Jimma Institute of Technology

Faculty of Computing and Informatics

Department of Software Engineering

ELECTIVE I: WEB SERVICE GROUP ASSIGNMENT II

December , 2025

Jimma, Ethiopia

1. Introduction

The objective of this assignment was to design and implement a functional web application that demonstrates four major concepts in modern web services as required by the assignment guideline: Web Service Integration, Authentication and Authorization, Data Transformation, and Error Handling and Logging.

To achieve this, our group developed a backend web service using Python Flask that consumes The Movie Database (TMDB) REST API. This external API provides structured movie data such as titles, descriptions, posters, and popularity rankings.

The implemented system successfully integrates these capabilities and provides practical exposure to real-world web service development, especially API consumption, security, data processing, and robustness through proper logging and error handling.

2. Implementation Steps

This section outlines how each part of the assignment was implemented.

2.1 Web Service Integration

Based on the assignment requirement to *consume at least one external REST API*, we integrated the TMDB API.

Implementation details:

- Loaded TMDB API key from a .env file
- Implemented backend functions to fetch:
  - A single movie by ID
  - A list of popular movies
- Exposed two API endpoints:
  - /movie → returns full details for one movie
  - /movies/list → returns IDs and titles of popular movies

This fulfills the requirement to build a REST client that consumes external data.

2.2 Authentication & Authorization

Following the assignment requirement to implement one authentication mechanism, we selected **JWT (JSON Web Token)**.

Features implemented:

- /auth/login – generates a signed JWT token
- A custom jwt_required Python decorator to protect endpoints
- /auth/profile – a protected route accessible only with a valid token
- Server returns 401 Unauthorized for:
    - Missing tokens
    - Invalid tokens
    - Expired tokens

This demonstrates proper secure access to API routes.

2.3 Data Transformation

To fulfill the task of *parsing, processing, and displaying data in a user-friendly format*, we implemented a transformation layer.

The /movies/summary endpoint:

- Retrieves popular movie data from TMDB
- Processes each movie (title, poster, overview)
- Displays the results in a **clean, styled HTML grid layout**
- Includes responsive images and formatted descriptions

This section demonstrates how raw JSON data can be transformed into a readable user interface.

2.4 Error Handling and Logging

Error handling and logging were implemented exactly as required:

- /movie/error-test generates an intentional API error by forcing an invalid movie ID
- Exceptions handled:
    - HTTP errors (e.g., 404 not found)
    - Network or timeout errors
    - Unexpected general exceptions
- All events logged in movie_app.log, including:
    - Successful requests
    - Failed API calls
    - Timestamped error traces

This satisfies the assignment requirement for robust exception handling and request logging.

