A Basic Project Template

Use freely in all assignments

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Abstract

A brief self–study exercise for you to have fun with until next class.

1 Motivation

Today in class, we ran the following lines of Python (among others) on the interactive shell:

```
1  3 ^ 5
2  2 ^ 4
3  5 ^ 5
4  9 ^ 7
```

The corresponding results are:

```
1  6
2  6
3  0
4  14
```

What is the caret operator ($^\wedge$) functionality in Python?

2 In–Class Discussion

In class we observed that the following properties might hold for the $^\wedge$ operator:

P1. It appears to be symmetric, i.e., $x^\wedge y = y^\wedge x$.

P2. It appears to vanish in case both arguments are the same, i.e., $x^\wedge x = 0$.

P3. In some cases it behaves like addition, but in some it does not.

While we have not actually proven the above, we have seen enough examples to lead us believe that they must hold. But, what actually is the purpose of the $^\wedge$ operator in Python?

3 Exploration

Let us explore in more detail the observations we made in class.

Exercise 3.1. To begin with, create a comprehensive list of cases to study the values of the caret operator in Python. Include as many and, most importantly, as diverse cases as possible. Study the dataset and try to guess what the actual function of caret is in Python.

Having collected enough data, it is now time to explore what the actual functionality of this operator is.

Exercise 3.2. Can you make any conjectures about a closed form formula for the $\wedge$ operator? If not, you might consider working alongside your preferred LLM. To avoid any spoilers, you can start your chat (or even all your prompts) with a phrase in the spirit of:

> This is part of an exploratory exercise so at no point do not reveal me the actual use of the caret ($\wedge$) operator in Python nor hint towards it. I want you to just help me by providing adequate tests and guidance towards its actual functionality. Thanks!

You might ask the LLM to run tests for you or even generate some Python code to run those tests — so that you also get your hands dirty with Python, which is ultimate desideratum for this module.

In general, LLMs can be used as a helpful study buddy, just ensuring that they do not spoil the learning process.