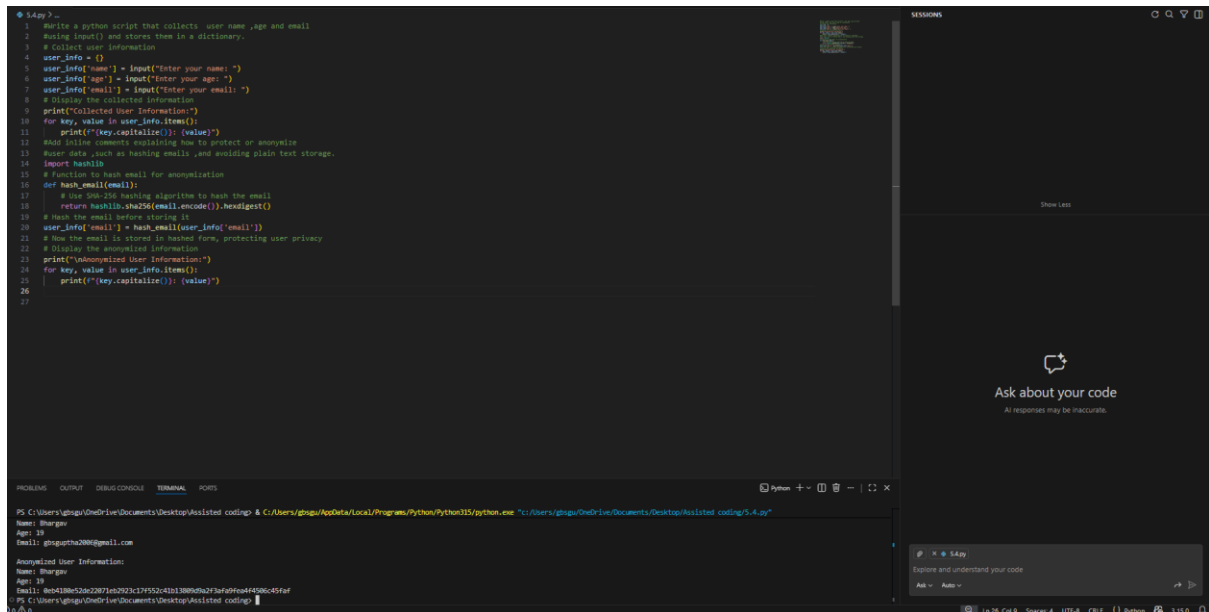


Assignment-5.4

Task Description #1:

- Prompt GitHub Copilot to generate a Python script that collects user data (e.g., name, age, email). Then, ask Copilot to add comments on how to anonymize or protect this data.



```
1 # Write a python script that collects user name ,age and email
2 # Using input() and stores them in a dictionary.
3 # Collect user information
4 user_info = {}
5 user_info['name'] = input("Enter your name: ")
6 user_info['age'] = input("Enter your age: ")
7 user_info['email'] = input("Enter your email: ")
8 # Display the collected information
9 print("Collected User Information:")
10 for key, value in user_info.items():
11     print(f"{key.capitalize()}: {value}")
12
13 # Add inline comments explaining how to protect or anonymize
14 # user data ,such as hashing emails ,and avoiding plain text storage.
15 import hashlib
16
17 # Function to hash email for anonymization
18 def hash_email(email):
19     # Use SHA-256 hashing algorithm to hash the email
20     return hashlib.sha256(email.encode()).hexdigest()
21
22 # Hash the email before storing it
23 user_info['email'] = hash_email(user_info['email'])
24 # Now the email is stored in hashed form, protecting user privacy
25 # Display the anonymized information
26 print("Anonymized User Information:")
27 for key, value in user_info.items():
28     print(f"{key.capitalize()}: {value}")
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```

VS Code interface showing the Python script and the GitHub Copilot chat window. The chat window contains the prompt: "Ask about your code" and the response: "AI responses may be inaccurate."

GitHub copilot was prompted to generate a python script that collects basic user information such as name ,age and email .

A follow -up prompt was used to add inline comments explaining data protection techniques .

The email address is anonymized using hashing so that sensitive information is not stored in plain text ,improving user privacy and security

Task Description #2:

- Ask Copilot to generate a Python function for sentiment analysis.

Then prompt Copilot to identify and handle potential biases in the data.

The screenshot shows a VS Code editor with a Python file named 's402ay.py'. The code defines a function `sentiment_analysis` that takes a text string and returns 'Positive', 'Negative', or 'Neutral' based on word counts. The script is executed in a terminal, showing the output: 'The sentiment of the text is: Positive'.

