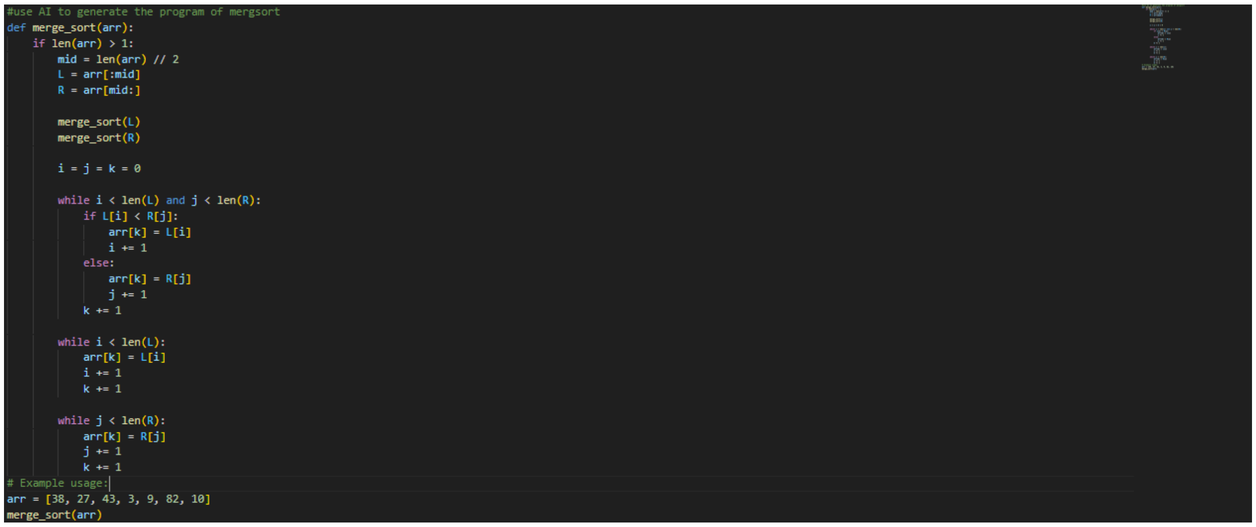
# ASSIGNMENT 12.5

**NAME : RAVITEJA VADLURI =>=>=> 2303A51942 =>=>=> BATCH 12**

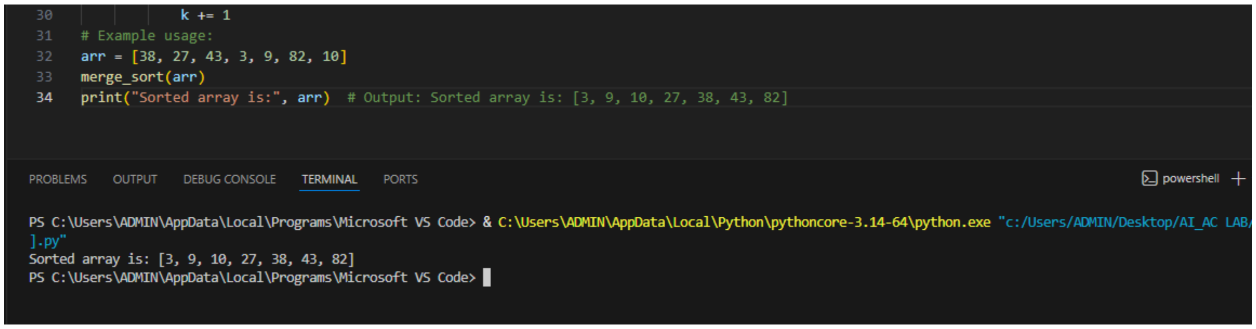
## Task Description #1 (Sorting – Merge Sort Implementation)

• Task: Use AI to generate a Python program that implements the Merge Sort algorithm.



```python
#use AI to generate the program of mergsort
def merge_sort(arr):
    if len(arr) > 1:
        mid = len(arr) // 2
        L = arr[:mid]
        R = arr[mid:]

        merge_sort(L)
        merge_sort(R)

        i = j = k = 0

        while i < len(L) and j < len(R):
            if L[i] < R[j]:
                arr[k] = L[i]
                i += 1
            else:
                arr[k] = R[j]
                j += 1
            k += 1

        while i < len(L):
            arr[k] = L[i]
            i += 1
            k += 1

        while j < len(R):
            arr[k] = R[j]
            j += 1
            k += 1
# Example usage:
arr = [38, 27, 43, 3, 9, 82, 10]
merge_sort(arr)
```

## OUTPUT

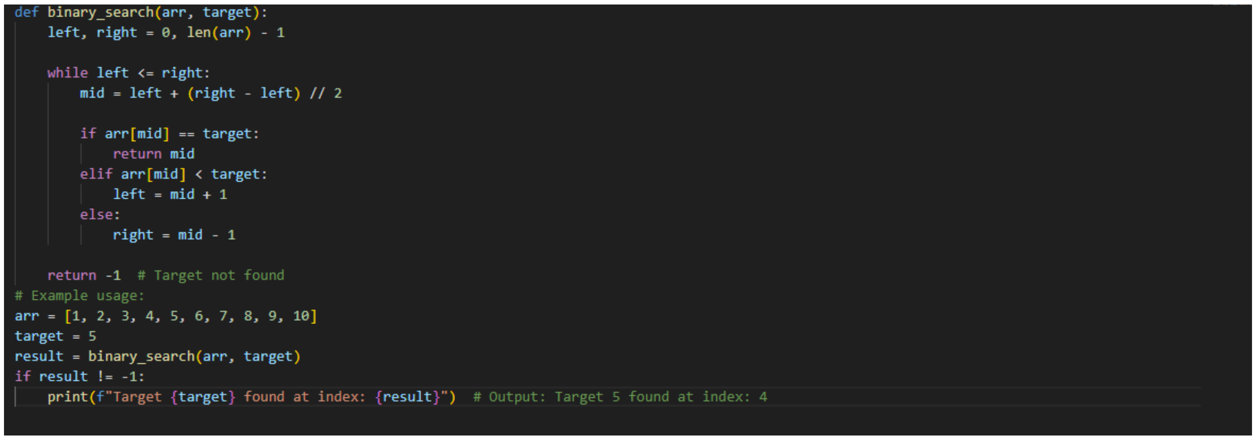


```
            k += 1
# Example usage:
arr = [38, 27, 43, 3, 9, 82, 10]
merge_sort(arr)
print("Sorted array is:", arr)  # Output: Sorted array is: [3, 9, 10, 27, 38, 43, 82]
```

```
PS C:\Users\ADMIN\AppData\Local\Programs\Microsoft VS Code> & C:\Users\ADMIN\AppData\Local\Python\pythoncore-3.14-64\python.exe "c:/Users/ADMIN/Desktop/AI_AC LAB/
].py"
Sorted array is: [3, 9, 10, 27, 38, 43, 82]
PS C:\Users\ADMIN\AppData\Local\Programs\Microsoft VS Code> 
```

