

Half Semester Project CIS613

Abstract

This project presents a comprehensive web application designed to offer users insightful information based on their birth date. It calculates the user's age in years, months, weeks, and days, identifies their generation, and provides interesting numerological insights, such as life path numbers. Additionally, it delves into astrology, offering zodiac signs, horoscopes, and compatibility reports with other zodiac signs. The application seamlessly integrates various disciplines, such as astrology, numerology, and demographic studies, to provide a personalized and engaging user experience.

Introduction

In the age of personalized content, individuals seek more than just generic information; they look for insights that resonate on a personal level. This project taps into this desire by combining numerology and astrology to provide users with unique insights based on their birth date. It bridges the gap between complex astrological and numerological calculations and the end-user by presenting this information in an accessible and engaging web application format.

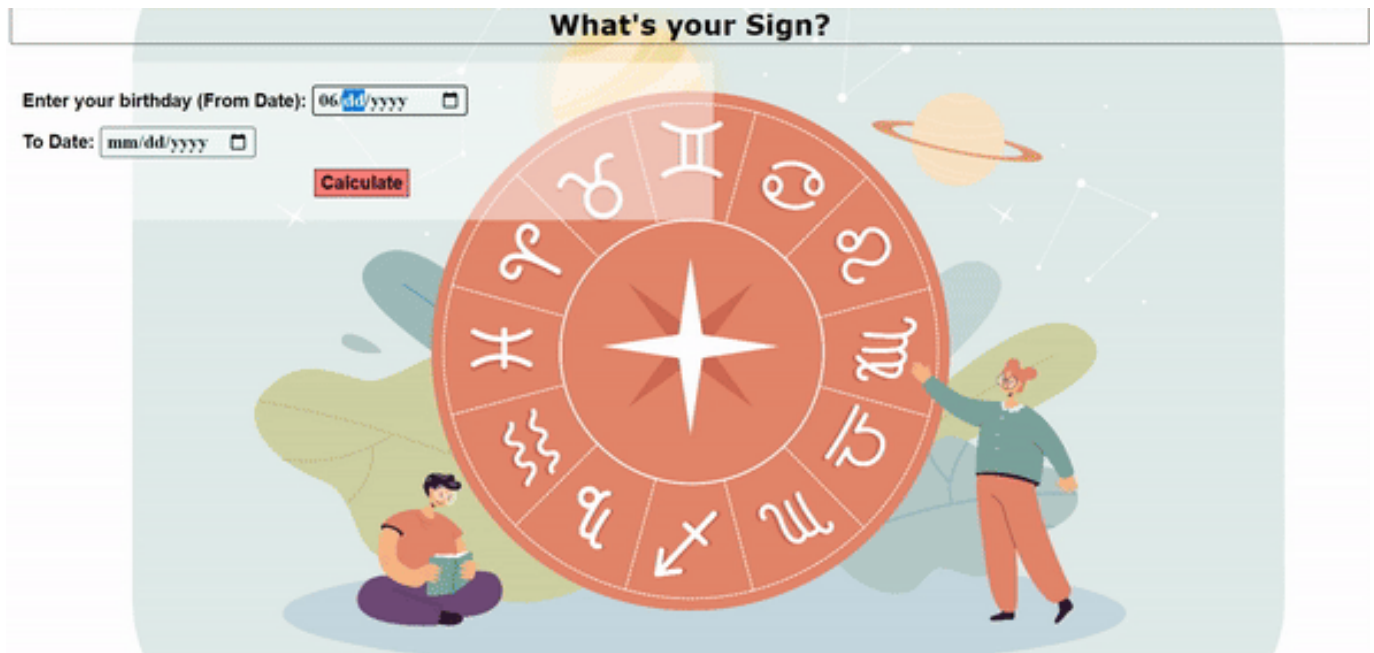


Fig. Demo of the Project

Methodology

How the Project Works

The project consists of a frontend web application and a backend server. The frontend, developed with Vue.js, provides a user-friendly interface where users can input their birth date and a comparison date (usually the current date) to calculate their age. Once the calculation is requested, the frontend sends this data to the backend.

The backend, built with Flask, processes the request by calculating the user's age, determining their zodiac sign, generating a life path number, and fetching their horoscope and zodiac compatibility. It then sends this information back to the frontend, where it is displayed to the user.