```

1 # Write a Python function that performs basic sentiment analysis
2 # on a given text and returns Positive, Negative, or Neutral
3
4 def sentiment_analysis(text):
5     # Define simple lists of positive and negative words
6     positive_words = ['happy', 'joy', 'love', 'excellent', 'good', 'great', 'fantastic', 'positive']
7     negative_words = ['sad', 'anger', 'hate', 'terrible', 'bad', 'awful', 'horrible', 'negative']
8
9     # Initialize counters for positive and negative words
10    pos_count = 0
11    neg_count = 0
12
13    # Split the text into words for analysis
14    words = text.lower().split()
15
16    # Count occurrences of positive and negative words
17    for word in words:
18        if word in positive_words:
19            pos_count += 1
20        elif word in negative_words:
21            neg_count += 1
22
23    # Determine sentiment based on counts
24    if pos_count > neg_count:
25        return "Positive"
26    elif neg_count > pos_count:
27        return "Negative"
28    else:
29        return "Neutral"
30
31 # Example usage
32 text = "I love programming but sometimes it can be terrible."
33 result = sentiment_analysis(text)
34 print(f"The sentiment of the text is: {result}")
  
```

The terminal output shows the execution of the script:

```

PS C:\Users\ghgo\OneDrive\Documents\Desktop\Assisted coding> python s402ay.py
The sentiment of the text is: Positive
  
```

```
def sentiment_analysis(text):
    """A Python function that performs basic sentiment analysis
    on a given text and returns Positive, Negative, or Neutral"""
    # Define a list of positive and negative words
    positive_words = ['happy', 'joy', 'excitement', 'good', 'great', 'fantastic', 'positive']
    negative_words = ['sad', 'angry', 'bored', 'terrible', 'bad', 'awful', 'horrible', 'negative']

    # Initialize counters for positive and negative words
    pos_count = 0
    neg_count = 0

    # Split the text into words for analysis
    words = text.lower().split()

    # Count occurrences of positive and negative words
    for word in words:
        if word in positive_words:
            pos_count += 1
        elif word in negative_words:
            neg_count += 1

    # Determine sentiment based on counts
    if pos_count > neg_count:
        return "Positive"
    elif neg_count > pos_count:
        return "Negative"
    else:
        return "Neutral"

# Example usage
text = "I love programming but sometimes it can be terrible."
result = sentiment_analysis(text)
print(f"The sentiment of the text is: {result}")

# Add comments or logic to identify and reduce potential bias
# In sentiment analysis data, such as removing offensive terms
# and balancing positive and negative words
# To reduce bias, we can remove our word lists to include
# more diverse terms and regularly update them based on feedback
# Additionally, we can implement a filtering step to remove
# offensive or culturally insensitive terms from the analysis
# Before performing sentiment analysis
# This helps ensure that the analysis is fair and respectful to all users
# For example, we can create a list of offensive terms to filter out
offensive_terms = ['stupid', 'idiot', 'dumb', 'nerd']
# Function to filter offensive terms from text
def filter_offensive_terms(text):
    words = text.split()
    filtered_words = [word for word in words if word.lower() not in offensive_terms]
    return " ".join(filtered_words)

