

# Generative AI CA-2

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Q:5 Generate a model for Covid 19 with symptoms of parameters like fever, cold, shivering, weight loss, generate 100 model data with random values for each parameter and order by parameter lowest to highest in display based on the input parameter.

## COVID-19 Symptom Modeling

### 1. Introduction

COVID-19 has affected millions of people worldwide with symptoms that vary greatly in severity and type. Some of the most common symptoms include fever, cold, shivering, and weight loss. Understanding the distribution and severity of these symptoms across patients can help in building effective predictive models and providing better patient care.

In this I generate a model that simulates COVID-19 symptoms for 100 hypothetical patients, using random values to represent different levels of each symptom. I sort the data based on different symptom parameters for further analysis.

### 2. Objectives

The main objectives of this model are:

- To generate random data simulating COVID-19 symptoms (fever, cold, shivering, and weight loss) for 100 patients.
- To sort the generated data based on any of the symptoms in ascending order.
- To provide a flexible method for analyzing different symptom severities across patients.

### 3. Symptoms Overview

The following symptoms are considered in this model:

- Fever : Represents the body temperature of the patient, ranging from 36.5°C to 40°C.
- Cold : A scale representing the severity of cold symptoms (runny nose, congestion) ranging from 0 to 10.
- Shivering : A scale representing the intensity of shivering, ranging from 0 (no shivering) to 10 (severe shivering).
- Weight Loss : Represents the weight loss in kilograms, ranging from 0 kg to 5 kg.

### 4. Methodology

#### 4.1. Data Generation

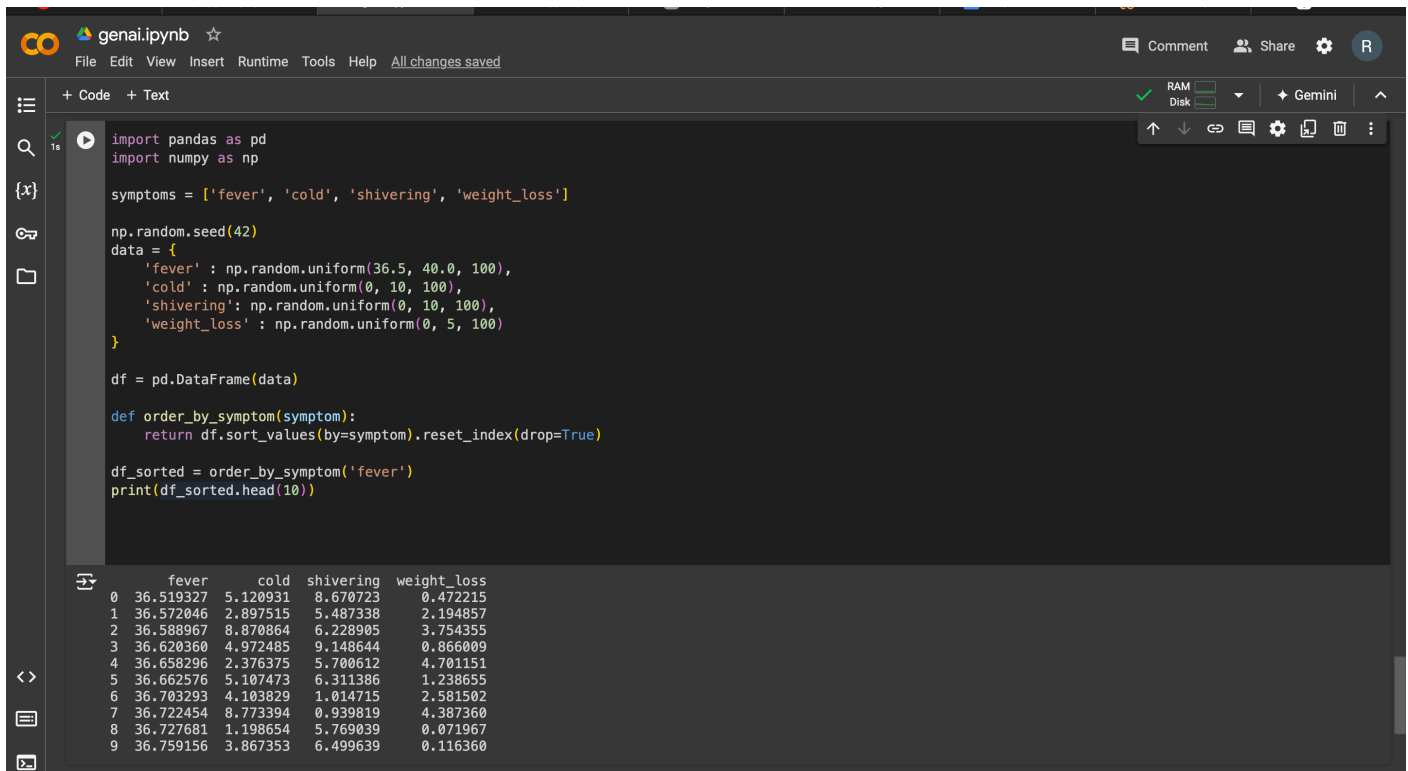
Random data is generated for each symptom using Python's `numpy` library. The values are distributed within the following ranges:

- Fever : 36.5°C to 40°C.
- Cold : 0 (no cold) to 10 (severe cold).
- Shivering : 0 (no shivering) to 10 (severe shivering).
- Weight Loss : 0 kg to 5 kg. The random data ensures that each patient profile varies in symptom severity, mimicking real-world diversity in COVID-19 symptom expression.

## 4.2. Data Sorting

Once the data is generated, it can be sorted based on any symptom parameter. This allows us to identify trends, such as patients with the highest fever, or those experiencing the most weight loss.

## 4.3. Python Code Implementation\*\*



```
import pandas as pd
import numpy as np

symptoms = ['fever', 'cold', 'shivering', 'weight_loss']

np.random.seed(42)
data = {
    'fever': np.random.uniform(36.5, 40.0, 100),
    'cold': np.random.uniform(0, 10, 100),
    'shivering': np.random.uniform(0, 10, 100),
    'weight_loss': np.random.uniform(0, 5, 100)
}

df = pd.DataFrame(data)

def order_by_symptom(symptom):
    return df.sort_values(by=symptom).reset_index(drop=True)

df_sorted = order_by_symptom('fever')
print(df_sorted.head(10))
```

	fever	cold	shivering	weight_loss
0	36.519327	5.120931	8.670723	0.472215
1	36.572046	2.807515	5.487338	2.194857
2	36.588967	8.870864	6.228005	3.754355
3	36.620360	4.972485	9.148644	0.866009
4	36.658296	2.376375	5.700612	4.701151
5	36.662576	5.107473	6.311386	1.238655
6	36.703293	4.103829	1.014715	2.581502
7	36.722454	8.773394	0.939819	4.387360
8	36.727681	1.198654	5.769039	0.071967
9	36.759156	3.867353	6.499639	0.116360

## 4.4. Explanation of the Code

Data Generation : I use the `numpy.random.uniform()` function to generate random values for each symptom. This ensures variability in the data.

DataFrame Creation : The generated data is converted into a `pandas` DataFrame, making it easier to manipulate and analyze.

Sorting Function: The `order_by_symptom()` function allows us to sort the data by any symptom. By default, the data is sorted by fever, but the function can sort based on other symptoms like cold, shivering, or weight loss.

## 5. Results

The model generates 100 data points representing various levels of fever, cold, shivering, and weight loss. Below is a sample of the data, sorted by **fever**:

fever	cold	shivering	weight_loss
36.52°C	5.12	8.67	0.47 kg
36.57°C	2.90	5.49	2.19 kg
36.59°C	8.87	6.23	3.75 kg

36.62°C	4.97	9.15	0.87 kg	
36.66°C	2.38	5.70	4.70 kg	

## 1. Introduction

In financial institutions, a bank account represents a customer's financial interactions with the bank. In this scenario, I have focused on savings accounts, where customers perform basic transactions like deposits and withdrawals. Over time, the balance of an account fluctuates based on these transactions.

This model simulates the behavior of 100 savings accounts over a period of 12 months, where random deposits and withdrawals are made to each account. The final goal is to print each account's final balance after the transactions and organize the accounts from the lowest to the highest final balance.