3. Tools and Technologies Used

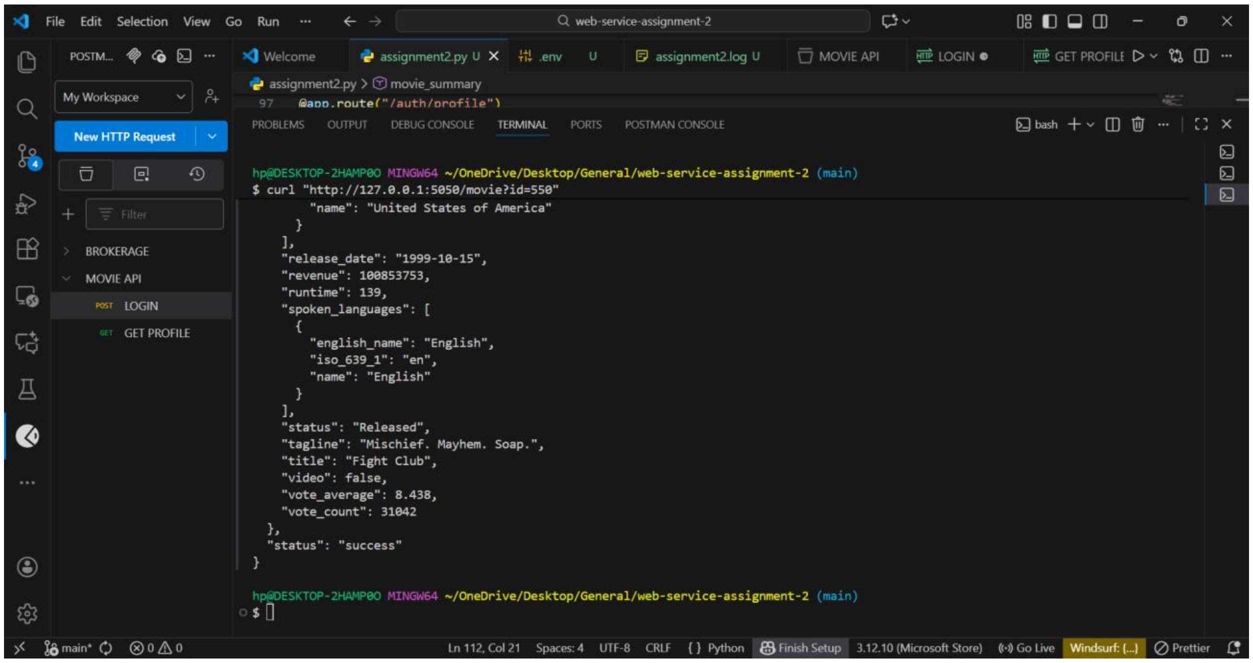
Tool / Technology	Purpose
Python 3	Main programming language
Flask	Web framework for routing and server logic
Requests	Communicating with external REST APIs
TMDB REST API	Real external data source
JWT (PyJWT)	Token-based authentication
python-dotenv	Managing environment variables
Logging module	Handling event and error logs
HTML / CSS	Rendering data transformation output
Postman	Testing API endpoints and verifying request/response behavior

This combination satisfies the required tools for integration, authentication, transformation, and logging.

4. Results and Observations

Screenshots should be included here in your final PDF.

4.1 Web Service Integration Results

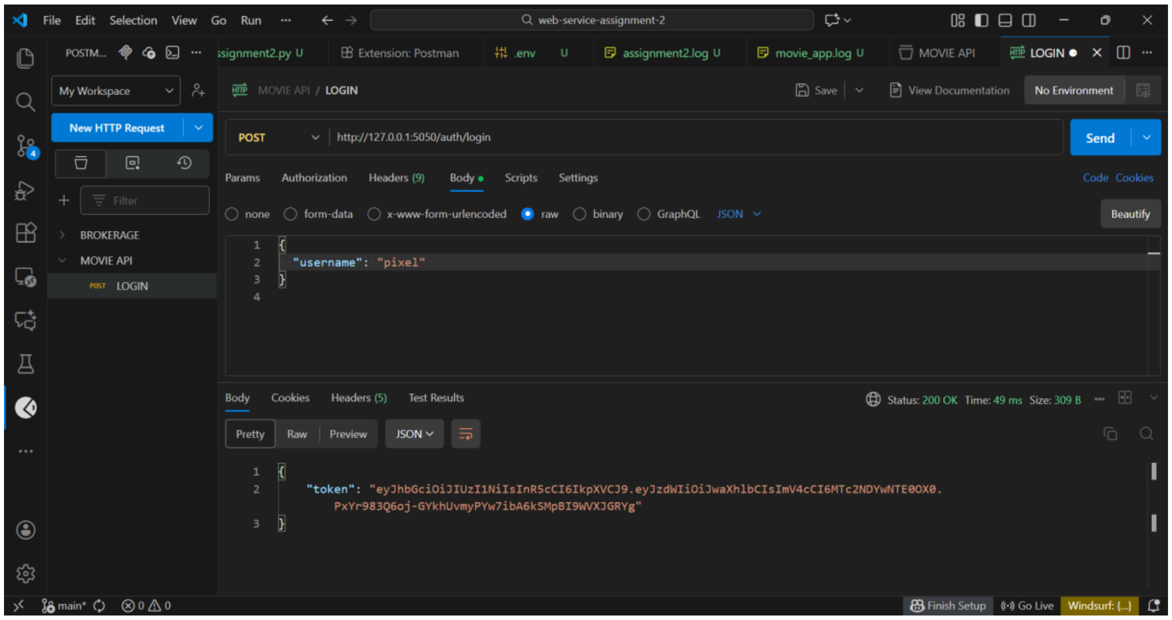


```
hp@DESKTOP-2HAMP0O MINGW64 ~/OneDrive/Desktop/General/web-service-assignment-2 (main)
$ curl "http://127.0.0.1:5050/movie?id=550"
        "name": "United States of America"
      }
    ],
    "release_date": "1999-10-15",
    "revenue": 100853753,
    "runtime": 139,
    "spoken_languages": [
      {
        "english_name": "English",
        "iso_639_1": "en",
        "name": "English"
      }
    ],
    "status": "Released",
    "tagline": "Mischief. Mayhem. Soap.",
    "title": "Fight Club",
    "video": false,
    "vote_average": 8.438,
    "vote_count": 31042
  },
  "status": "success"
}

hp@DESKTOP-2HAMP0O MINGW64 ~/OneDrive/Desktop/General/web-service-assignment-2 (main)
$
```