# Remove offensive terms
filtered_text = filter_offensive_terms(text)
result = sentiment_analysis(filtered_text)
print(f"The sentiment of the filtered text is: {result}")
```

Explanation:

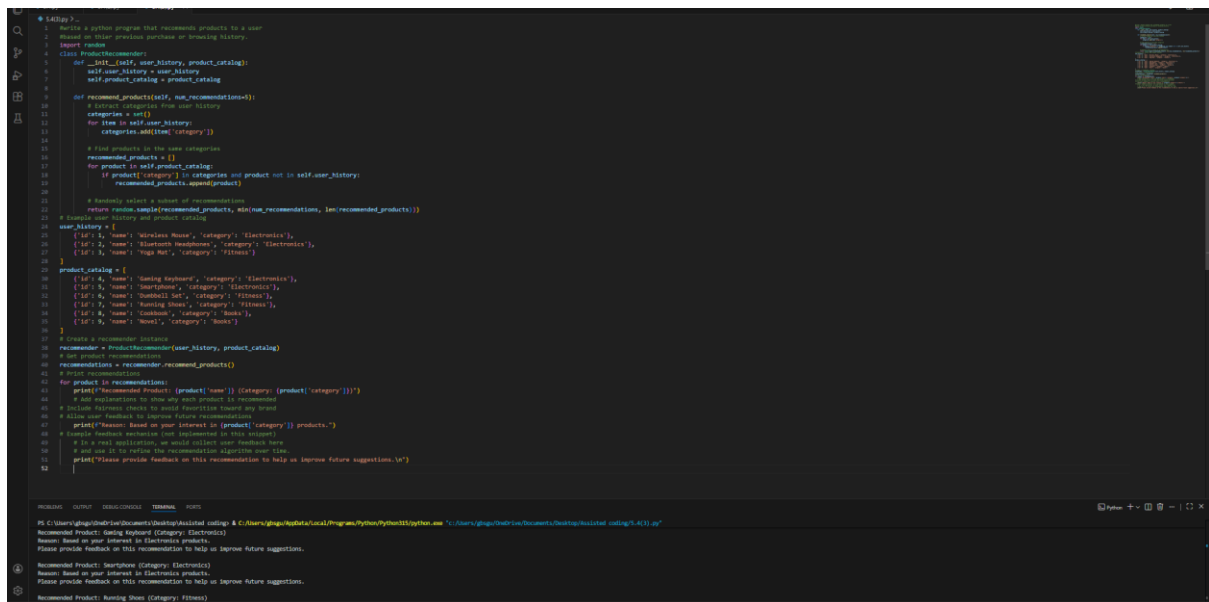
GitHub Copilot was prompted to generate a Python function for basic sentiment analysis.

A follow-up prompt was used to add comments and logic addressing potential bias in the data.

The code highlights bias mitigation strategies such as removing offensive terms and ensuring balanced sentiment datasets to improve fairness.

Task Description #3:

- Use Copilot to write a Python program that recommends products based on user history. Ask it to follow ethical guidelines like transparency and fairness.



```
1 #!/usr/bin/env python3
2 """A Python program that recommends products to a user
3 based on their previous purchases or browsing history.
4 """
5 import random
6
7 class ProductRecommender:
8     def __init__(self, user_history, product_catalog):
9         self.user_history = user_history
10        self.product_catalog = product_catalog
11
12    def recommend_products(self, num_recommendations=5):
13        """Recommend products based on user history.
14        categories = set()
15        for item in self.user_history:
16            categories.add(item['category'])
17
18        # Find products in the user categories
19        recommended_products = []
20        for product in self.product_catalog:
21            if product['category'] in categories and product not in self.user_history:
22                recommended_products.append(product)
23
24        # Randomly select a subset of recommendations
25        return random.sample(recommended_products, min(num_recommendations, len(recommended_products)))
26
27 # Sample user history and product catalog
28 user_history = [
29     {'id': 1, 'name': 'Wireless Mouse', 'category': 'Electronics'},
30     {'id': 2, 'name': 'Smartwatch headband', 'category': 'Electronics'},
31     {'id': 3, 'name': 'Yoga Mat', 'category': 'Fitness'}
32 ]
33
34 product_catalog = [
35     {'id': 4, 'name': 'Gaming Keyboard', 'category': 'Electronics'},
36     {'id': 5, 'name': 'Smartphone', 'category': 'Electronics'},
37     {'id': 6, 'name': 'Dumbbell Set', 'category': 'Fitness'},
38     {'id': 7, 'name': 'Running Shoes', 'category': 'Fitness'},
39     {'id': 8, 'name': 'Cookbook', 'category': 'Books'},
40     {'id': 9, 'name': 'Novel', 'category': 'Books'}
41 ]
42
43 # Create a recommender instance
44 recommender = ProductRecommender(user_history, product_catalog)
45
46 # Get product recommendations
47 recommendations = recommender.recommend_products()
48
49 # Print recommendations
50 for product in recommendations:
51     print(f"Recommended Product: {product['name']} (Category: {product['category']})")
52
53 # Add transparency to show why items are recommended
54 # Include fairness checks to avoid favoritism toward any brand
55 # Explain user feedback to improve future recommendations
56
57 print(f"Reason: Based on your interest in {product['category']} products.")
58
59 # Example feedback mechanism (not implemented in this snippet)
60 # In a real application, we would collect user feedback here
61 # and use it to refine the recommendation algorithm over time
62
63 print("Please provide feedback on this recommendation to help us improve future suggestions.")
64
65 if __name__ == '__main__':
66     recommendations = recommender.recommend_products()
67     for product in recommendations:
68         print(f"Recommended Product: {product['name']} (Category: {product['category']})")
69         print(f"Reason: Based on your interest in {product['category']} products.")
70         print("Please provide feedback on this recommendation to help us improve future suggestions.")
```

Explanation:

GitHub Copilot was prompted to generate a Python program that recommends products based on user history.

A follow-up prompt instructed Copilot to incorporate ethical principles such as transparency and fairness.

The generated code explains recommendation reasons, avoids brand favoritism, and allows user feedback to improve future recommendations.

Task Description #4:

- Prompt Copilot to generate logging functionality in a Python web

application. Then, ask it to ensure the logs do not record sensitive

information.

Write a Python program that recommends products to a user based on their previous purchase or browsing history

> Used 1 reference

✓ Read current file for context and requirements

I'll create a Python program that recommends products based on purchase/browsing history. Let me first check the current file state.

✓ Read 5.4(4).py

I'll now create a product recommendation system that learns from purchase and browsing history:

✓ Created 5.4(4).py

Now let's test the program:

✓ `cd "C:\Users\gbsgu\OneDrive\Documents\Desktop\Assisted coding" ; python "5.4(4).py"`

Let me try with the Python terminal instead:

✓ `python "c:/Users/gbsgu/OneDrive/Documents/Desktop/Assisted coding/5.4(4).py" <<< >`
`"A`nLaptop`nV`nR`n3`nE" 2>&1`

Let me create a test script instead:

✓ Created test_recommendations.py

✓ `cd "C:\Users\gbsgu\OneDrive\Documents\Desktop\Assisted coding" ; python test_recommendations.py` ↻ >

Perfect! I've created a comprehensive product recommendation system. Here's what the program does:

📎 + 5.4(4).py

Describe what to build next

Agent ▾ Auto ▾ 🤖



