

# Ionpath Interview Task - Python

Download the data file (29.5MB) from:

<https://drive.google.com/a/ionpath.com/uc?export=download&id=0B1sqrwqmmIaIRURvUG9XOWJoMVk>

You will need to import the PyTables library in order to read the data from this file, but you should not need knowledge of this library beyond what is shown in the example below. You may use any other trusted open source libraries and resources, as long as the work to complete this task is your own. This task should take ~ 1 hour total.

The downloaded file contains mass spectrometry data from rastering over a 256x256 grid. The raster goes across each row from left to right, starting with the top row and repeating this left-to-right pattern until it reaches the bottom. At each pixel in the grid, two types of data are collected: a series of timestamps and their corresponding ion counts.

To access the timestamps and counts from pixel  $i$  in the grid, where  $i$  is in the range  $[0, 256*256)$ , you could use:

```
import tables

with tables.open_file('data.inp') as infile:
    timestamps = infile.root.time[i]
    counts = infile.root.counts[i]
```

Here, `timestamps` and `counts` are each an array of length  $d$ , where `counts[k]` is the number of ions that arrived at time `timestamps[k]`.

We know at what timestamps certain types of ions should arrive. In particular,

- Red ions should arrive with timestamps between 16,660 and 16,685
- Green ions should arrive with timestamps between between 11,994 and 12,012
- Blue ions should arrive with timestamps between 15,600 and 15,630
- Gray ions should arrive with timestamps between 6,296 and 6,304

Your task, should you choose to accept it:

1. Create a grayscale image showing the distribution of gray ions. The goal is to visually demonstrate the relative amounts of the gray channel across the grid, so that a person can easily see where there are a lot of gray ions vs. where there are few.
2. Create an RGB image showing the red, green and blue ions. Same goal as above for each of the individual colors.
3. Are the blue ions more likely to occur near the red ions or near the green ions?

Please return both the code and the images. Thanks!