Key functionalities include:

- Age Calculation: Computes how old the user is in years, months, weeks, and days.
- Zodiac Sign Identification: Determines the user's zodiac sign based on their birth date.
- Life Path Number Calculation: Calculates the user's life path number, offering insights into their personality and life's journey.
- Horoscope and Zodiac Compatibility: Provides daily horoscopes and compatibility scores with other zodiac signs.

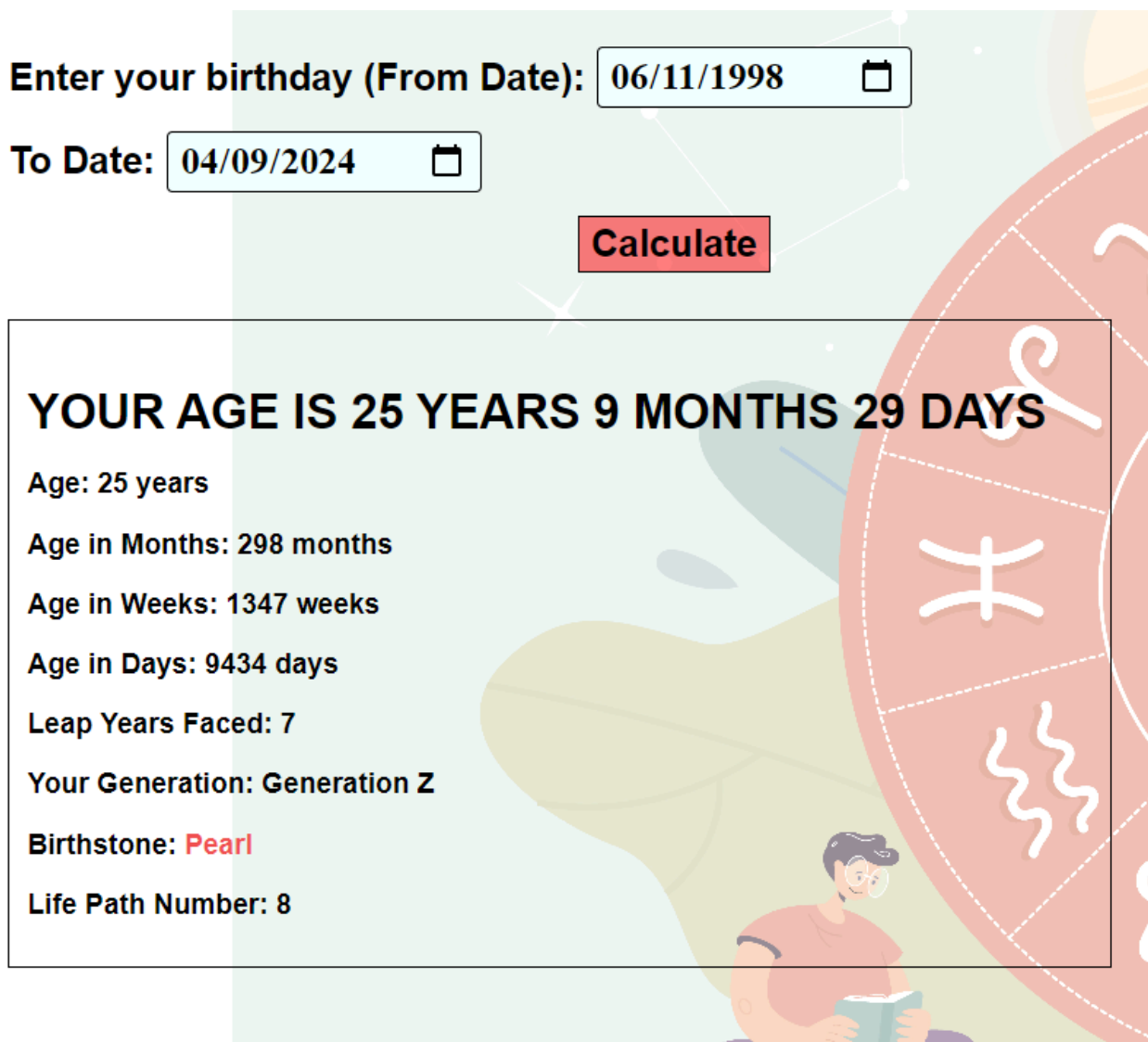
What the Project Does

The project offers a multifaceted approach to understanding oneself through various lenses:

- Astrological Insights: By providing the user's zodiac sign and daily horoscope, the application offers a glimpse into the astrological influences on their day-to-day life and personality.
- Numerological Analysis: The life path number calculation reveals key personality traits and potential life paths, adding another layer of personal insight.
- Demographic Context: The generation identification offers a broader demographic context, connecting the user with broader societal cohorts.
- Compatibility Reports: The zodiac compatibility feature allows users to explore their relationships with others through the astrological compatibility scores, adding a fun and interactive element to the experience.

