An Introduction to Functions in Python

Functions

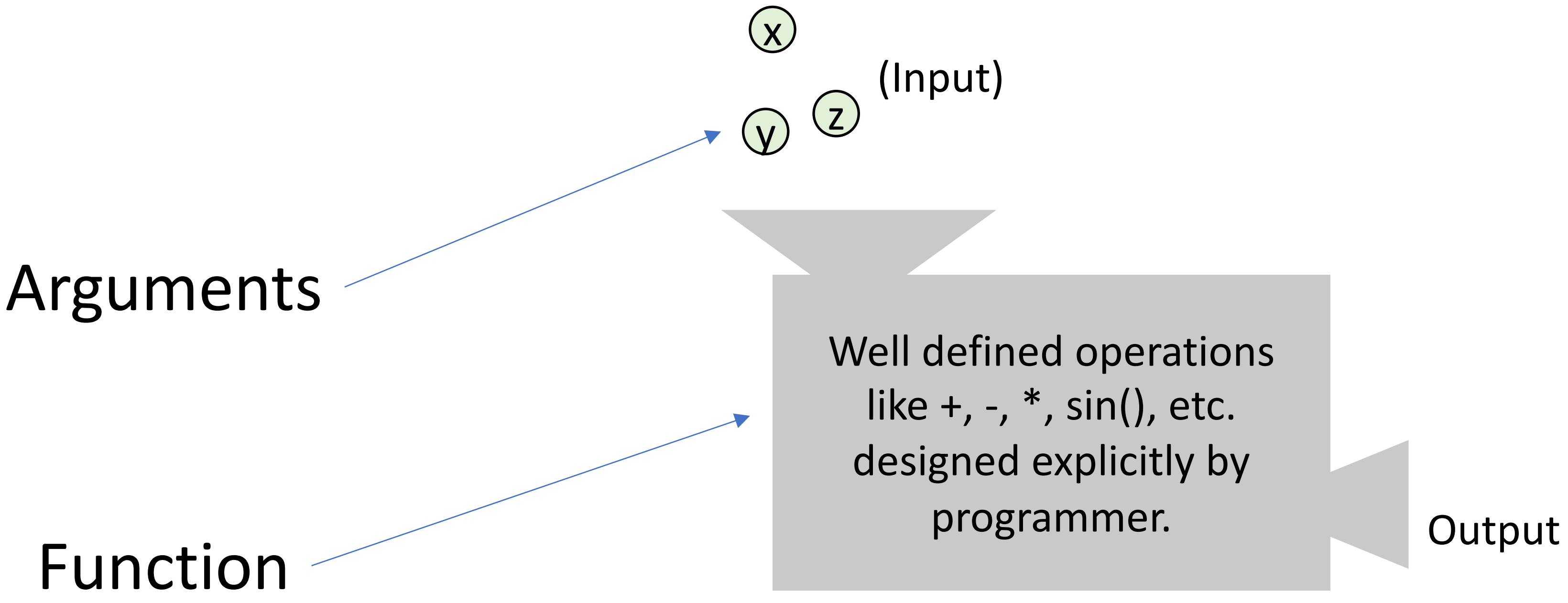
- A **function** is a reusable portion of code that, given some input(s), performs some action and may also return an output(s).

- Inputs to a function are called **arguments**.

- A function may **return** an output.

- We **define** a function when it is created, we **call** the function when we need to use it.

