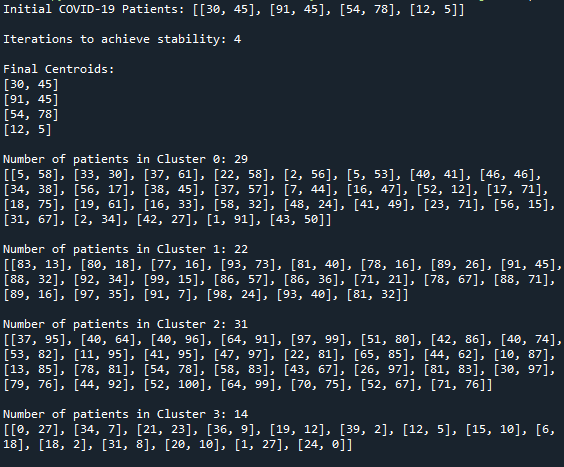
|  |  |
| --- | --- |
| **Bug # 1** | Parentheses in creation of list of lists with list comprehension |
| **Why it is a Bug** | The comment calls for a list of lists, not a list of tuples |
| **When Triggered** | The bug is triggered when the list is populated with empty tuples |
| **How I Found it** | Reading the comments and the code |
| **Exception Type** | None |
| **Type of Error** | Logical |
| **Bug Fix Line #** | 24 |
| **Bug Fix Description** | I replaced the parentheses with brackets to create a list of lists as specified on line 23 |
| **Excp. Screenshot** | None |
| **Bug # 2** | Y value indicates the same value as the x value |
| **Why it is a Bug** | In order to import the points, the y value has to be indicated appropriately |
| **When Triggered** | It is triggered on the first pass of the parent for loop |
| **How I Found it** | Reading the code, I realized the points aren’t parsed correctly because they both indicated index [0] |
| **Exception Type** | None |
| **Type of Error** | Logical |
| **Bug Fix Line #** | 34 |
| **Bug Fix Description** | I changed the y value to indicate point[1] instead of point[0] |
| **Excp. Screenshot** | None |
| **Bug # 3** | Index of cluster index used for point index instead of the cluster index value |
| **Why it is a Bug** | The for loop would append the points according to the number of cluster indexes in order of the points list, instead of looking through the points list for the correct cluster value |
| **When Triggered** | It’s triggered when the parent for loop is executed for the first time |
| **How I Found it** | Thinking about the code line-by-line, I had a hunch it wasn’t right. Looking carefully at what it was doing, I saw that it was indicating the wrong centroids |
| **Exception Type** | None |
| **Type of Error** | Logical |
| **Bug Fix Line #** | 45 |
| **Bug Fix Description** | I added a dummy variable to store the index\_value of the centroid according to the list of centroids, and then changed to the index of points[index\_value] so the appropriate points would be pulled from the points list |
| **Excp. Screenshot** | None |
| **Bug # 4** | Reverse indexing of point deletion |
| **Why it is a Bug** | There is no need to iterate in reverse order, it would not prevent the points to be shifted by 1 either way – the operation doesn’t cause that |
| **When Triggered** | Triggered in running the for loop with negative indexing |
| **How I Found it** | Looking at the comments and thinking about the algorithm, the points are not “shifted” at all by deleting members of the list, reversely or not |
| **Exception Type** | None |
| **Type of Error** | Logical |
| **Bug Fix Line #** | 50 |
| **Bug Fix Description** | The negative index on the cluster\_index list was removed, and the associated comment |
| **Excp. Screenshot** | None |
| **Bug # 5** | Similar to Bug#3, the value for the cluster\_indexes was not indicated, the index was used instead |
| **Why it is a Bug** | This would delete the wrong points |
| **When Triggered** | Triggered when the for loop executes the deletion code |
| **How I Found it** | Thinking again about what the code is doing, and the comment, I saw the same bug as #3 |
| **Exception Type** | None |
| **Type of Error** | Logical |
| **Bug Fix Line #** | 52 |
| **Bug Fix Description** | I added my dummy variable and fixed the index of the points deleted |
| **Excp. Screenshot** | None |
| **Bug # 6** | Missing parentheses on x value calculation |
| **Why it is a Bug** | Without parentheses the x value is not squared, the point value is squared |
| **When Triggered** | Upon the first iteration of the parent for loop, and the first iteration of the child for loop, the code is executed |
| **How I Found it** | Thinking about the math, and the Pythagorean Theorem, I noticed the error |
| **Exception Type** | None |
| **Type of Error** | Logical |
| **Bug Fix Line #** | 59-62 |
| **Bug Fix Description** | Added parentheses around the x value calculation, before the squaring |
| **Excp. Screenshot** | None |
| **Bug # 7** | Missing parentheses on x value calculation |
| **Why it is a Bug** | Without parentheses the x value is not squared, the point value is squared |
| **When Triggered** | Upon the first iteration of the parent for loop, and the first iteration of the child for loop, the code is executed |