What are some useful functions, and what do they do?

1. ``calculate_age()`` : The snippet of code is part of a Flask application's backend route that handles the calculation of a user's age based on input dates. When the `'/calculate'` route receives a POST request with JSON data, it retrieves the `'fromDate'` and `'toDate'` values, which represent the user's birthdate and the date to calculate the age until, respectively. The ``datetime.strptime`` function converts these date strings into ``datetime`` objects. The age in years is calculated by subtracting the birth year from the current year and adjusting for whether the current date has surpassed the birth date in the current year. Age in months multiplies the years by 12 and adds the difference between the current and birth months. Age In weeks, divide the total days by 7. The ``count_leap_years`` function calculates the number of leap



Enter your birthday (From Date): 06/11/1998

To Date: 04/09/2024

Calculate

YOUR AGE IS 25 YEARS 9 MONTHS 29 DAYS

Age: 25 years

Age in Months: 298 months

Age in Weeks: 1347 weeks

Age in Days: 9434 days

Leap Years Faced: 7

Your Generation: Generation Z

Birthstone: Pearl

Life Path Number: 8

```

@app.route('/calculate', methods=['POST'])
@cross_origin(origin="localhost:8080")
def calculate_age():
    if not request.is_json:
        print("Request is not JSON!")
        return jsonify({"error": "Missing JSON in request"}), 400

    data = request.get_json()
    print("Received data:", data)
    from_date = datetime.strptime(data['fromDate'], '%Y-%m-%d')
    to_date = datetime.strptime(data['toDate'], '%Y-%m-%d')
    delta = to_date - from_date

    age_years = to_date.year - from_date.year - ((to_date.month, to_date.day) < (from_date.month, from_date.day))
    age_months = age_years * 12 + to_date.month - from_date.month
    age_weeks = delta.days // 7
    age_days = delta.days
    leap_years = count_leap_years(from_date.year, to_date.year)

    zodiac_info = get_zodiac_info(from_date)

    extra_months = to_date.month - from_date.month - (to_date.day < from_date.day)
    extra_days = to_date.day - from_date.day

    if extra_days < 0:
        days_in_prev_month = (to_date - timedelta(days=to_date.day)).day
        extra_days += days_in_prev_month

    if extra_months < 0:
        extra_months += 12

    generation = "Unknown"
    if from_date.year < 1946:
        generation = "The Silent Generation"
    elif from_date.year < 1965:
        generation = "Baby Boomer"
    elif from_date.year < 1981:
        generation = "Generation X"
    elif from_date.year < 1997:
        generation = "Millennials"
    elif from_date.year < 2013:
        generation = "Generation Z"

    birth_month = from_date.month
    birthstone_name, birthstone_url = birthstones[birth_month]

    return jsonify({
        'age': age_years,
        'months': age_months,
        'weeks': age_weeks,
        'days': age_days,
        'leapYears': leap_years,
        'generation': generation,
        'extra_months': extra_months,
        'extra_days': extra_days,
        'birthstone': {
            'name': birthstone_name

```

years experienced by the user, which could be used to further refine the age calculation.

The ``get_zodiac_info`` function presumably determines the zodiac sign based on the birth date and could provide additional astrological information such as a horoscope and birthstone. Additional code calculates 'extra_months' and 'extra_days' for a more precise age and determines the user's generation based on the year of birth. Finally, the function returns a JSON object with all these calculated values, including the user's age in years, months, weeks, and days, the number of leap years faced, generation, birthstone name, and URL for more information about the birthstone. This data is likely to be used in the frontend to display it to the user.

Fig. How the backend calculate the mathematical terms

2. ``get_zodiac_sign(month, day)``: This function determines a user's zodiac sign based on their birth date. It checks the provided month and day against a predefined range of dates corresponding to each zodiac sign.