## 2. Objective

- Generate 100 Savings Accounts : Each account starts with a random balance and undergoes random transactions over a period of 12 months.
- Simulate Deposits and Withdrawals : Transactions are randomly generated and applied to each account.
- Calculate Final Balances : After simulating transactions, the final balance of each account is calculated.
- Sort by Final Balance : The accounts are sorted by their final balance, and the sorted data is printed.

```

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import random

class SavingsAccount:
    def __init__(self, account_id, initial_balance):
        self.account_id = account_id
        self.balance = initial_balance
        self.transactions = []

    def deposit(self, amount):
        self.balance += amount
        self.transactions.append(f"Deposit: {amount}")

    def withdraw(self, amount):
        if self.balance >= amount:
            self.balance -= amount
            self.transactions.append(f"Withdraw: {amount}")
        else:
            self.transactions.append(f"Failed Withdraw: {amount} (Insufficient balance)")

    def __str__(self):
        return f"Account {self.account_id}, Final Balance: {self.balance}"

def generate_accounts(num_accounts, num_months, num_transactions_per_month, seed_value):
    random.seed(seed_value)
    accounts = []

    for i in range(num_accounts):
        initial_balance = random.randint(1000, 5000)
        account = SavingsAccount(account_id=i+1, initial_balance=initial_balance)

        for _ in range(num_months):
            for _ in range(num_transactions_per_month):
                transaction_type = random.choice(["deposit", "withdraw"])
                transaction_amount = random.randint(100, 1000)
  
```

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for _ in range(num_months):
    for _ in range(num_transactions_per_month):
        transaction_type = random.choice(["deposit", "withdraw"])
        transaction_amount = random.randint(10, 1000)
        if transaction_type == "deposit":
            account.deposit(transaction_amount)
        else:
            account.withdraw(transaction_amount)

    accounts.append(account)

return accounts

num_accounts = 100
num_months = 6
num_transactions_per_month = 10
seed_value = 42

accounts = generate_accounts(num_accounts, num_months, num_transactions_per_month, seed_value)

sorted_accounts = sorted(accounts, key=lambda x: x.balance)

for account in sorted_accounts:
    print(account)
```

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Account 72, Final Balance: 31
Account 9, Final Balance: 111
Account 84, Final Balance: 197
Account 19, Final Balance: 367
Account 66, Final Balance: 467
Account 10, Final Balance: 492
Account 18, Final Balance: 603
Account 100, Final Balance: 631
Account 86, Final Balance: 635
Account 56, Final Balance: 807
Account 25, Final Balance: 834
Account 49, Final Balance: 846
Account 20, Final Balance: 847
Account 14, Final Balance: 860
Account 69, Final Balance: 944
Account 33, Final Balance: 1094
Account 41, Final Balance: 1102
Account 89, Final Balance: 1115
Account 54, Final Balance: 1175
Account 16, Final Balance: 1210
Account 91, Final Balance: 1270
Account 30, Final Balance: 1354
Account 75, Final Balance: 1509
Account 98, Final Balance: 1521
Account 64, Final Balance: 1626
Account 70, Final Balance: 1646
Account 47, Final Balance: 1684
Account 46, Final Balance: 1705
Account 34, Final Balance: 1841
Account 55, Final Balance: 2058
Account 5, Final Balance: 2077
Account 61, Final Balance: 2206
Account 38, Final Balance: 2274
Account 12, Final Balance: 2393
Account 13, Final Balance: 2393
Account 74, Final Balance: 2621
Account 24, Final Balance: 2665
Account 80, Final Balance: 2811
Account 96, Final Balance: 3020
```

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## Explanation of the Code

- Generate Random Initial Balances:** We generate 100 random balances between \$1000 and \$5000 for the accounts using `np.random.uniform()`.
- Simulate Random Transactions:** Each account experiences a number of random transactions (deposits or withdrawals) across 12 months. Each transaction can be either a **deposit** (positive value) or a **withdrawal** (negative value), randomly chosen, with amounts between \$10 and \$1000.
- Final Balance Calculation:** For each account, the final balance is calculated by adding the sum of all transactions to the initial balance.

4. **Data Handling with Pandas:** We use `pandas` to store and manipulate the account data, allowing us to easily sort the accounts by their final balance and print the results.
5. **Sort Accounts by Final Balance:** The accounts are sorted in ascending order based on their final balance, and the result is printed to show each account's initial and final balances.