Figure 1 Successful API response shown for a valid movie ID

4.2 Authentication & Authorization Results



POST http://127.0.0.1:5050/auth/login

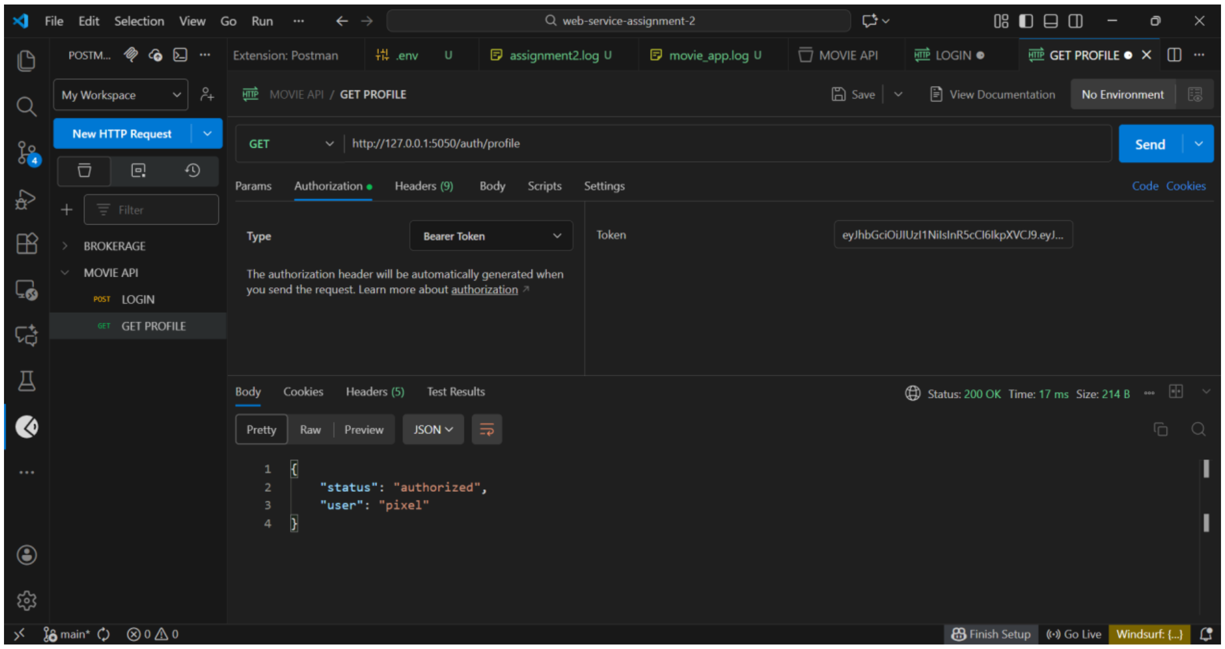
Body (raw, JSON):

```
{
    "username": "pixel"
}
```