Fig. Frontend showing Zodiac Sign, Horoscope and Interesting facts with a link to learn more

3. ``get_zodiac_info(birth_date)``: This function acts as an aggregator, gathering various pieces of zodiac-related information. It uses the user's birth date to determine their zodiac sign, life path number, and zodiac compatibility.

- ``calculate_life_path_number(month, day, year)``: Called within ``get_zodiac_info``, this function calculates the life path number based on the numerology of the user's birth date.
- ``get_zodiac_compatibility(zodiac_sign)``: Also called ``get_zodiac_info``, it retrieves compatibility scores or insights based on the user's zodiac sign.

If a zodiac sign is determined, the function fetches the horoscope, facts about the sign, and a URL for more information from predefined dictionaries (``horoscopes`` and ``facts_about_signs``). It then bundles this information into a JSON-like dictionary, including the life path number and compatibility info, which is likely sent back to the frontend for display. If the zodiac sign is unknown (e.g., if the birth date does not match any predefined zodiac date ranges), it defaults to returning a dictionary with values set to "Unknown" or "No horoscope available."

The frontend portion (not shown in the snippet but implied), would display this information appropriately, likely under a section titled "Zodiac Sign" or similar. This functionality enriches the web app by providing personalized zodiac and numerology information based on the user's inputted birth date.

```

def get_zodiac_sign(month, day):
    for zodiac, (start_date, end_date) in zodiac_dates.items():
        if (month == start_date[0] and day >= start_date[1]) or \
            (month == end_date[0] and day <= end_date[1]):
            return zodiac
    return "Unknown"

def get_zodiac_info(birth_date):
    month = birth_date.month
    day = birth_date.day
    year = birth_date.year
    zodiac_sign = get_zodiac_sign(month, day)
    life_path_number = calculate_life_path_number(month, day, year)
    compatibility_info = get_zodiac_compatibility(zodiac_sign)

    if zodiac_sign:
        horoscope = horoscopes.get(zodiac_sign, "No horoscope available.")
        facts = facts_about_signs.get(zodiac_sign, "No facts available.")
        more_info_url = f"https://en.wikipedia.org/wiki/{zodiac\_sign}\_\"\(astrology\)\""

        return {
            'sign': zodiac_sign,
            'horoscope': horoscope,
            'facts': facts,
            'more_info_url': more_info_url,
            'life_path_number': life_path_number,
            'compatibility': compatibility_info
        }
    else:
        return {
            'sign': "Unknown",
            'horoscope': "No horoscope available.",
            'facts': "No facts available.",
            'more_info_url': "https://en.wikipedia.org/wiki/Zodiac"
        }

```

Fig. Backend of determining Zodiac Sign and Zodiac Info

Tests Conducted

Unittest

Conducting unittests, especially for critical functions like `calculate_life_path_number` and `count_leap_years`, is an essential practice in software development that ensures the reliability and accuracy of the application's functionality. In this project, the unittests serve multiple purposes and bring significant benefits, contributing to the overall quality and robustness of the web application.

The core appeal of this project lies in its ability to provide users with insightful and accurate information based on their birth dates. Unittests ensure that the calculations for life path numbers and leap years are performed correctly, guaranteeing the integrity of the insights provided to the user. By systematically testing each function with a variety of inputs, potential errors or edge cases that could lead to incorrect outputs are identified early. This proactive approach helps in preventing user-facing issues that could detract from the user experience. As the project evolves, new features may be added, or existing code may be refactored. Unittests serve as a safety net, ensuring that changes in the codebase do not inadvertently break existing functionality. Writing unittests encourages a modular and decoupled design, as functions need to be testable in isolation. This not only leads to cleaner code but also speeds up the development process by allowing for quick checks on the functionality of individual components.

The tests contribute directly to the reliability of the application by ensuring that key functions perform as expected under various scenarios. This reliability is critical for an application that users rely on for personal insights. The process of writing tests often leads to discovering better ways to structure the code or optimize algorithms, leading to overall improvements in code quality. By ensuring the accuracy of the calculations and predictions, unittests indirectly contribute to user trust and satisfaction. Users are more likely to engage with and recommend the application when they can rely on its outputs. As the project grows, the tests will serve as a foundation for safely integrating new features or making changes. They reduce the risk of introducing bugs that could undermine the user experience.