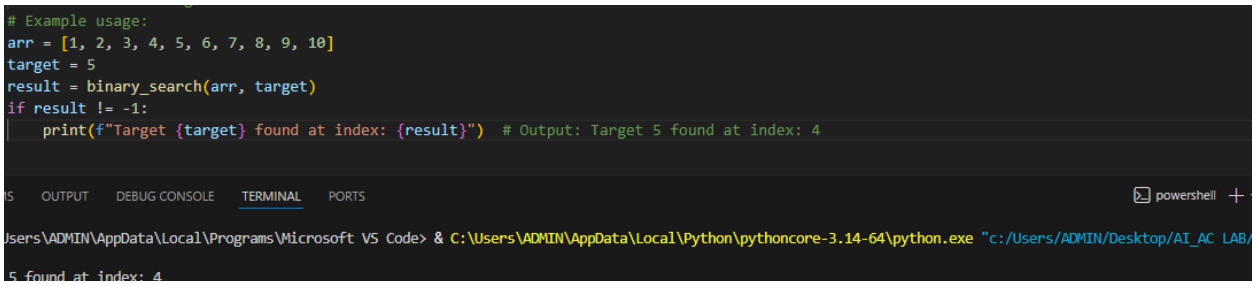
## Task Description #2 (Searching – Binary Search with AI Optimization)

• Task: Use AI to create a binary search function that finds a target element in a sorted list.



```
def binary_search(arr, target):
    left, right = 0, len(arr) - 1

    while left <= right:
        mid = left + (right - left) // 2

        if arr[mid] == target:
            return mid
        elif arr[mid] < target:
            left = mid + 1
        else:
            right = mid - 1

    return -1  # Target not found
# Example usage:
arr = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
target = 5
result = binary_search(arr, target)
if result != -1:
    print(f"Target {target} found at index: {result}")  # Output: Target 5 found at index: 4
```

**OUTPUT**



```
# Example usage:
arr = [1, 2, 3, 4, 5, 6, 7, 8, 9, 10]
target = 5
result = binary_search(arr, target)
if result != -1:
    print(f"Target {target} found at index: {result}")  # Output: Target 5 found at index: 4
```

```
Jsers\ADMIN\AppData\Local\Programs\Microsoft VS Code> & C:\Users\ADMIN\AppData\Local\Python\pythoncore-3.14-64\python.exe "c:/Users/ADMIN/Desktop/AI_AC LAB/
5 found at index: 4
```

**Task Description #3: Smart Healthcare Appointment Scheduling System**

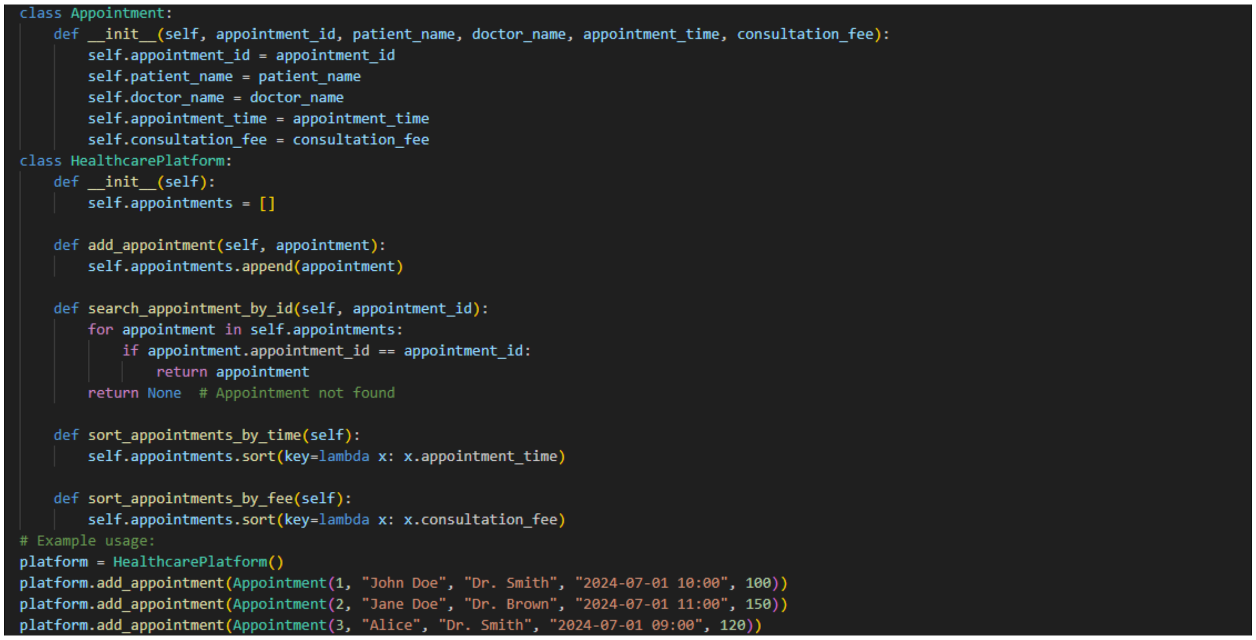
A healthcare platform maintains appointment records containing

appointment ID, patient name, doctor name, appointment time, and

consultation fee. The system needs to:

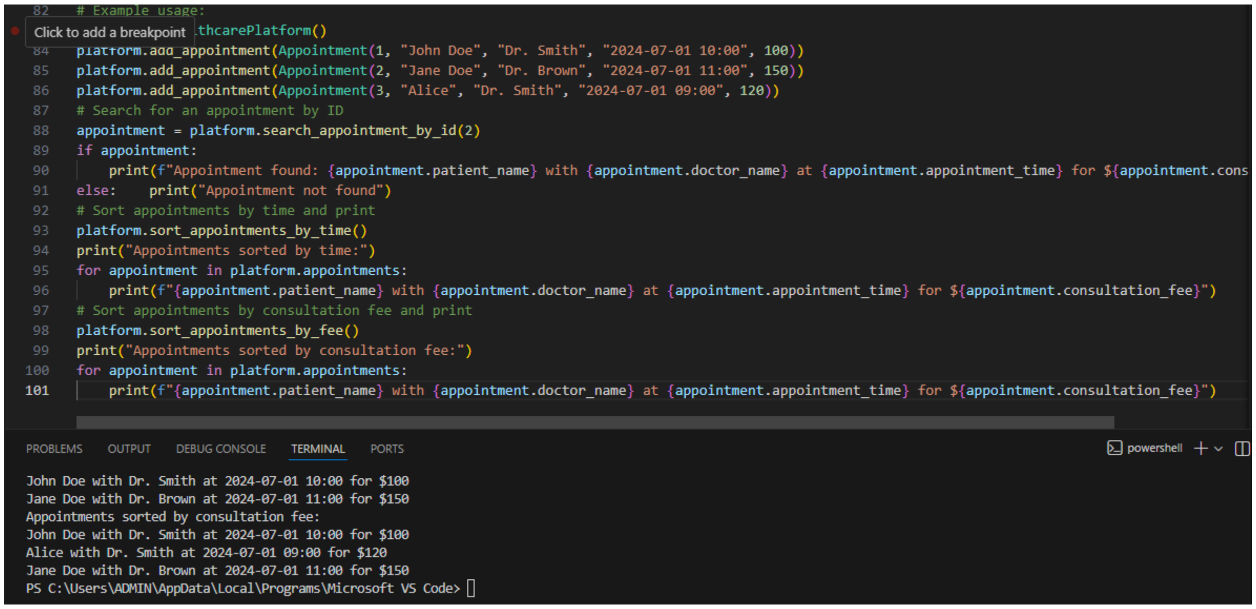
1. Search appointments using appointment ID.