Status: 200 OK Time: 49 ms Size: 309 B

```
{
    "token": "eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJzdWIiOiJwaXhlbCIsImV4cCI6MTc2NDYwNTE0OX0.
      PxYr983Q6oj-GYkhUvmyPYw7ibA6kSMpBI9WVXJGRYg"
}
```

Figure 2: Token generation



MOVIE API / GET PROFILE

GET http://127.0.0.1:5050/auth/profile

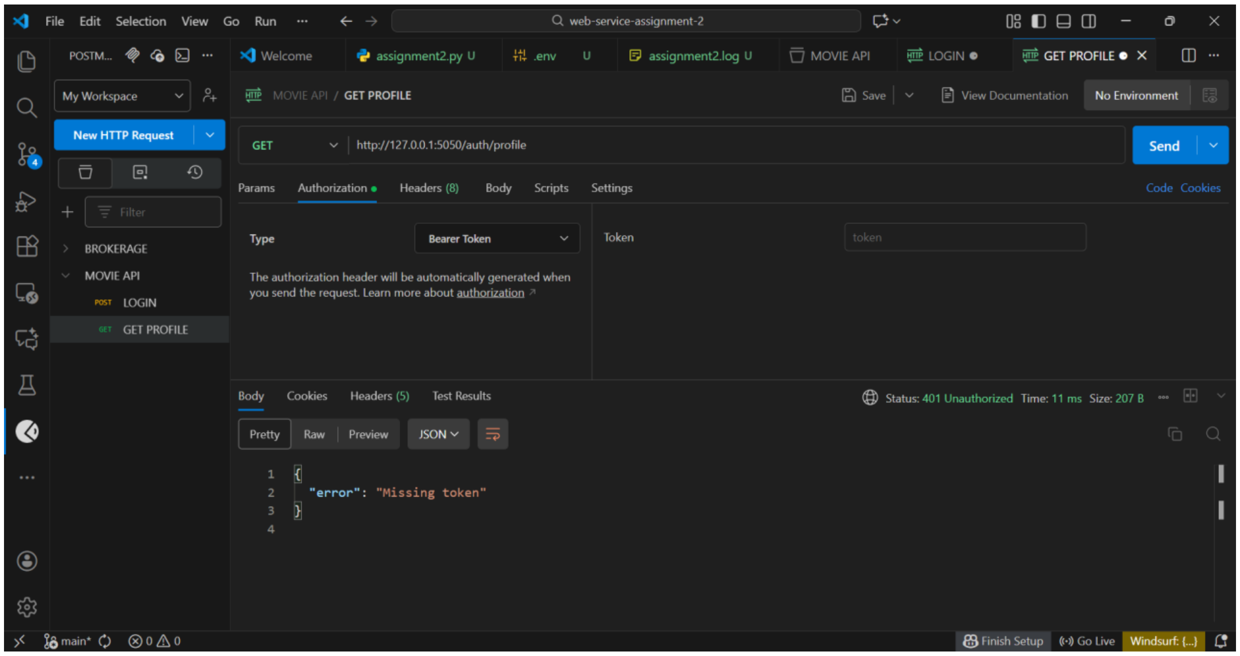
Authorization — Type: Bearer Token — Token: eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJ...

The authorization header will be automatically generated when you send the request. Learn more about authorization

Status: 200 OK Time: 17 ms Size: 214 B

```
{
    "status": "authorized",
    "user": "pixel"
}
```