In conclusion, conducting unittests for the ``calculate_life_path_number`` and ``count_leap_years`` functions has played a pivotal role in enhancing the project's quality, reliability, and user trust. It sets a solid foundation for future development, ensuring that the application can evolve without compromising on the accuracy and integrity of the information it provides.

The screenshot shows the PyCharm IDE interface. The left sidebar displays the project structure for 'HOROSCOPE-BIRTHDAY', with the 'test.py' file selected under the 'Backend' directory. The main editor window shows the code for 'test.py', which defines a 'TestApp' class inheriting from 'unittest.TestCase'. The class contains two test methods: 'test_calculate_life_path_number' and 'test_count_leap_years'. The 'test_calculate_life_path_number' method tests a function 'calculate_life_path_number' with various birth dates and their expected life path numbers. The 'test_count_leap_years' method tests a function 'count_leap_years' with various year ranges and their expected number of leap years. The bottom panel shows the 'TERMINAL' output, indicating that 2 tests were run successfully in 0.000s.

```

5 class TestApp(unittest.TestCase):
7     def test_calculate_life_path_number(self):
8         test_cases = [
9             (datetime(1990, 12, 25), 2), # 1+9+9+0+1+2+2+5 = 29 -> 2+9 = 11 -> 1+1 = 2
10            (datetime(2000, 1, 1), 4), # 2+0+0+0+1+1+1 = 4
11            (datetime(1985, 10, 23), 2), # 1+9+8+5+1+0+2+3 = 29 -> 2+9 = 11 -> 1+1 = 2
12            (datetime(2000, 1, 1), 4),
13            (datetime(1995, 5, 17), 1), # 1+9+9+5+5+1+7 = 37 -> 3+7 = 10 -> 1+0 = 1
14            (datetime(1988, 12, 29), 4), # 1+9+8+8+1+2+2+9 = 40 -> 4+0 = 4
15            (datetime(2002, 2, 2), 8), # 2+0+0+2+2+2 = 8
16            (datetime(1990, 6, 25), 5), # 1+9+9+0+6+2+5 = 32 -> 3+2 = 5
17            (datetime(2021, 3, 7), 6), # 2+0+2+1+3+7 = 15 -> 1+5 = 6
18            (datetime(1964, 7, 12), 3), # 1+9+6+4+7+1+2 = 30 -> 3+0 = 3
19            (datetime(1975, 11, 5), 2), # 1+9+7+5+1+1+5 = 29 -> 2+9 = 11 -> 1+1 = 2
20            (datetime(1942, 8, 23), 2), # 1+9+4+2+8+2+3 = 29 -> 2+9 = 11 -> 1+1 = 2
21            (datetime(1983, 4, 14), 3), # 1+9+8+3+4+1+4 = 30 -> 3+0 = 3
22            (datetime(2007, 9, 18), 9), # 2+0+0+7+9+1+8 = 27 -> 2+7 = 9
23            (datetime(2012, 12, 21), 2), # 2+0+1+2+1+2+2+1 = 11 -> 1+1 = 2
24            (datetime(1980, 3, 5), 8), # 1+9+8+0+3+5 = 26 -> 2+6 = 8
25            (datetime(1945, 5, 29), 8), # 1+9+4+5+5+2+9 = 35 -> 3+5 = 8
26            (datetime(1999, 1, 1), 3), # 1+9+9+9+1+1 = 30 -> 3+0 = 3
27        ]
28        for birth_date, expected in test_cases:
29            self.assertEqual(calculate_life_path_number(birth_date.month, birth_date.day), expected)
30
31    def test_count_leap_years(self):
32        test_cases = [
33            (2000, 2020, 6), # 2000, 2004, 2008, 2012, 2016, 2020
34            (1990, 2000, 3), # 1992, 1996, 2000
35            (1985, 1985, 0), # No leap year
36            (2000, 2020, 6),
37            (1990, 2000, 3),
38            (1985, 1985, 0),
39            (1960, 1969, 3),
40            (1900, 2000, 25),
41            (1800, 1900, 24),
42            (1600, 1700, 25), # 1600 is a leap year
43            (2001, 2021, 5),
44            (2020, 2020, 1), # Only one leap year
45            (2000, 2004, 2), # Two leap years, including a century leap year
46            (1996, 2000, 2),
47            (1988, 1992, 2),
48            (1952, 1960, 3),
49            (1904, 1912, 3),
50            (1888, 1896, 3),
51        ]
52        for year1, year2, expected in test_cases:
53            self.assertEqual(count_leap_years(year1, year2), expected)