2. Sort appointments based on time or consultation fee.



```
class Appointment:
    def __init__(self, appointment_id, patient_name, doctor_name, appointment_time, consultation_fee):
        self.appointment_id = appointment_id
        self.patient_name = patient_name
        self.doctor_name = doctor_name
        self.appointment_time = appointment_time
        self.consultation_fee = consultation_fee
class HealthcarePlatform:
    def __init__(self):
        self.appointments = []

    def add_appointment(self, appointment):
        self.appointments.append(appointment)

    def search_appointment_by_id(self, appointment_id):
        for appointment in self.appointments:
            if appointment.appointment_id == appointment_id:
                return appointment
        return None  # Appointment not found

    def sort_appointments_by_time(self):
        self.appointments.sort(key=lambda x: x.appointment_time)

    def sort_appointments_by_fee(self):
        self.appointments.sort(key=lambda x: x.consultation_fee)
# Example usage:
platform = HealthcarePlatform()
platform.add_appointment(Appointment(1, "John Doe", "Dr. Smith", "2024-07-01 10:00", 100))
platform.add_appointment(Appointment(2, "Jane Doe", "Dr. Brown", "2024-07-01 11:00", 150))
platform.add_appointment(Appointment(3, "Alice", "Dr. Smith", "2024-07-01 09:00", 120))
```

**OUYPUT**



Click to add a breakpoint

```python
# Example usage:
                 thcarePlatform()
platform.add_appointment(Appointment(1, "John Doe", "Dr. Smith", "2024-07-01 10:00", 100))
platform.add_appointment(Appointment(2, "Jane Doe", "Dr. Brown", "2024-07-01 11:00", 150))
platform.add_appointment(Appointment(3, "Alice", "Dr. Smith", "2024-07-01 09:00", 120))
# Search for an appointment by ID
appointment = platform.search_appointment_by_id(2)
if appointment:
    print(f"Appointment found: {appointment.patient_name} with {appointment.doctor_name} at {appointment.appointment_time} for ${appointment.cons
else:    print("Appointment not found")
# Sort appointments by time and print
platform.sort_appointments_by_time()
print("Appointments sorted by time:")
for appointment in platform.appointments:
    print(f"{appointment.patient_name} with {appointment.doctor_name} at {appointment.appointment_time} for ${appointment.consultation_fee}")
# Sort appointments by consultation fee and print
platform.sort_appointments_by_fee()
print("Appointments sorted by consultation fee:")
for appointment in platform.appointments:
    print(f"{appointment.patient_name} with {appointment.doctor_name} at {appointment.appointment_time} for ${appointment.consultation_fee}")
```

```
John Doe with Dr. Smith at 2024-07-01 10:00 for $100
Jane Doe with Dr. Brown at 2024-07-01 11:00 for $150
Appointments sorted by consultation fee:
John Doe with Dr. Smith at 2024-07-01 10:00 for $100
Alice with Dr. Smith at 2024-07-01 09:00 for $120
Jane Doe with Dr. Brown at 2024-07-01 11:00 for $150
PS C:\Users\ADMIN\AppData\Local\Programs\Microsoft VS Code>
```

**Task Description #4: Railway Ticket Reservation System Scenario**

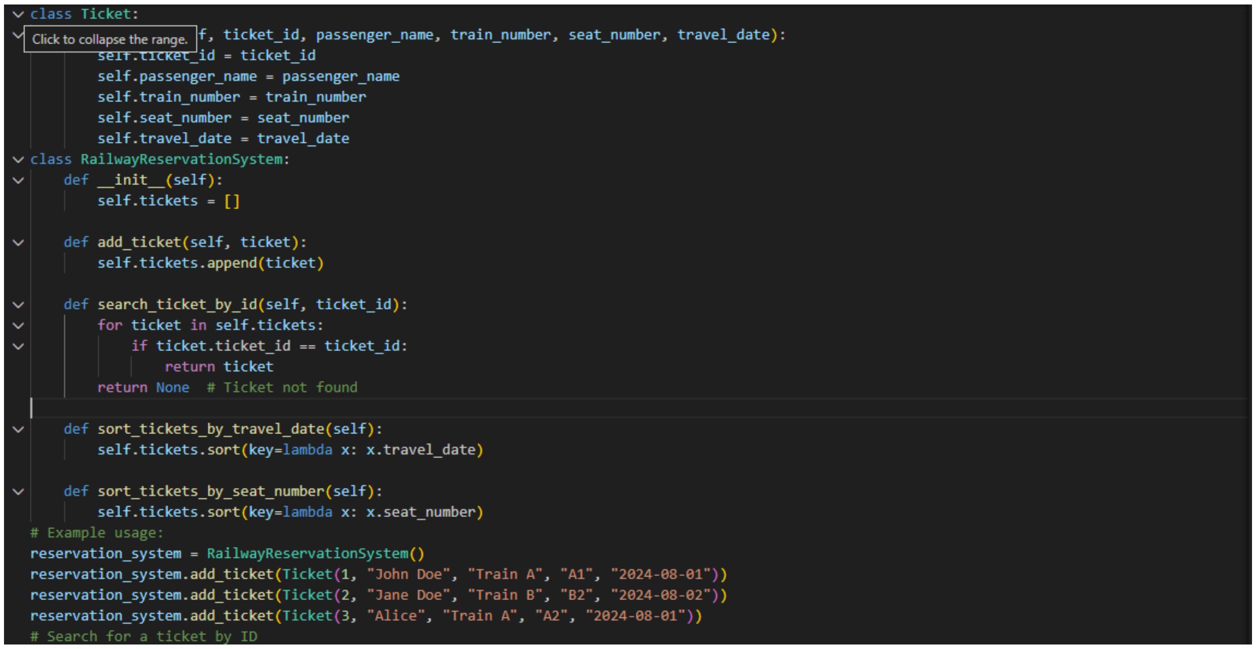
A railway reservation system stores booking details such as ticket

ID, passenger name, train number, seat number, and travel date. The

system must:

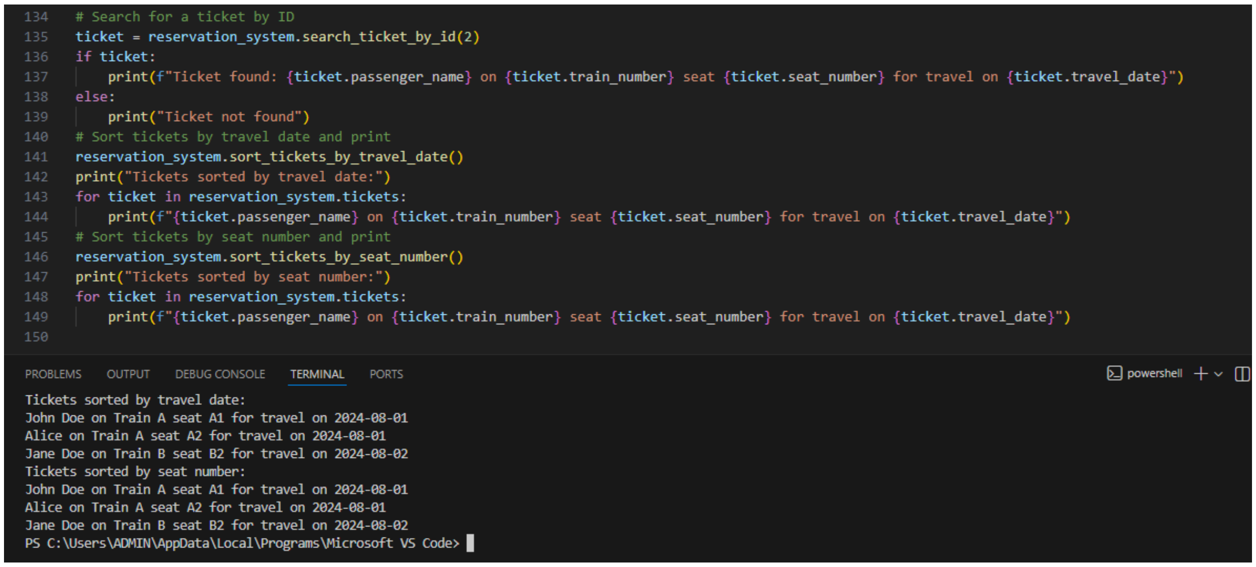
1. Search tickets using ticket ID.