Figure 3 Authorized access



MOVIE API / GET PROFILE

GET http://127.0.0.1:5050/auth/profile

Authorization — Type: Bearer Token — Token: token

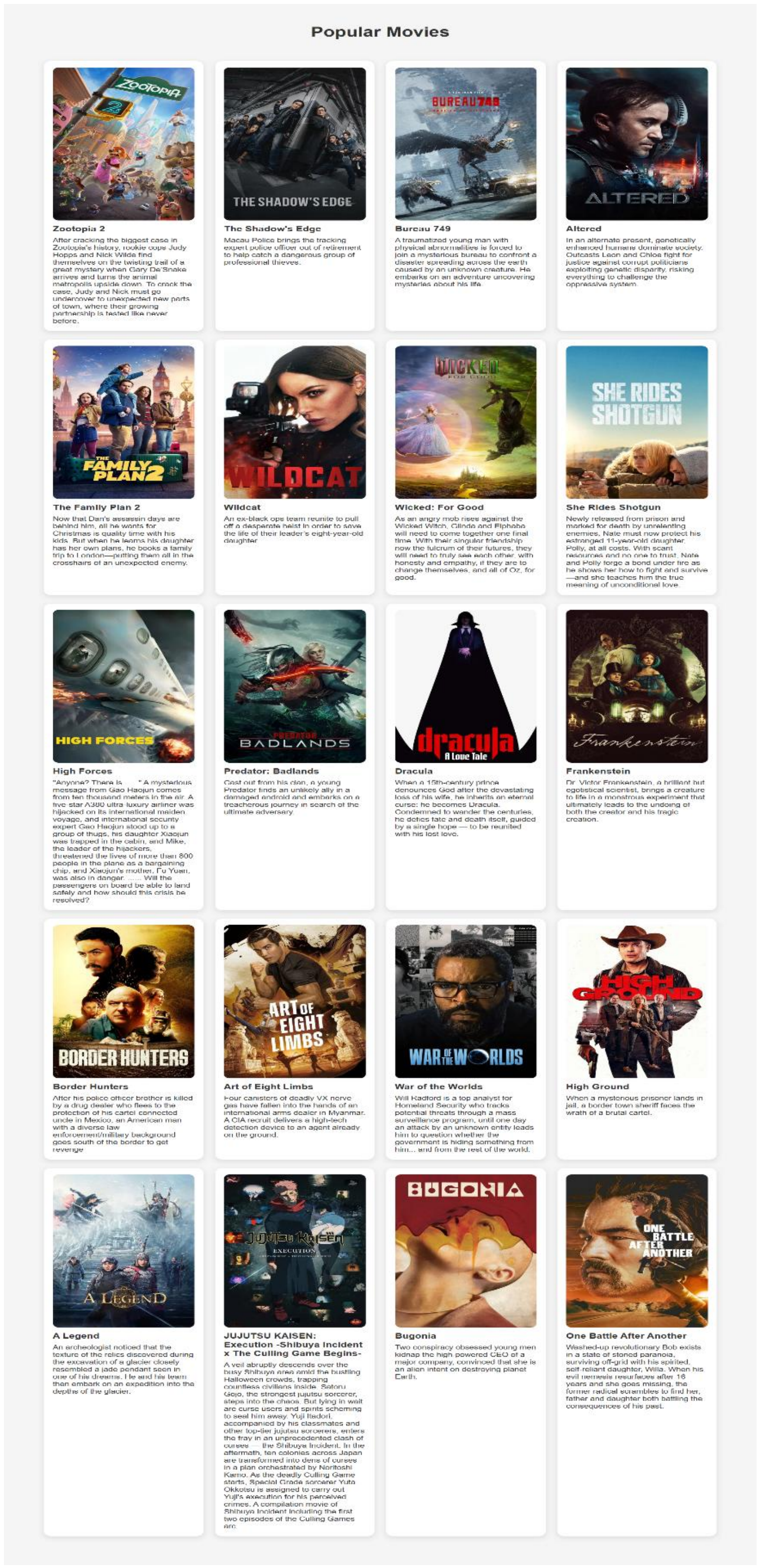
The authorization header will be automatically generated when you send the request. Learn more about authorization

Status: 401 Unauthorized Time: 11 ms Size: 207 B

```
{
    "error": "Missing token"
}
```

Figure 4Unauthorized access

4.3 Data Transformation Results



Popular Movies

Zootopia 2

After cracking the biggest case in Zootopia's history, rookie cops Judy Hopps and Nick Wilde find themselves on the twisting trail of a great mystery when Gary De'Snake arrives and turns the animal metropolis upside down. To crack the case, Judy and Nick must go undercover to unexpected new parts of town, where their growing partnership is tested like never before.

