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DIPARTIMENTO
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DELL'INFORMAZIONE

Python Programming for Data Science and Engineering

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The aim of **Assignment 4** is to *Pandas your Game*. Thus, starting from what you have done in the assignment 3, you must modify it as following:

1. Organize *Pokemons*, *Moves* and *Type effectiveness* into DataFrames
2. Collect more data in a *New Random Battle Mode*
3. Store and save game data in your disk using Pandas
4. Analyse and plot some results

Explanations on how to perform these steps are provided in the following slides.



Modify the previously developed *Random Battle Mode* as follow:

- **Automatic player creation**

At the start of each game, randomly select the Starter Pokemon and assign to it a random level from 1 to 20 to be assigned to the “Level” attribute of the Pokemon object.

- **Random enemy level**

At the beginning of each battle, assign to the wild Pokemon a random level from 1 to 20 to be assigned to the “Level” attribute of the Pokemon object.

- **Save the statistics**

Run the game several times (e.g., $N_{games} = 1000$ or more) and with a high-enough number of battles (e.g., $N_{battles} = 150$ or more). In addition to the previously saved statistics of assignment 3, **for each turn of each battle** keep also track of:

- Current player's Pokemon HPs
- Selected attacks
- Damage done



The Pokemon level up has some effects on its characteristics that must be managed. We have seen that the amount of damage dealt by a move is influenced by the level that you should have already considered in assignment 1.

The level also modifies the Pokemon statistics. Thus, given the *BaseStats* of the selected Pokemon and its *level*, you should add to the Pokemon object the attribute *ActStats* (*HP*, *attack*, *defense*, *speed*, *special*) and calculating the values as follow:

For HP calculation:
$$ActHP = floor\left(baseHP * 2 * \frac{level}{100}\right) + level + 10$$

For all the other stats:
$$ActStat = floor\left(baseStat * 2 * \frac{level}{100}\right) + 5$$

Now during the game and the battles (e.g., in the *useMove()* method), use only the *ActStats* of the Pokemon instead of its *BaseStats*.



Display a set of graphs showing the results of the tests on random battles.

- Simple plot

1. Display the average (\pm std dev) reduction of the percentage player's pokemon HPs along the battle turns.

- Pie Plot

1. For each starter pokemon, display in the same figure the percentage of times each attack of the player's pokemon has been used and the percentage of total damage done by each attack.
2. Display in the same figure the distribution of pokemon types in the *pokemons.json* file and the distribution of pokemon types in the list of pokemons encountered during the games.

- Bar charts

1. For each starter Pokemon, display the average damage done by the player's pokemon grouped by pokemon level.

- Image charts

1. For each starter pokemon, display in color-code the percentage of victories as a function of both enemy's pokemon level and enemy's pokemon type.