```

TERMINAL

```

..
Ran 2 tests in 0.000s

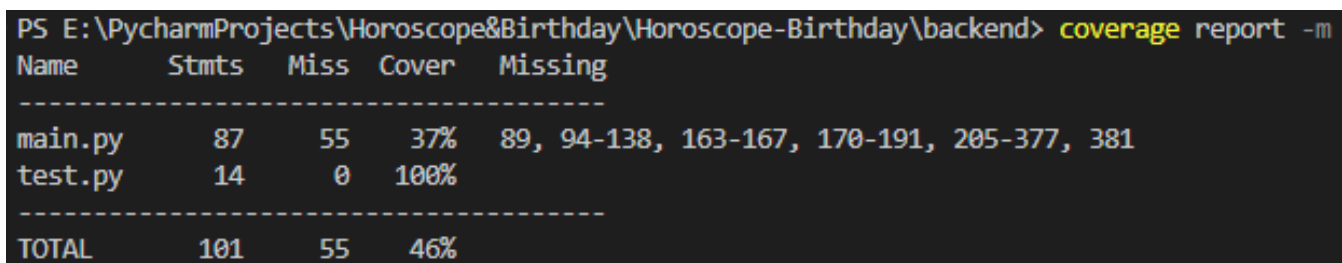
OK
PS E:\PycharmProjects\Horoscope&Birthday\Horoscope-Birthday\backend>

```

Fig. Unittest

Code Coverage

Code coverage reveals untested code areas, guiding test development to improve overall code quality and prevent production bugs. It ensures thorough testing, covering edge cases and failure paths, which reduces the cost and complexity of addressing bugs found later in production. High test coverage equates to stable code, boosting confidence in the application's reliability. As a form of documentation, it highlights tested areas and potential risk zones, helping teams focus their testing efforts effectively. By increasing test coverage, developers can safeguard new features and refactoring, enhance the application's robustness and user experience, and preventing the accrual of technical debt.



```
PS E:\PycharmProjects\Horoscope&Birthday\Horoscope-Birthday\backend> coverage report -m
```

Name	Stmts	Miss	Cover	Missing
main.py	87	55	37%	89, 94-138, 163-167, 170-191, 205-377, 381
test.py	14	0	100%	
TOTAL	101	55	46%	

Fig. Code Coverage Report

The coverage test reveals areas that the current tests do not cover. This could mean that more test cases need to be added to make sure these parts of the code are also checked. By confirming that every functional aspect of the application has been tested and verified to operate as intended, this can potentially result in improved output.

Selenium

Selenium automates browsers for web application testing, simulating user interactions to validate behavior across different browsers and ensuring cross-browser compatibility. This automation extends to repetitive tasks like form submissions, enhancing testing efficiency and accuracy while reducing human error. Integrated into CI/CD pipelines, Selenium supports frequent and reliable releases by identifying regression issues early in development. Its reusable tests facilitate efficient regression testing across application versions, contributing to improved product quality and user experience. This leads to a quicker time to market and lowers maintenance costs by catching bugs early, providing developers and stakeholders with confidence in the stability of new releases.