The Shadow's Edge

Macau Police brings the tracking expert police officer out of retirement to help catch a dangerous group of professional thieves.

Bureau 749

A traumatized young man with physical abnormalities is forced to join a mysterious bureau to confront a disaster spreading across the earth caused by an unknown creature. He embarks on an adventure uncovering mysteries about his life.

Altered

In an alternate present, genetically enhanced humans dominate society. Outcasts Leon and Chloe fight for justice against corrupt politicians exploiting genetic disparity, risking everything to challenge the oppressive system.

The Family Plan 2

Now that Dan's assassin days are behind him, all he wants for Christmas is quality time with his kids. But when he learns his daughter has her own plans, he books a family trip to London—putting them all in the crosshairs of an unexpected enemy.

Wildcat

An ex-black ops team reunite to pull off a desperate heist in order to save the life of their leader's eight-year-old daughter

Wicked: For Good

As an angry mob rises against the Wicked Witch, Glinda and Elphaba will need to come together one final time. With their singular friendship now the fulcrum of their futures, they will need to truly see each other, with honesty and empathy, if they are to change themselves, and all of Oz, for good.

She Rides Shotgun

Newly released from prison and marked for death by unrelenting enemies, Nate must now protect his estranged 11-year-old daughter, Polly, at all costs. With scant resources and no one to trust, Nate and Polly forge a bond under fire as he shows her how to fight and survive —and she teaches him the true meaning of unconditional love.

High Forces

"Anyone? There is ......" A mysterious message from Gao Haojun comes from ten thousand meters in the air. A five star A380 ultra-luxury airliner was hijacked on its international maiden voyage, and international security expert Gao Haojun stood up to a group of thugs, his daughter Xiaojun was trapped in the cabin, and Mike, the leader of the hijackers, threatened the lives of more than 800 people in the plane as a bargaining chip, and Xiaojun's mother, Fu Yuan, was also in danger. ...... Will the passengers on board be able to land safely and how should this crisis be resolved?

Predator: Badlands

Cast out from his clan, a young Predator finds an unlikely ally in a damaged android and embarks on a treacherous journey in search of the ultimate adversary.

Dracula

When a 15th-century prince denounces God after the devastating loss of his wife, he inherits an eternal curse: he becomes Dracula. Condemned to wander the centuries, he defies fate and death itself, guided by a single hope — to be reunited with his lost love.

Frankenstein

Dr. Victor Frankenstein, a brilliant but egotistical scientist, brings a creature to life in a monstrous experiment that ultimately leads to the undoing of both the creator and his tragic creation.

Border Hunters

After his police officer brother is killed by a drug dealer who flees to the protection of his cartel connected uncle in Mexico, an American man with a diverse law enforcement/military background goes south of the border to get revenge

Art of Eight Limbs

Four canisters of deadly VX nerve gas have fallen into the hands of an international arms dealer in Myanmar. A CIA recruit delivers a high-tech detection device to an agent already on the ground.

War of the Worlds

Will Radford is a top analyst for Homeland Security who tracks potential threats through a mass surveillance program, until one day an attack by an unknown entity leads him to question whether the government is hiding something from him... and from the rest of the world.

High Ground

When a mysterious prisoner lands in jail, a border town sheriff faces the wrath of a brutal cartel.

A Legend

An archeologist noticed that the texture of the relics discovered during the excavation of a glacier closely resembled a jade pendant seen in one of his dreams. He and his team then embark on an expedition into the depths of the glacier.