2. Sort bookings based on travel date or seat number



```
class Ticket:
    Click to collapse the range.f, ticket_id, passenger_name, train_number, seat_number, travel_date):
        self.ticket_id = ticket_id
        self.passenger_name = passenger_name
        self.train_number = train_number
        self.seat_number = seat_number
        self.travel_date = travel_date
class RailwayReservationSystem:
    def __init__(self):
        self.tickets = []

    def add_ticket(self, ticket):
        self.tickets.append(ticket)

    def search_ticket_by_id(self, ticket_id):
        for ticket in self.tickets:
            if ticket.ticket_id == ticket_id:
                return ticket
        return None  # Ticket not found

    def sort_tickets_by_travel_date(self):
        self.tickets.sort(key=lambda x: x.travel_date)

    def sort_tickets_by_seat_number(self):
        self.tickets.sort(key=lambda x: x.seat_number)
# Example usage:
reservation_system = RailwayReservationSystem()
reservation_system.add_ticket(Ticket(1, "John Doe", "Train A", "A1", "2024-08-01"))
reservation_system.add_ticket(Ticket(2, "Jane Doe", "Train B", "B2", "2024-08-02"))
reservation_system.add_ticket(Ticket(3, "Alice", "Train A", "A2", "2024-08-01"))
# Search for a ticket by ID
```

**OUTPUT**



```
# Search for a ticket by ID
ticket = reservation_system.search_ticket_by_id(2)
if ticket:
    print(f"Ticket found: {ticket.passenger_name} on {ticket.train_number} seat {ticket.seat_number} for travel on {ticket.travel_date}")
else:
    print("Ticket not found")
# Sort tickets by travel date and print
reservation_system.sort_tickets_by_travel_date()
print("Tickets sorted by travel date:")
for ticket in reservation_system.tickets:
    print(f"{ticket.passenger_name} on {ticket.train_number} seat {ticket.seat_number} for travel on {ticket.travel_date}")
# Sort tickets by seat number and print
reservation_system.sort_tickets_by_seat_number()
print("Tickets sorted by seat number:")
for ticket in reservation_system.tickets:
    print(f"{ticket.passenger_name} on {ticket.train_number} seat {ticket.seat_number} for travel on {ticket.travel_date}")
```

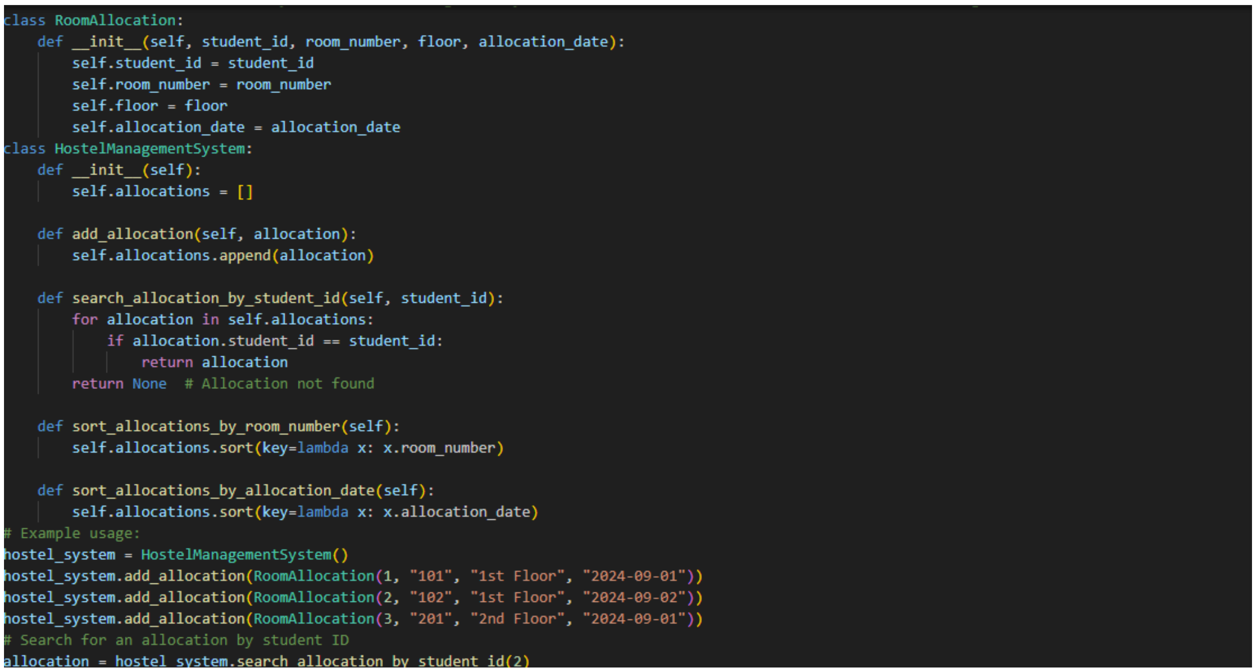
```
Tickets sorted by travel date:
John Doe on Train A seat A1 for travel on 2024-08-01
Alice on Train A seat A2 for travel on 2024-08-01
Jane Doe on Train B seat B2 for travel on 2024-08-02
Tickets sorted by seat number:
John Doe on Train A seat A1 for travel on 2024-08-01
Alice on Train A seat A2 for travel on 2024-08-01
Jane Doe on Train B seat B2 for travel on 2024-08-02
PS C:\Users\ADMIN\AppData\Local\Programs\Microsoft VS Code>
```

## Task Description #5: Smart Hostel Room Allocation System

A hostel management system stores student room allocation details including student ID, room number, floor, and allocation date. The system needs to:

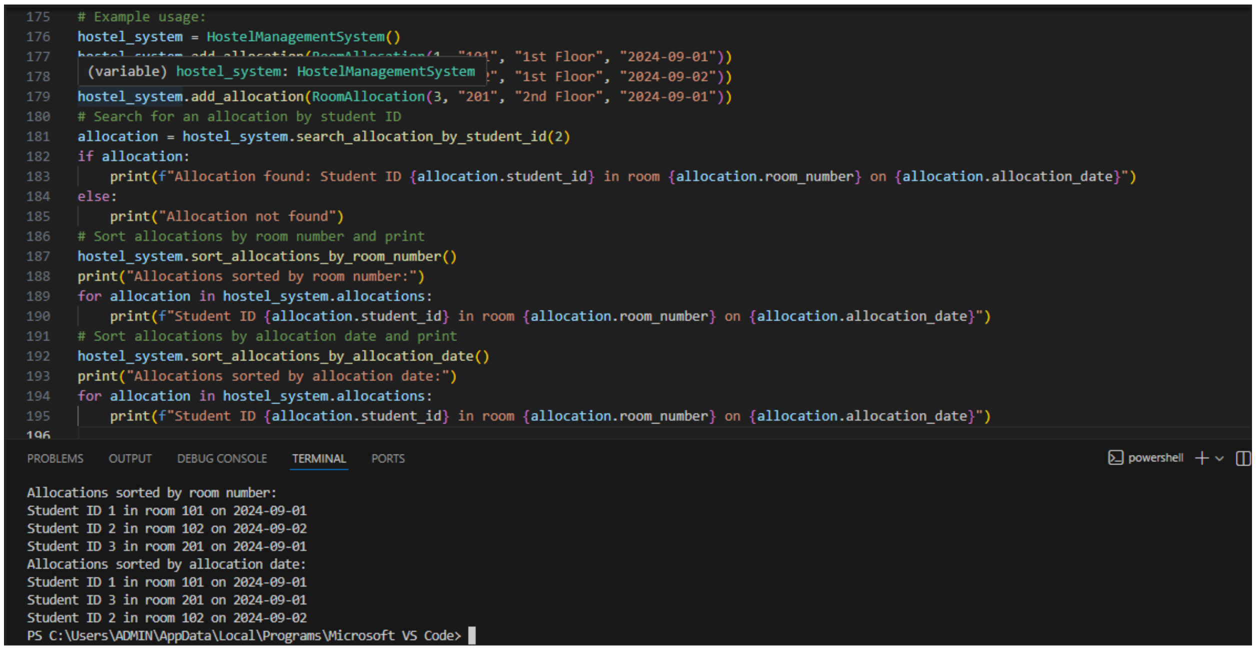
1. Search allocation details using student ID.

2. Sort records based on room number or allocation date.



```python
class RoomAllocation:
    def __init__(self, student_id, room_number, floor, allocation_date):
        self.student_id = student_id
        self.room_number = room_number
        self.floor = floor
        self.allocation_date = allocation_date
class HostelManagementSystem:
    def __init__(self):
        self.allocations = []

    def add_allocation(self, allocation):
        self.allocations.append(allocation)

    def search_allocation_by_student_id(self, student_id):
        for allocation in self.allocations:
            if allocation.student_id == student_id:
                return allocation
        return None  # Allocation not found

    def sort_allocations_by_room_number(self):
        self.allocations.sort(key=lambda x: x.room_number)

    def sort_allocations_by_allocation_date(self):
        self.allocations.sort(key=lambda x: x.allocation_date)
# Example usage:
hostel_system = HostelManagementSystem()
hostel_system.add_allocation(RoomAllocation(1, "101", "1st Floor", "2024-09-01"))
hostel_system.add_allocation(RoomAllocation(2, "102", "1st Floor", "2024-09-02"))
hostel_system.add_allocation(RoomAllocation(3, "201", "2nd Floor", "2024-09-01"))
# Search for an allocation by student ID
allocation = hostel_system.search_allocation_by_student_id(2)
```

## OUTPUT



```python
# Example usage:
hostel_system = HostelManagementSystem()
hostel_system.add_allocation(RoomAllocation(1, "101", "1st Floor", "2024-09-01"))
 (variable) hostel_system: HostelManagementSystem ", "1st Floor", "2024-09-02"))
hostel_system.add_allocation(RoomAllocation(3, "201", "2nd Floor", "2024-09-01"))
# Search for an allocation by student ID
allocation = hostel_system.search_allocation_by_student_id(2)
if allocation:
    print(f"Allocation found: Student ID {allocation.student_id} in room {allocation.room_number} on {allocation.allocation_date}")
else:
    print("Allocation not found")
# Sort allocations by room number and print
hostel_system.sort_allocations_by_room_number()
print("Allocations sorted by room number:")
for allocation in hostel_system.allocations:
    print(f"Student ID {allocation.student_id} in room {allocation.room_number} on {allocation.allocation_date}")
# Sort allocations by allocation date and print
hostel_system.sort_allocations_by_allocation_date()
print("Allocations sorted by allocation date:")
for allocation in hostel_system.allocations:
    print(f"Student ID {allocation.student_id} in room {allocation.room_number} on {allocation.allocation_date}")
```

```
Allocations sorted by room number:
Student ID 1 in room 101 on 2024-09-01
Student ID 2 in room 102 on 2024-09-02
Student ID 3 in room 201 on 2024-09-01
Allocations sorted by allocation date:
Student ID 1 in room 101 on 2024-09-01
Student ID 3 in room 201 on 2024-09-01
Student ID 2 in room 102 on 2024-09-02
PS C:\Users\ADMIN\AppData\Local\Programs\Microsoft VS Code>
```

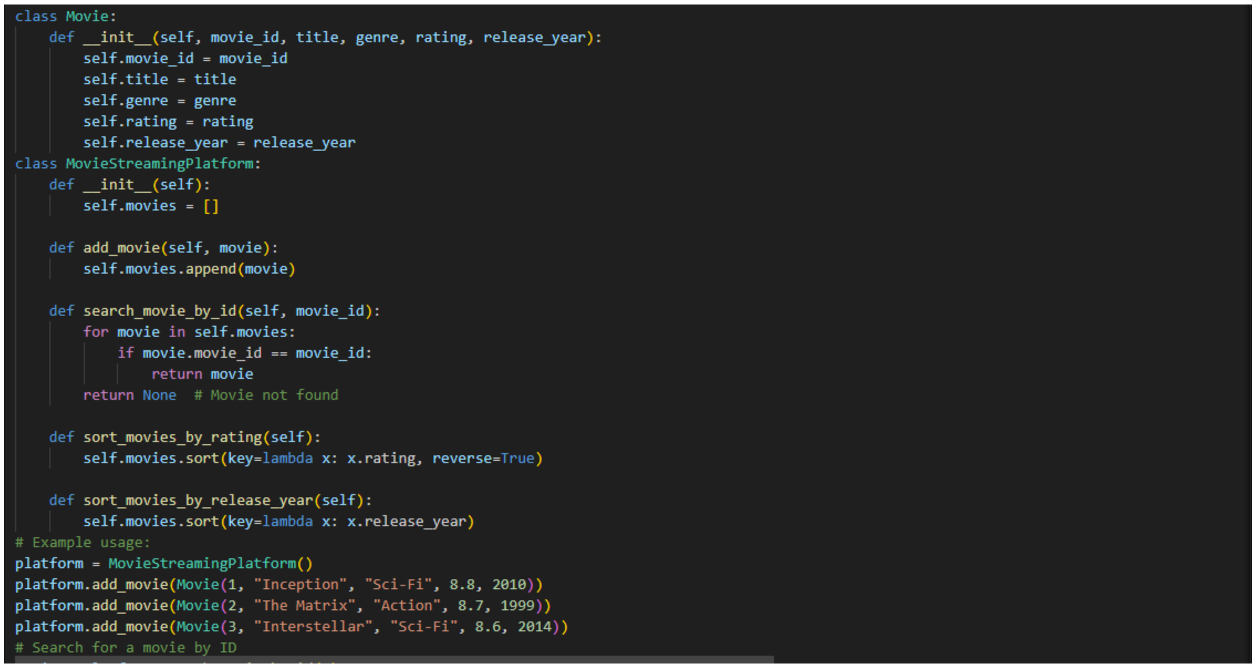
## Online Movie Streaming Platform

A streaming service maintains movie records with movie ID, title,

genre, rating, and release year. The platform needs to:

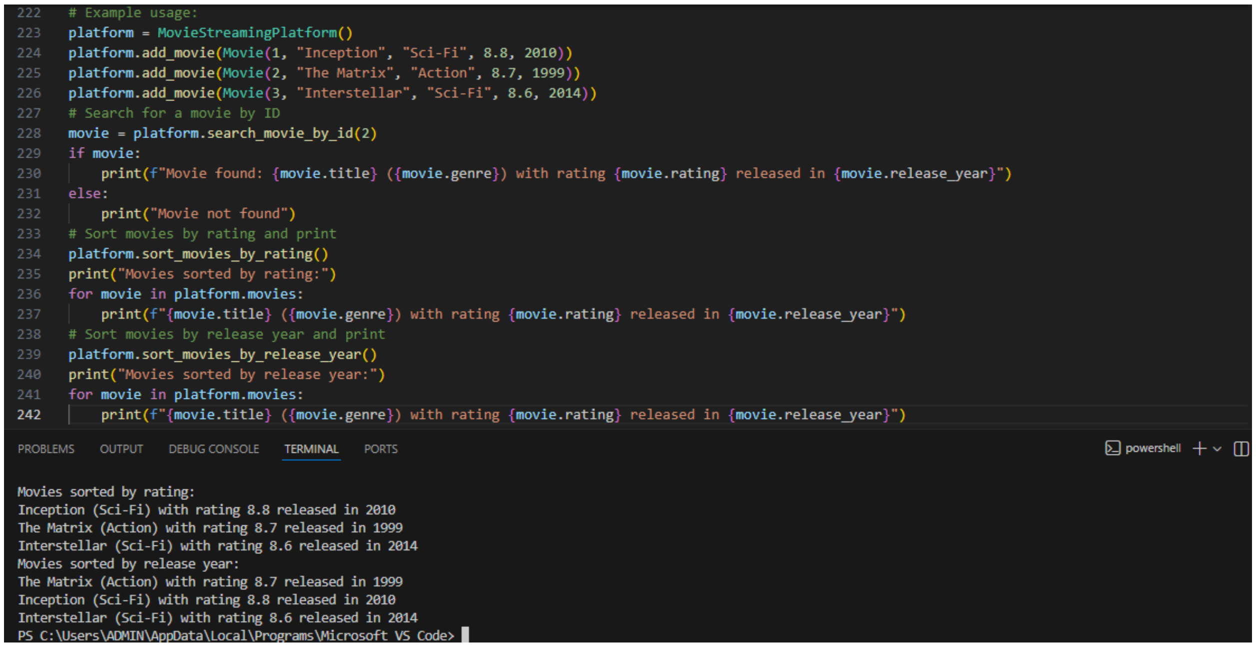
1. Search movies by movie ID.

2. Sort movies based on rating or release year.



```python
class Movie:
    def __init__(self, movie_id, title, genre, rating, release_year):
        self.movie_id = movie_id
        self.title = title
        self.genre = genre
        self.rating = rating
        self.release_year = release_year
class MovieStreamingPlatform:
    def __init__(self):
        self.movies = []

    def add_movie(self, movie):
        self.movies.append(movie)

    def search_movie_by_id(self, movie_id):
        for movie in self.movies:
            if movie.movie_id == movie_id:
                return movie
        return None  # Movie not found

    def sort_movies_by_rating(self):
        self.movies.sort(key=lambda x: x.rating, reverse=True)

    def sort_movies_by_release_year(self):
        self.movies.sort(key=lambda x: x.release_year)
# Example usage:
platform = MovieStreamingPlatform()
platform.add_movie(Movie(1, "Inception", "Sci-Fi", 8.8, 2010))
platform.add_movie(Movie(2, "The Matrix", "Action", 8.7, 1999))
platform.add_movie(Movie(3, "Interstellar", "Sci-Fi", 8.6, 2014))
# Search for a movie by ID
```

## OUTPUT



```python
# Example usage:
platform = MovieStreamingPlatform()
platform.add_movie(Movie(1, "Inception", "Sci-Fi", 8.8, 2010))
platform.add_movie(Movie(2, "The Matrix", "Action", 8.7, 1999))
platform.add_movie(Movie(3, "Interstellar", "Sci-Fi", 8.6, 2014))
# Search for a movie by ID
movie = platform.search_movie_by_id(2)
if movie:
    print(f"Movie found: {movie.title} ({movie.genre}) with rating {movie.rating} released in {movie.release_year}")
else:
    print("Movie not found")
# Sort movies by rating and print
platform.sort_movies_by_rating()
print("Movies sorted by rating:")
for movie in platform.movies:
    print(f"{movie.title} ({movie.genre}) with rating {movie.rating} released in {movie.release_year}")
# Sort movies by release year and print
platform.sort_movies_by_release_year()
print("Movies sorted by release year:")
for movie in platform.movies:
    print(f"{movie.title} ({movie.genre}) with rating {movie.rating} released in {movie.release_year}")
```

```
Movies sorted by rating:
Inception (Sci-Fi) with rating 8.8 released in 2010
The Matrix (Action) with rating 8.7 released in 1999
Interstellar (Sci-Fi) with rating 8.6 released in 2014
Movies sorted by release year:
The Matrix (Action) with rating 8.7 released in 1999
Inception (Sci-Fi) with rating 8.8 released in 2010
Interstellar (Sci-Fi) with rating 8.6 released in 2014
PS C:\Users\ADMIN\AppData\Local\Programs\Microsoft VS Code>
```

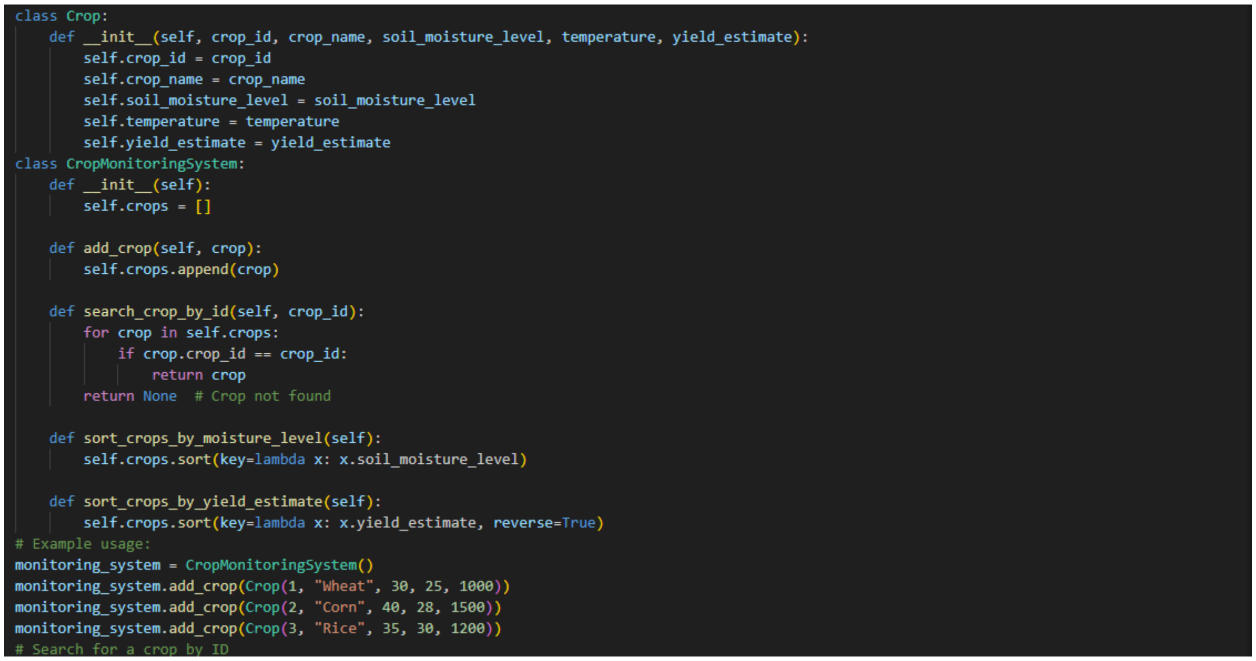
**Task Description #7: Smart Agriculture Crop Monitoring System**