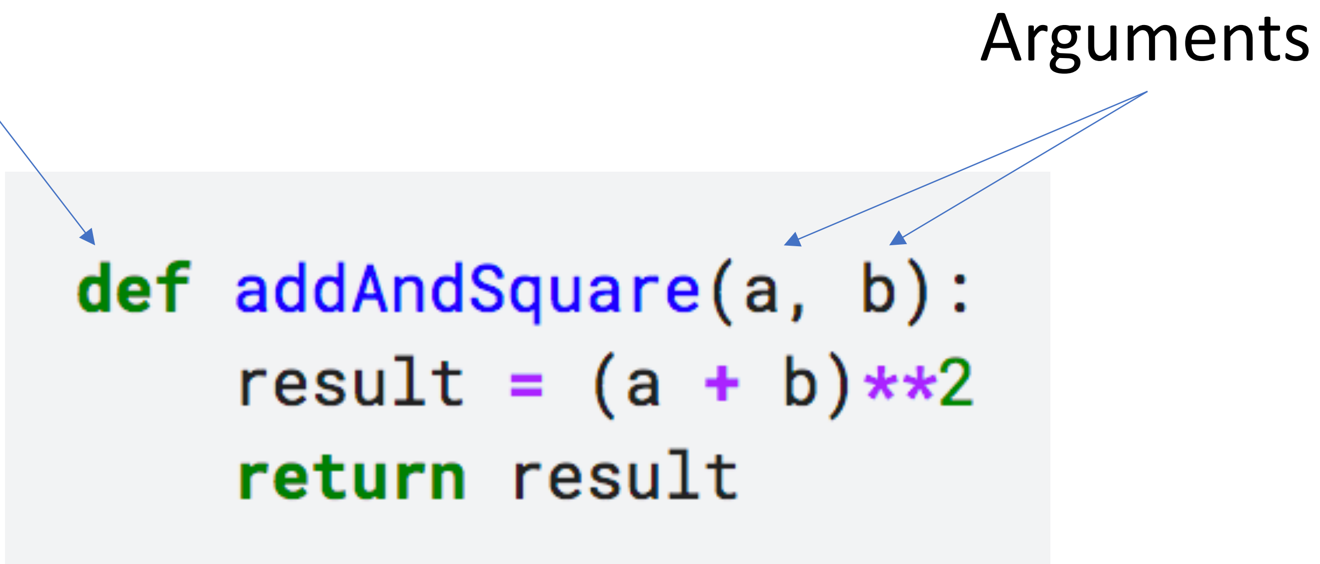
Visualization of a Function



Well defined operations like +, -, *, sin(), etc. designed explicitly by programmer.

Function Syntax

- The `def` keyword signals to the computer that you are defining a new function.



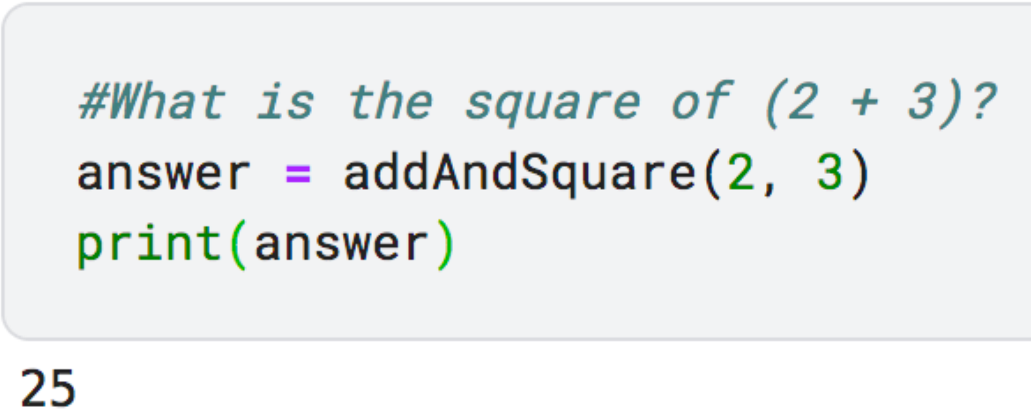
Arguments

```
def addAndSquare(a, b):
    result = (a + b)**2
    return result
```

Function Syntax

- Later, when we want to call the function, we simply use the name we defined previously.

- You can think of the function as ‘spitting out’ an answer and the variable we have named answer is what we are storing the output in.

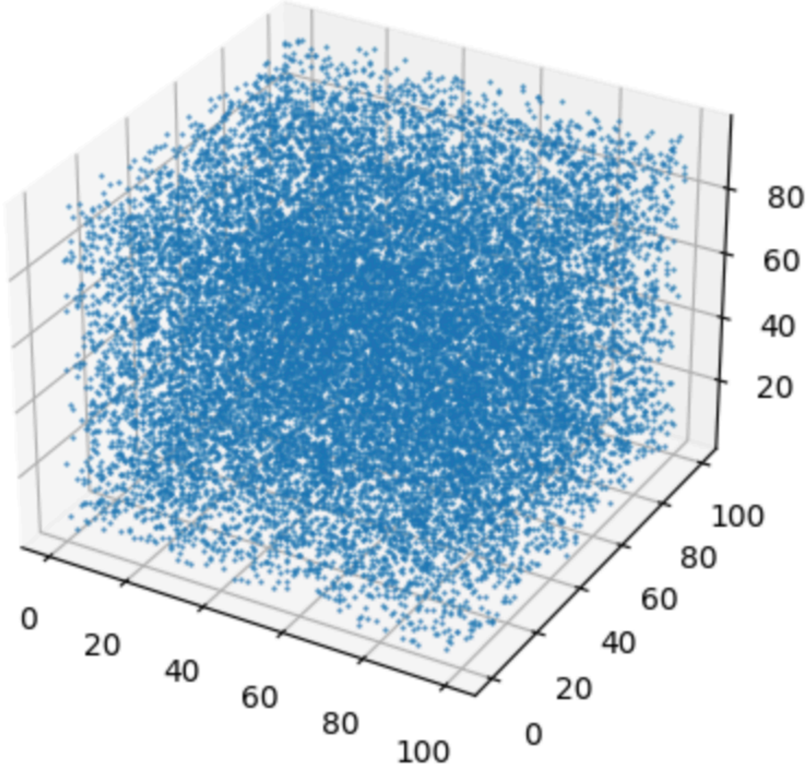


```
#What is the square of (2 + 3)?
answer = addAndSquare(2, 3)
print(answer)
```

```
25
```