JUJUTSU KAISEN: Execution -Shibuya Incident x The Culling Game Begins-

A veil abruptly descends over the busy Shibuya area amid the bustling Halloween crowds, trapping countless civilians inside. Satoru Gojo, the strongest jujutsu sorcerer, steps into the chaos. But lying in wait are curse users and spirits scheming to seal him away. Yuji Itadori, accompanied by his classmates and other top-tier jujutsu sorcerers, enters the fray in an unprecedented clash of curses — the Shibuya Incident. In the aftermath, ten colonies across Japan are transformed into dens of curses in a plan orchestrated by Noritoshi Kamo. As the deadly Culling Game starts, Special Grade sorcerer Yuta Okkotsu is assigned to carry out Yuji's execution for his perceived crimes. A compilation movie of Shibuya Incident including the first two episodes of the Culling Games arc.

Bugonia

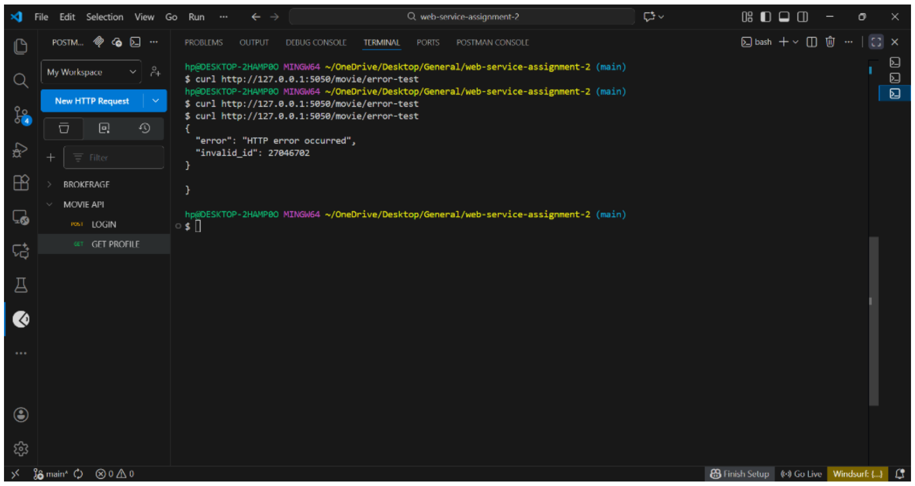
Two conspiracy obsessed young men kidnap the high powered CEO of a major company, convinced that she is an alien intent on destroying planet Earth.

One Battle After Another

Washed-up revolutionary Bob exists in a state of stoned paranoia, surviving off-grid with his spirited, self-reliant daughter, Willa. When his evil nemesis resurfaces after 16 years and she goes missing, the former radical scrambles to find her, father and daughter both battling the consequences of his past.

Figure 5: Titles and overviews presented in card layout

4.4 Error Handling & Logging Results

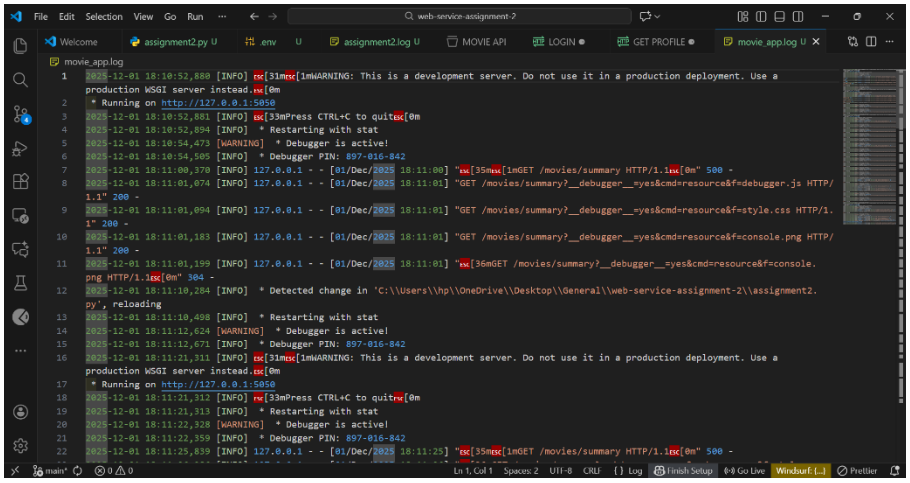


```
hp@DESKTOP-2HAMP0O MINGW64 ~/OneDrive/Desktop/General/web-service-assignment-2 (main)
$ curl http://127.0.0.1:5050/movie/error-test
hp@DESKTOP-2HAMP0O MINGW64 ~/OneDrive/Desktop/General/web-service-assignment-2 (main)
$ curl http://127.0.0.1:5050/movie/error-test
$ curl http://127.0.0.1:5050/movie/error-test
{
  "error": "HTTP error occurred",
  "invalid_id": 27046702
}

}

hp@DESKTOP-2HAMP0O MINGW64 ~/OneDrive/Desktop/General/web-service-assignment-2 (main)
$ 
```