An agriculture monitoring system stores crop data with crop ID, crop

name, soil moisture level, temperature, and yield estimate. Farmers need to:

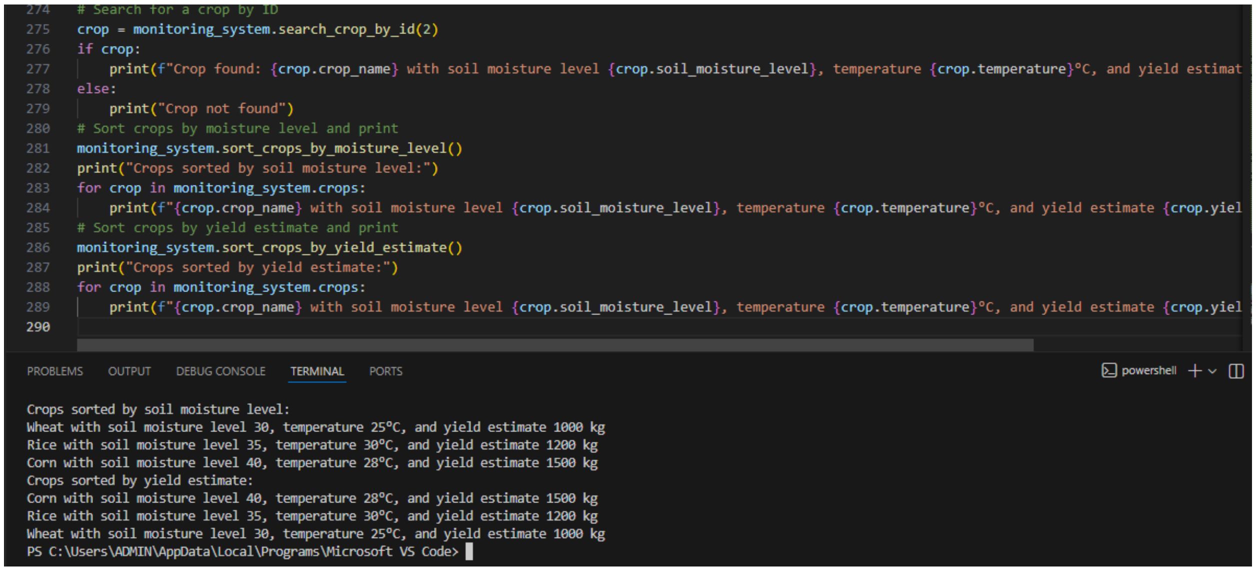
1. Search crop details using crop ID.

2. Sort crops based on moisture level or yield estimate.



```python
class Crop:
    def __init__(self, crop_id, crop_name, soil_moisture_level, temperature, yield_estimate):
        self.crop_id = crop_id
        self.crop_name = crop_name
        self.soil_moisture_level = soil_moisture_level
        self.temperature = temperature
        self.yield_estimate = yield_estimate
class CropMonitoringSystem:
    def __init__(self):
        self.crops = []

    def add_crop(self, crop):
        self.crops.append(crop)

    def search_crop_by_id(self, crop_id):
        for crop in self.crops:
            if crop.crop_id == crop_id:
                return crop
        return None  # Crop not found

    def sort_crops_by_moisture_level(self):
        self.crops.sort(key=lambda x: x.soil_moisture_level)

    def sort_crops_by_yield_estimate(self):
        self.crops.sort(key=lambda x: x.yield_estimate, reverse=True)
# Example usage:
monitoring_system = CropMonitoringSystem()
monitoring_system.add_crop(Crop(1, "Wheat", 30, 25, 1000))
monitoring_system.add_crop(Crop(2, "Corn", 40, 28, 1500))
monitoring_system.add_crop(Crop(3, "Rice", 35, 30, 1200))
# Search for a crop by ID
```

**OUTPUT**



```python
# Search for a crop by ID
crop = monitoring_system.search_crop_by_id(2)
if crop:
    print(f"Crop found: {crop.crop_name} with soil moisture level {crop.soil_moisture_level}, temperature {crop.temperature}°C, and yield estimat
else:
    print("Crop not found")
# Sort crops by moisture level and print
monitoring_system.sort_crops_by_moisture_level()
print("Crops sorted by soil moisture level:")
for crop in monitoring_system.crops:
    print(f"{crop.crop_name} with soil moisture level {crop.soil_moisture_level}, temperature {crop.temperature}°C, and yield estimate {crop.yiel
# Sort crops by yield estimate and print
monitoring_system.sort_crops_by_yield_estimate()
print("Crops sorted by yield estimate:")
for crop in monitoring_system.crops:
    print(f"{crop.crop_name} with soil moisture level {crop.soil_moisture_level}, temperature {crop.temperature}°C, and yield estimate {crop.yiel
```

```
Crops sorted by soil moisture level:
Wheat with soil moisture level 30, temperature 25°C, and yield estimate 1000 kg
Rice with soil moisture level 35, temperature 30°C, and yield estimate 1200 kg
Corn with soil moisture level 40, temperature 28°C, and yield estimate 1500 kg
Crops sorted by yield estimate:
Corn with soil moisture level 40, temperature 28°C, and yield estimate 1500 kg
Rice with soil moisture level 35, temperature 30°C, and yield estimate 1200 kg
Wheat with soil moisture level 30, temperature 25°C, and yield estimate 1000 kg
PS C:\Users\ADMIN\AppData\Local\Programs\Microsoft VS Code>
```

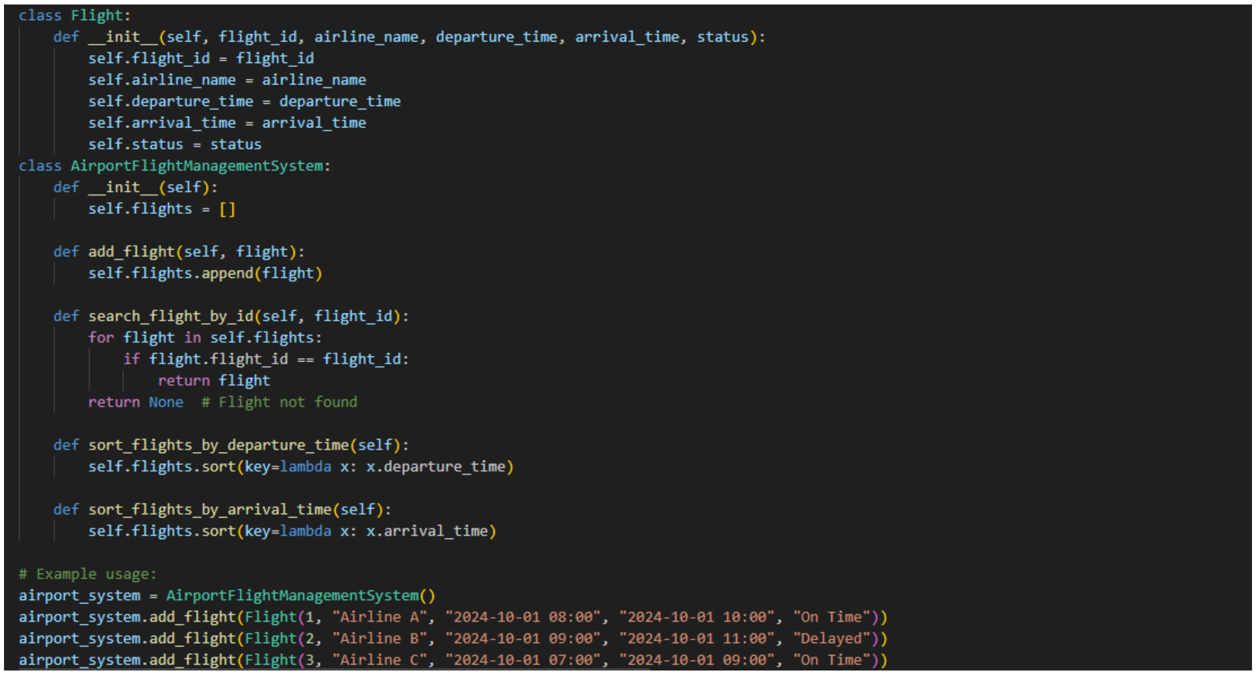
**Task Description #8: Airport Flight Management System**