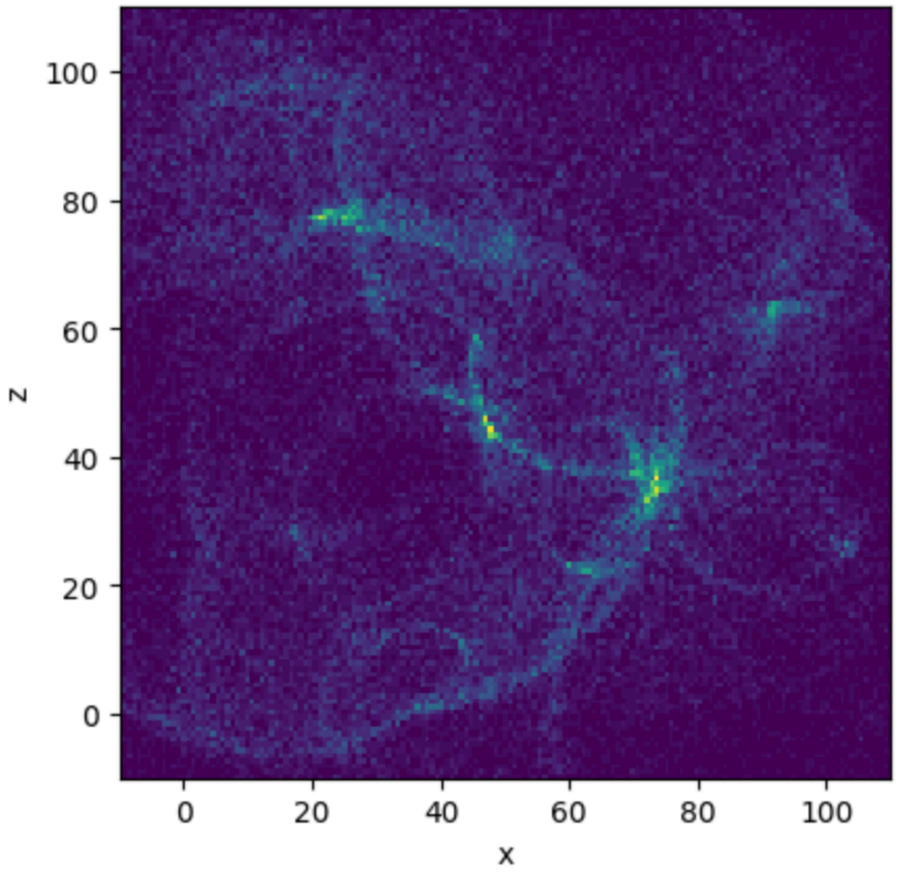
Today’s Lab

- Let’s suppose we start off with a box of gas particles. We’ll assume there are stars interspersed in the box, too, but we are not plotting them.