Figure 6: JSON output from invalid ID



```
2025-12-01 18:10:52,880 [INFO] esc[31mesc[1mWARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.esc[0m
 * Running on http://127.0.0.1:5050
2025-12-01 18:10:52,881 [INFO] esc[33mPress CTRL+C to quitesc[0m
2025-12-01 18:10:52,894 [INFO]  * Restarting with stat
2025-12-01 18:10:54,473 [WARNING]  * Debugger is active!
2025-12-01 18:10:54,505 [INFO]  * Debugger PIN: 897-016-842
2025-12-01 18:11:00,370 [INFO] 127.0.0.1 - - [01/Dec/2025 18:11:00] "esc[35mesc[1mGET /movies/summary HTTP/1.1esc[0m" 500 -
2025-12-01 18:11:01,074 [INFO] 127.0.0.1 - - [01/Dec/2025 18:11:01] "GET /movies/summary?__debugger__=yes&cmd=resource&f=debugger.js HTTP/1.1" 200 -
2025-12-01 18:11:01,094 [INFO] 127.0.0.1 - - [01/Dec/2025 18:11:01] "GET /movies/summary?__debugger__=yes&cmd=resource&f=style.css HTTP/1.1" 200 -
2025-12-01 18:11:01,183 [INFO] 127.0.0.1 - - [01/Dec/2025 18:11:01] "GET /movies/summary?__debugger__=yes&cmd=resource&f=console.png HTTP/1.1" 200 -
2025-12-01 18:11:01,199 [INFO] 127.0.0.1 - - [01/Dec/2025 18:11:01] "esc[36mGET /movies/summary?__debugger__=yes&cmd=resource&f=console.png HTTP/1.1esc[0m" 304 -
2025-12-01 18:11:10,284 [INFO]  * Detected change in 'C:\\Users\\hp\\OneDrive\\Desktop\\General\\web-service-assignment-2\\assignment2.py', reloading
2025-12-01 18:11:10,498 [INFO]  * Restarting with stat
2025-12-01 18:11:12,624 [WARNING]  * Debugger is active!
2025-12-01 18:11:12,671 [INFO]  * Debugger PIN: 897-016-842
2025-12-01 18:11:21,311 [INFO] esc[31mesc[1mWARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.esc[0m
 * Running on http://127.0.0.1:5050
2025-12-01 18:11:21,312 [INFO] esc[33mPress CTRL+C to quitesc[0m
2025-12-01 18:11:21,313 [INFO]  * Restarting with stat
2025-12-01 18:11:22,328 [WARNING]  * Debugger is active!
2025-12-01 18:11:22,359 [INFO]  * Debugger PIN: 897-016-842
2025-12-01 18:11:25,839 [INFO] 127.0.0.1 - - [01/Dec/2025 18:11:25] "esc[35mesc[1mGET /movies/summary HTTP/1.1esc[0m" 500 -
```

Figure 7: Error captured in log file

5. Conclusion

This assignment provided practical experience in building secure and reliable web services.

Key lessons include:

- How to consume REST APIs using HTTP requests
- Practical implementation of JWT-based authentication
- Transforming JSON into readable HTML output
- Importance of structured error handling
- The value of logging for debugging and monitoring backend systems

The developed system successfully meets all requirements outlined in the assignment, demonstrating a complete and well-structured web service implementation.