ELECTRICAL TEAM TRAINING

TASK 4

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PREFACE

Gru snatched the **shrink ray gun** and faced **Vector** in a thrilling aerial duel. They **battled in the sky**, flying skillfully. Gru had a gadget-filled aircraft, while Vector used a fast pod with lasers. They dodged, shot lasers, and used gadgets. Gru's cleverness showed as he used magnetic hooks and a cloaking device. Vector sent drones, but Gru's aircraft evaded them.

The climax was in storm clouds. Thunder and rain made it tough, but Gru used it to hide. He tricked Vector with a bright decoy, then surprised him from above. Gru's quick move let him disable Vector's pod. Gru's aircraft trapped Vector's pod, and Gru got the shrink ray gun.

TASK4.1- Sky Clash

About

As you're **Dr. Nefario's helper**. He wants to create a computer program that acts like a **game**. This game will copy the battle between **Gru** and **Vector** in the sky. By playing this game many times, we can figure out the best ways to win the battle. It's like practicing a lot to come up with smart **strategies** that Gru could use to defeat Vector in the simulated sky fight.

Requirement

Implement a **Python** program that simulates this air battlefield using **OOP** Methods:

- Game has multiple **rounds** and it ends when one of the villains reaches **0 Health.**
- During one round each villain could use a weapon to damage the other or use a shield to protect himself from the other's weapons
- Try to exploit **OOP features** as possible (**Abstraction, Inheritance, Polymorphism, Encapsulation**)
- You have two approaches to implement this simulation, one is to control both villain's output _each round choose the weapon/shield for both villains_, second approach is to play with only one villain and make the other choose his weapon/shield by probabilistic criteria

- **Attributes of Each villain:**

Attribute	About
Health	It represents the villain's health and it's affected by the enemy's weapon according to the weapon damage (some weapons has special functions) **initial: 100 for each villain**
Energy	It represents the wizard's energy and it's affected by the power of the spell casted by the wizard himself **initial: 500 for each villain**
Shield	The shield protects the villain partially from opponent's attack according to percentage of reduction from weapon attack

- **Gru Gadgets:**
  - Gru Weapons

Weapons	Energy	Damage	Resources	Description
Freeze Gun	50	11	Inf	Minions occasionally wield freeze ray guns that shoot a freezing beam to immobilize opponents temporarily.
Electric Prod	88	18	5	Minions might use electric prods to deliver mild shocks to enemies, stunning them momentarily.
Mega Magnet	92	10 (reduce 20% of next opponent attack)	3	Minions utilize a mega magnet to attract or repel metal objects, potentially disrupting enemy vehicles or equipment.
Kalman Missile	120	20 (can't avoid it)	1	This unavoidable Missile created for enourmous distraction

  - Gru Shields

Weapons	Energy	Save	Resources	Description
Energy-Projected BarrierGun	20	40% of opponent damage	Inf	The spaceship's shields create an invisible, energy-projected barrier around the vehicle. This barrier absorbs and dissipates energy-based attacks such as lasers, beams, and plasma shots.
Selective Permeability	50	90% Of opponent damage	2	The shields can be programmed to allow certain objects, signals, or energies to pass through while blocking others. This can be useful for communication or specific tactical maneuvers.

- **Vector Gadgets:**
  - Vector Weapons

Weapons	Energy	Damage	Resources	Description
Laser Blasters	40	8	Inf	Vector's primary weapon would be powerful laser blasters attached to his flying pod. These blasters emit focused energy beams that can slice through obstacles and damage enemy vehicles.
Plasma Grenades	56	13	8	Vector could use plasma grenades that explode on impact, releasing fiery energy bursts that deal significant damage to enemy vehicles caught in the blast radius.
Sonic Resonance Cannon	100	22	3	Fires powerful sonic waves that can shatter enemy shields and disrupt their systems, temporarily incapacitating them.

- Vector Shields

Weapons	Energy	Save	Resources	Description
Energy Net Trap	15	32% of opponent damage (except Kalman missile)	Inf	Vector's pod might have the ability to deploy an energy net that ensnares enemy vehicles, temporarily immobilizing them and leaving them vulnerable to Vector's other attacks.
Quantum Deflector	40	80% Of opponent damage (except Kalman missile)	3	Manipulates quantum states to create a deflection field, causing enemy projectiles to miss the spaceship by a slight margin in the quantum realm.

Bonus

Draw a **UML schematic** of this OOP system

Output

- One or more (.py) files
- UML schematic

Appendix

- Python OOP Basics: Python OOP - YouTube

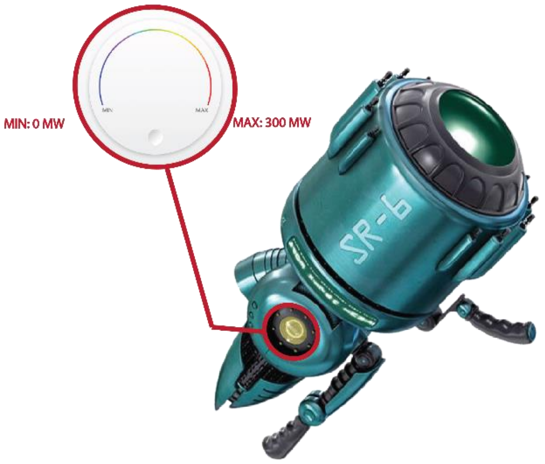
TASK4.2- Shrrinkage Model

About

After Gru's **successful battle against Vector**, he found something surprising about the shrink-ray gun he had taken back. When he looked closely at the gun, he saw it had an **old-fashioned analog knob**. This knob was used to control how much the gun would shrink things, and he needs to shrink the moon with a specific ratio