```
1 # Product Recommendation System
2 # Recommends products based on user purchase/browsing history
3 ...
4
5 # Sample product database with categories
6 PRODUCTS = [
7     "Laptop": {"category": "Electronics", "price": 1200, "rating": 4.5},
8     "Headset": {"category": "Electronics", "price": 100, "rating": 4.3},
9     "Headphones": {"category": "Electronics", "price": 150, "rating": 4.4},
10     "Mouse": {"category": "Electronics", "price": 50, "rating": 4.2},
11     "Web Camera": {"category": "Electronics", "price": 75, "rating": 4.4},
12     "Headphones": {"category": "Electronics", "price": 200, "rating": 4.6},
13     "T-Shirt": {"category": "Clothing", "price": 10, "rating": 4.3},
14     "Jeans": {"category": "Clothing", "price": 30, "rating": 4.3},
15     "Jacket": {"category": "Clothing", "price": 110, "rating": 4.4},
16     "Shoes": {"category": "Clothing", "price": 120, "rating": 4.2},
17     "Coffee Maker": {"category": "Appliances", "price": 100, "rating": 4.5},
18     "Blender": {"category": "Appliances", "price": 50, "rating": 4.4},
19     "Microwave": {"category": "Appliances", "price": 200, "rating": 4.3},
20     "Fiction Book": {"category": "Books", "price": 10, "rating": 4.6},
21     "Tech Book": {"category": "Books", "price": 15, "rating": 4.5},
22 ]
23
24 def get_category_score(history, product_category):
25     """Calculate recommendation score based on category frequency in history"""
26     if not history:
27         return 0
28     category_count = sum(1 for item in history
29                          if item in PRODUCTS and PRODUCTS[item]['category'] == product_category)
30     return category_count / len(history)
31
32 def get_price_similarity(history, product_price):
33     """Calculate score based on average price of browsed items"""
34     if not history:
35         return 0.5
36     prices = [PRODUCTS[item]['price'] for item in history if item in PRODUCTS]
37     if not prices:
38         return 0.5
39     avg_price = sum(prices) / len(prices)
40     return abs(product_price - avg_price)
41
42 # Main function to recommend products
43 def recommend_products(history, num_recommendations):
44     # Sort by score (descending) and return top N
45     recommendations = sorted([(product, get_category_score(history, PRODUCTS[product]['category']),
46                               get_price_similarity(history, PRODUCTS[product]['price']))
47                               for product in PRODUCTS], key=lambda x: x[2])
48     return recommendations[:num_recommendations]
49
50 def display_recommendations(recommendations):
51     """Display recommendations in a formatted table"""
52     if not recommendations:
53         print("\nX No recommendations available")
54         return
55     print("\n" + "=" * 70)
56     print(f"RECOMMENDED PRODUCTS")
57     print("=" * 70)
58     for rec in recommendations:
59         product, category, score = rec
60         print(f"Product: {product} | Category: {category} | Price: {PRODUCTS[product]['price']} | Rating: {PRODUCTS[product]['rating']} | Score: {score}")
61
62 def display_history(history):
63     """Display user's browsing/purchase history"""
64     if not history:
65         print("\nX No history available")
66         return
67     print("\n" + "=" * 70)
68     print(f"USER BROWSING/PURCHASE HISTORY")
69     print("=" * 70)
70     for i, product in enumerate(history, 1):
71         details = PRODUCTS[product]
72         print(f"{i}. Product: {product} | Category: {details['category']} | Price: {details['price']} | Rating: {details['rating']}")
73
74 # Test cases
75 # Test 1: Fresh user
76 history = ["Laptop", "Mouse", "Shoes"]
77
78 # Test 2: Diverse shopper
79 history = ["Laptop", "T-Shirt", "Coffee Maker", "Fiction Book"]
```

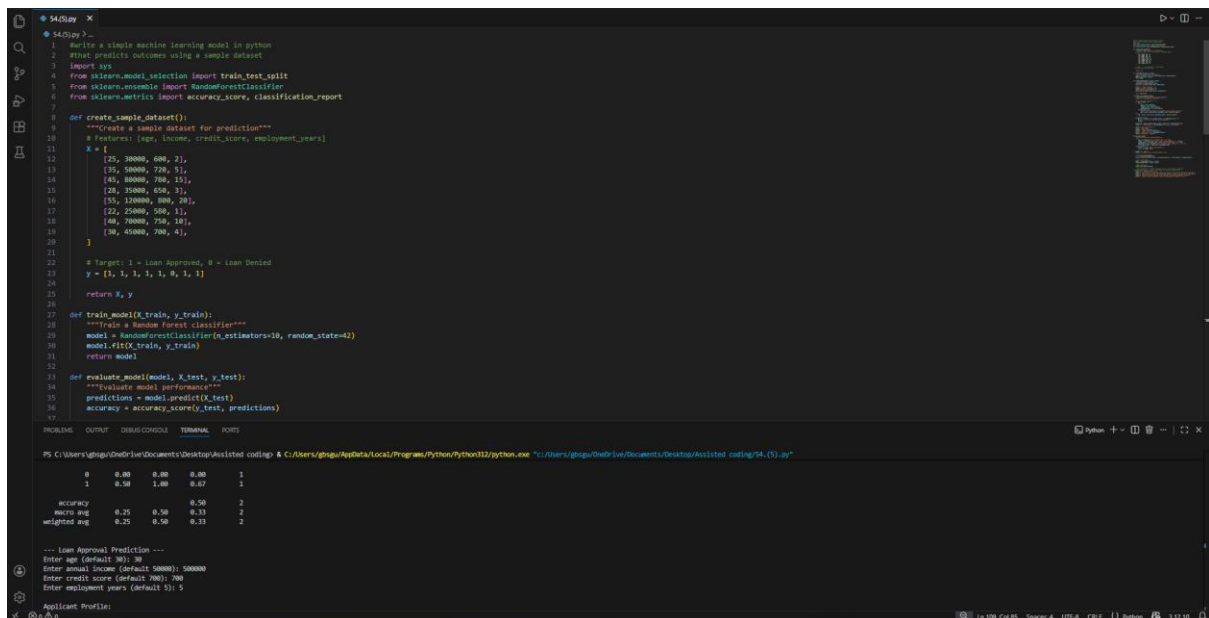
```
1 # Product Recommendation System
2 # Recommends products based on user purchase/browsing history