An airport system stores flight information including flight ID,

airline name, departure time, arrival time, and status. The system must:

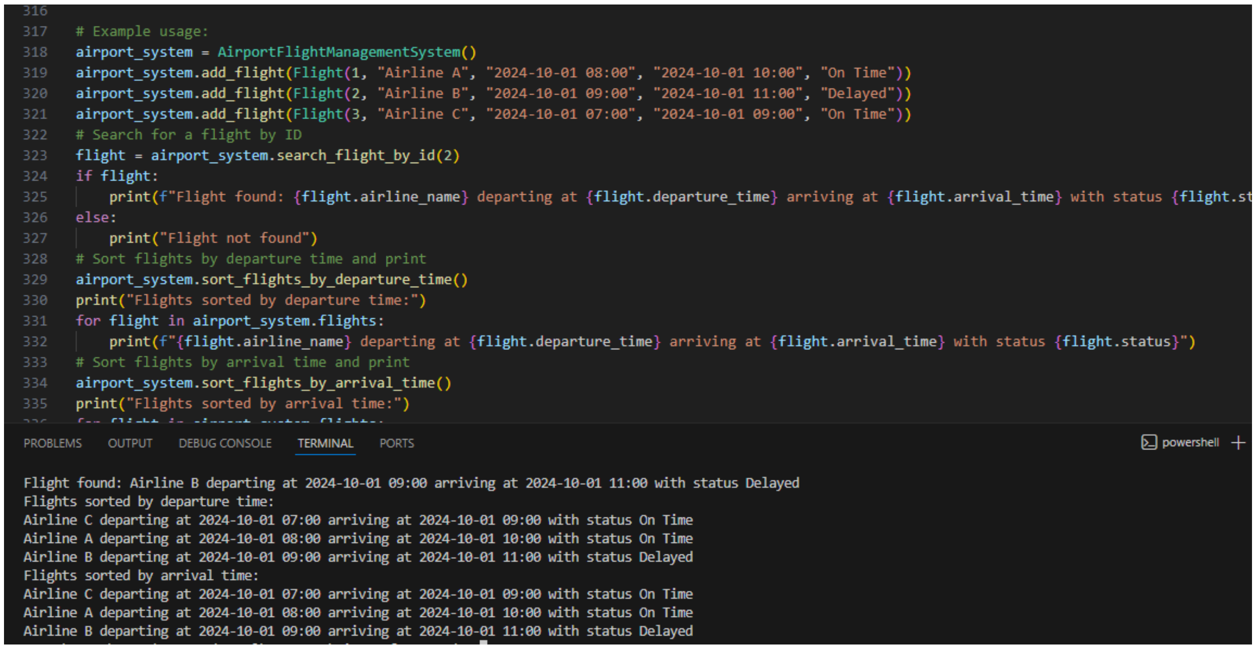
1. Search flight details using flight ID.

2. Sort flights based on departure time or arrival time.



```python
class Flight:
    def __init__(self, flight_id, airline_name, departure_time, arrival_time, status):
        self.flight_id = flight_id
        self.airline_name = airline_name
        self.departure_time = departure_time
        self.arrival_time = arrival_time
        self.status = status
class AirportFlightManagementSystem:
    def __init__(self):
        self.flights = []

    def add_flight(self, flight):
        self.flights.append(flight)

    def search_flight_by_id(self, flight_id):
        for flight in self.flights:
            if flight.flight_id == flight_id:
                return flight
        return None  # Flight not found

    def sort_flights_by_departure_time(self):
        self.flights.sort(key=lambda x: x.departure_time)

    def sort_flights_by_arrival_time(self):
        self.flights.sort(key=lambda x: x.arrival_time)

# Example usage:
airport_system = AirportFlightManagementSystem()
airport_system.add_flight(Flight(1, "Airline A", "2024-10-01 08:00", "2024-10-01 10:00", "On Time"))
airport_system.add_flight(Flight(2, "Airline B", "2024-10-01 09:00", "2024-10-01 11:00", "Delayed"))
airport_system.add_flight(Flight(3, "Airline C", "2024-10-01 07:00", "2024-10-01 09:00", "On Time"))
```

## OUTPUT



```python
# Example usage:
airport_system = AirportFlightManagementSystem()
airport_system.add_flight(Flight(1, "Airline A", "2024-10-01 08:00", "2024-10-01 10:00", "On Time"))
airport_system.add_flight(Flight(2, "Airline B", "2024-10-01 09:00", "2024-10-01 11:00", "Delayed"))
airport_system.add_flight(Flight(3, "Airline C", "2024-10-01 07:00", "2024-10-01 09:00", "On Time"))
# Search for a flight by ID
flight = airport_system.search_flight_by_id(2)
if flight:
    print(f"Flight found: {flight.airline_name} departing at {flight.departure_time} arriving at {flight.arrival_time} with status {flight.st
else:
    print("Flight not found")
# Sort flights by departure time and print
airport_system.sort_flights_by_departure_time()
print("Flights sorted by departure time:")
for flight in airport_system.flights:
    print(f"{flight.airline_name} departing at {flight.departure_time} arriving at {flight.arrival_time} with status {flight.status}")
# Sort flights by arrival time and print
airport_system.sort_flights_by_arrival_time()
print("Flights sorted by arrival time:")
```

```
Flight found: Airline B departing at 2024-10-01 09:00 arriving at 2024-10-01 11:00 with status Delayed
Flights sorted by departure time:
Airline C departing at 2024-10-01 07:00 arriving at 2024-10-01 09:00 with status On Time
Airline A departing at 2024-10-01 08:00 arriving at 2024-10-01 10:00 with status On Time
Airline B departing at 2024-10-01 09:00 arriving at 2024-10-01 11:00 with status Delayed
Flights sorted by arrival time:
Airline C departing at 2024-10-01 07:00 arriving at 2024-10-01 09:00 with status On Time
Airline A departing at 2024-10-01 08:00 arriving at 2024-10-01 10:00 with status On Time
Airline B departing at 2024-10-01 09:00 arriving at 2024-10-01 11:00 with status Delayed
```