Since no manual accompanied the shrink ray gun, we faced a challenge in understanding its functionality. However, we devised a unique solution: a **data-driven approach** involving the collection and analysis of information. With this in mind, we embarked on a process to **gather a comprehensive dataset**, consisting of different objects subjected to the gun's effects at varying positions of the analog knob.

Our next step involved utilizing this dataset to **train a machine-learning model**. This model would learn the intricate relationships between the knob's positions and the corresponding degrees of shrinkage. As we fed the model more data, it gradually grasped the underlying patterns, enabling it to make accurate predictions regarding shrinkage outcomes based on the knob's settings.



After you try the gun on different objects in Gru's house such as tables, cups, and minions, you recognize that the Gun has some kind of linear model (the gun is not precise so we need Machine learning technique to get the optimal model)

Requirements

1-Create **Linear Regression** Model, and train this model on the give dataset:

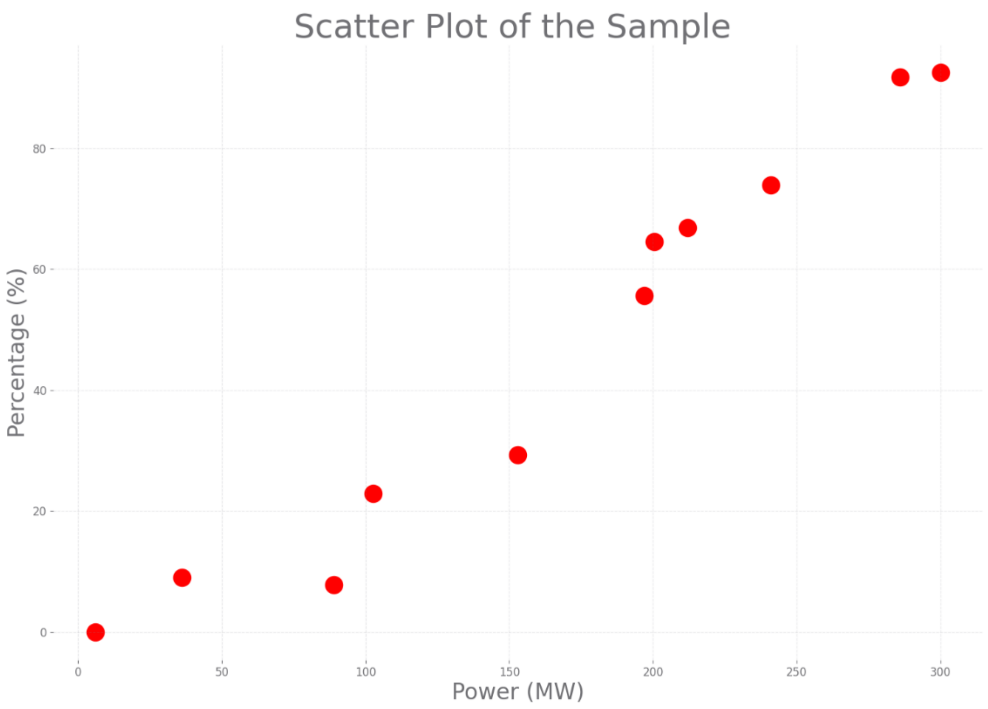
- The knob of the Gun has a range from [0 MW, 300MW]
- Assume that shrinkage does not depend on the volume of the target object
- Use **Jupyter Notebook** for your process flow
- This is a small sample from the dataset,
- Link of whole dataset: Dataset

Knob	Shrinkage
6.03	0%
36.18	9.01%
88.94	22.93%
102.51	29.28%
153.77	47.57%
197.40	55.67%
200.50	64.55%
212.56	66.09%
241.21	73.94%
286.43	91.75%
300	92.56%

2-If Gru needs to shrink the moon with a percentage **85%** where should he adjust the knob?

Bonus

Plot the dataset as scatter plot and also plot the linear model in the same chart using **matplotlib**



Output

- (.ipynb) file with the Model creation workflow

Appendix

Linear Regression:

- Introduction to Machine learning - YouTube
- Python | Linear Regression using sklearn - GeeksforGeeks
- sklearn.linear_model.LinearRegression — scikit-learn 1.3.0 documentation

Dataset Preprocessing:

- Pandas Read CSV in Python - GeeksforGeeks
- python - Linear Regression on Pandas DataFrame using Sklearn (IndexError: tuple index out of range) - Stack Overflow

Plotting

- Implementing and Visualizing Linear Regression in Python with SciKit Learn | by Sthitaprajna Mishra | Becoming Human: Artificial Intelligence Magazine