency": "USD"
    },
    {
      "date": "2025-10-09",
      "price": 565,
      "currency": "USD"
    }
  ],
  "tracking_interval_days": 15,
  "created_at": "2025-10-22 22:44:30",
  "semantic_score": 0.365,
  "keyword_score": 0,
  "hybrid_score": 0.255
},
{
  "_id": "68f918a9218a4f51a84e9f65",
  "flight_id": "FL1003",
  "route": {
    "origin": "KHI",
    "destination": "LHR"
  },
  "airline": "British Airways",
  "departure_date": "2026-02-23",
  "base_price": 1489,
  "price_history": [
```

## Troubleshooting

### MongoDB Connection Error

- Ensure MongoDB is running and accessible at localhost:27017

### Module Not Found

- Reinstall dependencies using `pip install -r requirements.txt`

### Port Already in Use

- Use an alternate port: ``unicorn main:app --port 8001``

### **Author Information**

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