3 ...
4
5 # Sample product database with categories
6 PRODUCTS = [
7     "Laptop": {"category": "Electronics", "price": 1200, "rating": 4.5},
8     "Headset": {"category": "Electronics", "price": 100, "rating": 4.3},
9     "Headphones": {"category": "Electronics", "price": 150, "rating": 4.4},
10     "Mouse": {"category": "Electronics", "price": 50, "rating": 4.2},
11     "Web Camera": {"category": "Electronics", "price": 75, "rating": 4.4},
12     "Headphones": {"category": "Electronics", "price": 200, "rating": 4.6},
13     "T-Shirt": {"category": "Clothing", "price": 10, "rating": 4.3},
14     "Jeans": {"category": "Clothing", "price": 30, "rating": 4.3},
15     "Jacket": {"category": "Clothing", "price": 110, "rating": 4.4},
16     "Shoes": {"category": "Clothing", "price": 120, "rating": 4.2},
17     "Coffee Maker": {"category": "Appliances", "price": 100, "rating": 4.5},
18     "Blender": {"category": "Appliances", "price": 50, "rating": 4.4},
19     "Microwave": {"category": "Appliances", "price": 200, "rating": 4.3},
20     "Fiction Book": {"category": "Books", "price": 10, "rating": 4.6},
21     "Tech Book": {"category": "Books", "price": 15, "rating": 4.5},
22 ]
23
24 def get_category_score(history, product_category):
25     """Calculate recommendation score based on category frequency in history"""
26     if not history:
27         return 0
28     category_count = sum(1 for item in history
29                          if item in PRODUCTS and PRODUCTS[item]['category'] == product_category)
30     return category_count / len(history)
31
32 def get_price_similarity(history, product_price):
33     """Calculate score based on average price of browsed items"""
34     if not history:
35         return 0.5
36     prices = [PRODUCTS[item]['price'] for item in history if item in PRODUCTS]
37     if not prices:
38         return 0.5
39     avg_price = sum(prices) / len(prices)
40     return abs(product_price - avg_price)
41
42 # Main function to recommend products
43 def recommend_products(history, num_recommendations):
44     # Sort by score (descending) and return top N
45     recommendations = sorted([(product, get_category_score(history, PRODUCTS[product]['category']),
46                               get_price_similarity(history, PRODUCTS[product]['price']))
47                               for product in PRODUCTS], key=lambda x: x[2])
48     return recommendations[:num_recommendations]
49
50 def display_recommendations(recommendations):
51     """Display recommendations in a formatted table"""
52     if not recommendations:
53         print("\nX No recommendations available")
54         return
55     print("\n" + "=" * 70)
56     print(f"RECOMMENDED PRODUCTS")
57     print("=" * 70)
58     for rec in recommendations:
59         product, category, score = rec
60         print(f"Product: {product} | Category: {category} | Price: {PRODUCTS[product]['price']} | Rating: {PRODUCTS[product]['rating']} | Score: {score}")
61
62 def display_history(history):
63     """Display user's browsing/purchase history"""
64     if not history:
65         print("\nX No history available")
66         return
67     print("\n" + "=" * 70)
68     print(f"USER BROWSING/PURCHASE HISTORY")
69     print("=" * 70)
70     for i, product in enumerate(history, 1):
71         details = PRODUCTS[product]
72         print(f"{i}. Product: {product} | Category: {details['category']} | Price: {details['price']} | Rating: {details['rating']}")
73
74 # Test cases
75 # Test 1: Fresh user
76 history = ["Laptop", "Mouse", "Shoes"]
77
78 # Test 2: Diverse shopper
79 history = ["Laptop", "T-Shirt", "Coffee Maker", "Fiction Book"]
```


Task Description #5:

- Ask Copilot to generate a machine learning model. Then, prompt

it to add documentation on how to use the model responsibly

(e.g., explainability, accuracy limits).