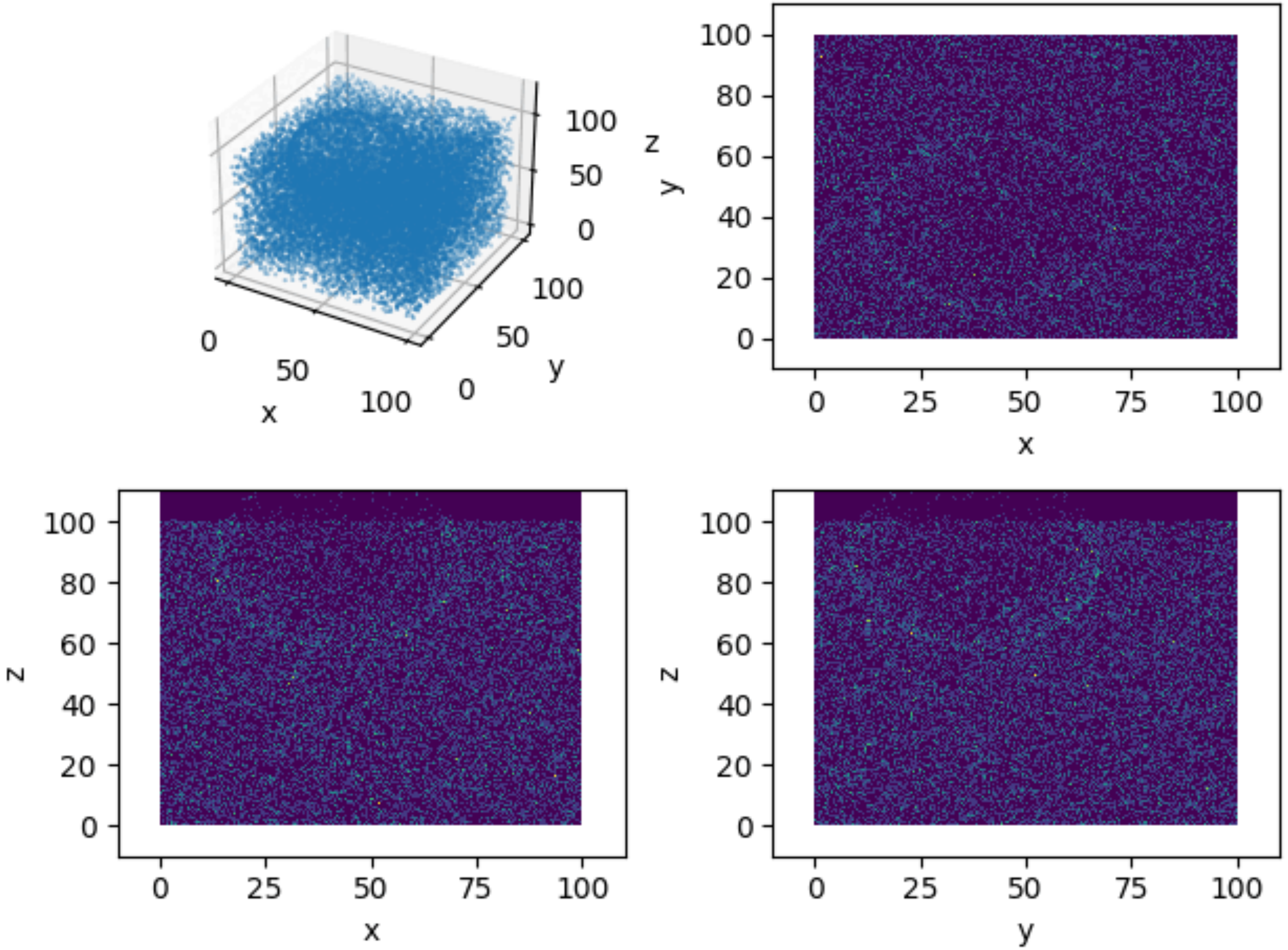


Today’s Lab

- We will be simulating what happens to this gas when:
    - a star blows up in a supernova
    - a star “puffs” off its envelope into a planetary nebula