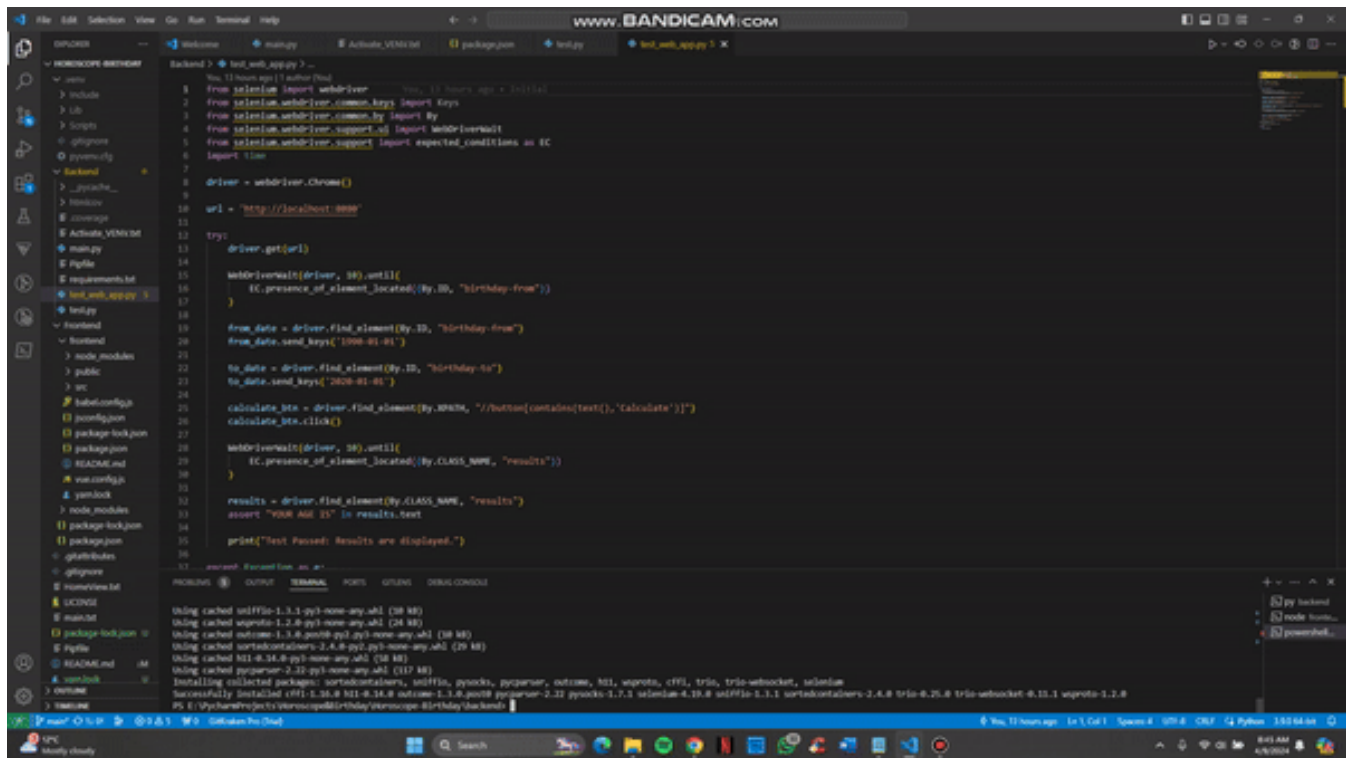


Fig. Selenium

In my project, using Selenium for frontend integration testing likely helped by automating the process of verifying that the application's user interface works seamlessly. It ensured that, from user input to backend processing and data retrieval, all parts of the application worked together as expected. This is especially valuable when the application involves complex user interactions, dynamic content changes, or multiple subsystems that need to be tested in an integrated manner for end-to-end functionality.

Why do these tests seem to be enough?

Unit tests check individual components for correct behavior, ensuring that each part of the backend functions as expected. This is fundamental for verifying my logic at the smallest functional level. Code coverage complements unit tests by identifying which parts of the codebase have been executed during testing, ensuring I haven't missed critical paths, and highlighting areas that might need additional testing. It helps to guarantee that the majority of my code is validated against specified test cases, reducing the likelihood of undetected bugs. Selenium tests verify the integration of these components in the frontend environment. They simulate real-world user interactions and ensure that, when the components work together, they produce the correct user-facing functionality.

Why do some other tests not make sense?

Metamorphic testing is often used when it's difficult to define clear expected outcomes for certain tests or to verify non-functional aspects of the application, like performance under stress. My project doesn't seem to require this level of testing, as the expected behaviors are well-defined and predictable. Mutation testing, which involves making small changes to the code (mutants) and checking if the tests catch these changes, is useful for evaluating the quality of the test cases themselves. It can be quite time-consuming and is often more beneficial in environments where software failure can lead to critical issues. Given the nature of my application, the current testing strategies are likely sufficient to ensure its reliability and correctness without needing the granular level of scrutiny provided by mutation testing. Overall, the testing methodologies I've chosen are apt for the scope and scale of my project, ensuring functionality, reliability, and a good user experience without the overhead of more complex testing strategies that might not yield proportional benefits for my use case.

Conclusion

This project successfully merges astrology, numerology, and demographic insights into a single, cohesive web application. It not only serves as an entertaining tool but also encourages users to explore the deeper aspects of their personalities and relationships. By providing personalized information in an accessible manner, it caters to the growing demand for customized content and self-exploration tools.

References

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