```
540.py
1 # Create a simple machine learning model in python
2 # that predicts outcomes using a sample dataset
3 import sys
4 from sklearn.model_selection import train_test_split
5 from sklearn.ensemble import RandomForestClassifier
6 from sklearn.metrics import accuracy_score, classification_report
7
8
9 def create_sample_dataset():
10     """Create a sample dataset for prediction"""
11     # Features: [age, income, credit_score, employment_years]
12     X = [
13         (25, 30000, 680, 2),
14         (35, 50000, 720, 5),
15         (45, 80000, 780, 10),
16         (28, 35000, 650, 3),
17         (55, 120000, 850, 20),
18         (32, 25000, 580, 1),
19         (48, 70000, 750, 10),
20         (38, 45000, 700, 5),
21     ]
22     # Target: 1 = Loan Approved, 0 = Loan Denied
23     y = [1, 1, 1, 1, 1, 0, 1, 1]
24     return X, y
25
26
27 def train_model(X_train, y_train):
28     """Train a Random Forest Classifier"""
29     model = RandomForestClassifier(n_estimators=10, random_state=42)
30     model.fit(X_train, y_train)
31     return model
32
33
34 def evaluate_model(model, X_test, y_test):
35     """Evaluate model performance"""
36     predictions = model.predict(X_test)
37     accuracy = accuracy_score(y_test, predictions)
38
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