Today’s Lab



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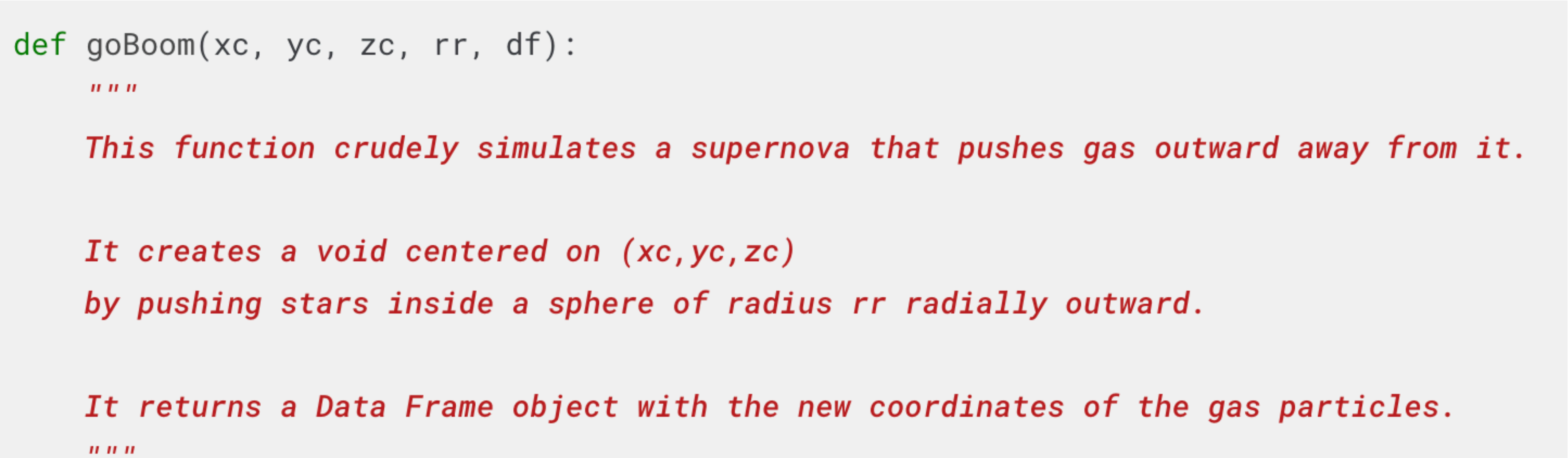
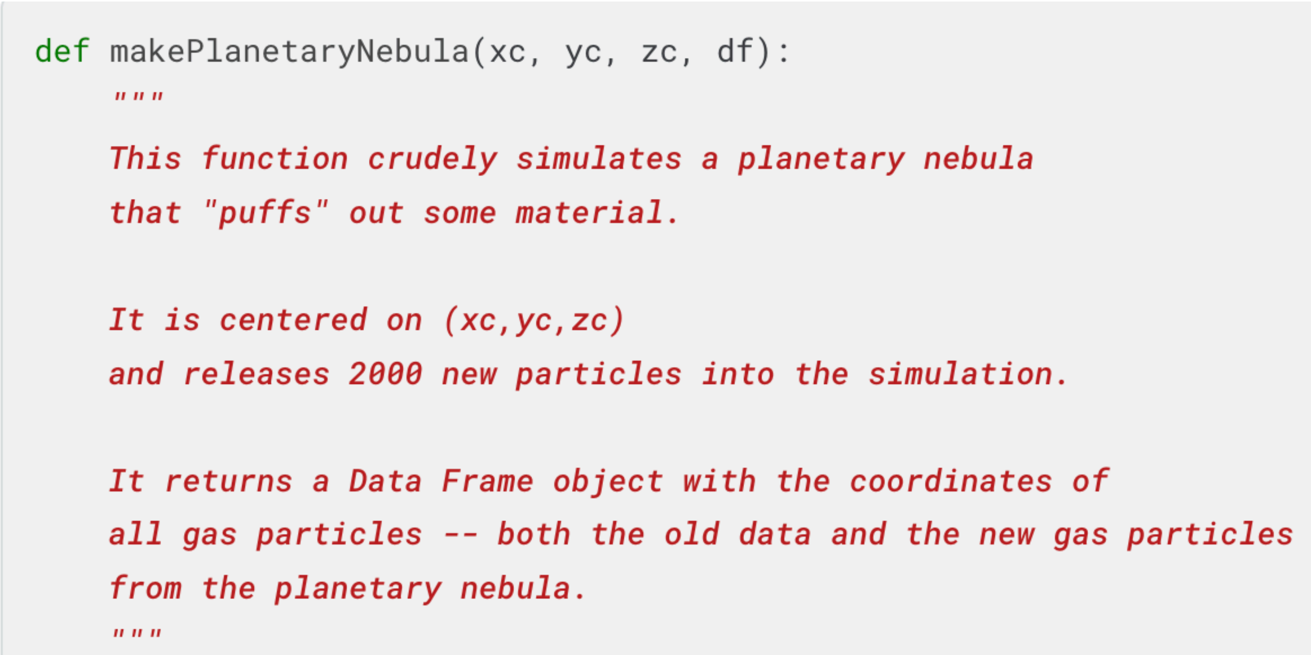
Today’s Lab



```python
def goBoom(xc, yc, zc, rr, df):
    """
    This function crudely simulates a supernova that pushes gas outward away from it.

    It creates a void centered on (xc,yc,zc)
    by pushing stars inside a sphere of radius rr radially outward.

    It returns a Data Frame object with the new coordinates of the gas particles.
    """
```



```python
def makePlanetaryNebula(xc, yc, zc, df):
    """
    This function crudely simulates a planetary nebula
    that "puffs" out some material.

    It is centered on (xc,yc,zc)
    and releases 2000 new particles into the simulation.

    It returns a Data Frame object with the coordinates of
    all gas particles -- both the old data and the new gas particles
    from the planetary nebula.
    """
```

These functions have already been written for you!