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**Project Idea**: The project focuses on simulating antibiotic resistance in a hypothetical setting like Bangladesh. We'll make it easy to understand and add some basic functionality to simulate how bacterial resistance might develop over time in response to repeated antibiotic treatments.

This simulation will demonstrate how bacteria populations might develop resistance over time in a simplified setting, where:

1. We have an initial bacterial population, some of which may develop resistance over time.
2. We simulate antibiotic treatments given every few generations.
3. Over time, bacteria that survive treatments may develop resistance, showing how resistance levels might increase.

**Project:** **Simulating Bacterial Antibiotic Resistance in Bangladesh**

**Implementation code:**

import random

# Simulation parameters

initial\_population = 1000 # Starting population of bacteria

treatment\_generations = 5 # Apply antibiotics every 5 generations

mutation\_chance = 0.02 # Chance of mutation for resistance (2%)

antibiotic\_effectiveness = 0.6 # Kills 60% of non-resistant bacteria on each treatment

total\_generations = 20 # Total generations in the simulation

# Starting populations

resistant\_bacteria = 0

non\_resistant\_bacteria = initial\_population

# Print header

print(f"{'Generation':>10} | {'Resistant Bacteria':>20} | {'Non-Resistant Bacteria':>25}")

for generation in range(1, total\_generations + 1):

# Apply antibiotic treatment every few generations

if generation % treatment\_generations == 0:

# Apply treatment: non-resistant bacteria are reduced

survivors = int(non\_resistant\_bacteria \* (1 - antibiotic\_effectiveness))

else:

# No treatment this generation, so all non-resistant survive

survivors = non\_resistant\_bacteria

# Calculate new population after reproduction

total\_survivors = survivors + resistant\_bacteria # all survivors reproduce

new\_bacteria = total\_survivors \* 2 # each bacterium reproduces

# Mutations: small percentage develop resistance in each generation

new\_resistant = int(new\_bacteria \* mutation\_chance)

new\_non\_resistant = new\_bacteria - new\_resistant

# Update populations

resistant\_bacteria = resistant\_bacteria + new\_resistant

non\_resistant\_bacteria = new\_non\_resistant

# Print current generation data

print(f"{generation:>10} | {resistant\_bacteria:>20} | {non\_resistant\_bacteria:>25}")

# End of simulation

print("\nSimulation complete.")

**Output of the project:**

|  |
| --- |
| Generation | Resistant Bacteria | Non-Resistant Bacteria |
| 1 40 1960 |
| 2 120 3920 |
| 3 281 7919 |
| 4 609 16072 |
| 5 890 13793 |
| 6 1477 28779 |
| 7 2687 59302 |
| 8 5166 121499 |
| 9 10232 248264 |
| 10 14613 214693 |
| 11 23785 449440 |
| 12 42714 927521 |
| 13 81523 1901661 |
| 14 160850 3887041 |
| 15 229476 3362706 |
| 16 373163 7040677 |
| 17 669716 14531127 |
| 18 1277749 29793653 |
| 19 2520605 60899948 |
| 20 3595828 52685945 |