| **How I Found it** | Thinking about the math, and the Pythagorean Theorem, I noticed the error |
| **Exception Type** | None |
| **Type of Error** | Logical |
| **Bug Fix Line #** | 59-62 |
| **Bug Fix Description** | Added parentheses around the x value calculation, before the squaring |
| **Excp. Screenshot** | None |
| **Bug # 8** | Missing parentheses on x value calculation |
| **Why it is a Bug** | Without parentheses the x value is not squared, the point value is squared |
| **When Triggered** | Upon the first iteration of the parent for loop, and the first iteration of the child for loop, the code is executed |
| **How I Found it** | Thinking about the math, and the Pythagorean Theorem, I noticed the error |
| **Exception Type** | None |
| **Type of Error** | Logical |
| **Bug Fix Line #** | 59-62 |
| **Bug Fix Description** | Added parentheses around the x value calculation, before the squaring |
| **Excp. Screenshot** | None |
| **Bug # 9** | Missing parentheses on x value calculation |
| **Why it is a Bug** | Without parentheses the x value is not squared, the point value is squared |
| **When Triggered** | Upon the first iteration of the parent for loop, and the first iteration of the child for loop, the code is executed |
| **How I Found it** | Thinking about the math, and the Pythagorean Theorem, I noticed the error |
| **Exception Type** | None |
| **Type of Error** | Logical |
| **Bug Fix Line #** | 59-62 |
| **Bug Fix Description** | Added parentheses around the x value calculation, before the squaring |
| **Excp. Screenshot** | None |
| **Bug # 10** | Missing parentheses on y value calculation |
| **Why it is a Bug** | Without parentheses the y value is not squared, the point value is squared |
| **When Triggered** | Upon the first iteration of the parent for loop, and the first iteration of the child for loop, the code is executed |
| **How I Found it** | Thinking about the math, and the Pythagorean Theorem, I noticed the error |
| **Exception Type** | None |
| **Type of Error** | Logical |
| **Bug Fix Line #** | 59-62 |
| **Bug Fix Description** | Added parentheses around the y value calculation, before the squaring |
| **Excp. Screenshot** | None |
| **Bug # 11** | Missing parentheses on y value calculation |
| **Why it is a Bug** | Without parentheses the y value is not squared, the point value is squared |
| **When Triggered** | Upon the first iteration of the parent for loop, and the first iteration of the child for loop, the code is executed |
| **How I Found it** | Thinking about the math, and the Pythagorean Theorem, I noticed the error |
| **Exception Type** | None |
| **Type of Error** | Logical |
| **Bug Fix Line #** | 59-62 |
| **Bug Fix Description** | Added parentheses around the y value calculation, before the squaring |
| **Excp. Screenshot** | None |
| **Bug # 12** | Missing parentheses on y value calculation |
| **Why it is a Bug** | Without parentheses the y value is not squared, the point value is squared |
| **When Triggered** | Upon the first iteration of the parent for loop, and the first iteration of the child for loop, the code is executed |
| **How I Found it** | Thinking about the math, and the Pythagorean Theorem, I noticed the error |
| **Exception Type** | None |
| **Type of Error** | Logical |
| **Bug Fix Line #** | 59-62 |
| **Bug Fix Description** | Added parentheses around the y value calculation, before the squaring |
| **Excp. Screenshot** | None |
| **Bug # 13** | Missing parentheses on y value calculation |
| **Why it is a Bug** | Without parentheses the y value is not squared, the point value is squared |
| **When Triggered** | Upon the first iteration of the parent for loop, and the first iteration of the child for loop, the code is executed |
| **How I Found it** | Thinking about the math, and the Pythagorean Theorem, I noticed the error |
| **Exception Type** | None |
| **Type of Error** | Logical |
| **Bug Fix Line #** | 59-62 |
| **Bug Fix Description** | Added parentheses around the y value calculation, before the squaring |
| **Excp. Screenshot** | None |
| **Bug # 14** | Wrong indices in the cluster append logic |
| **Why it is a Bug** | There are four clusters 0, 1, 2, 3 not 1, 2, 3, 4 so this would result in an incomplete sort by the if control structure |
| **When Triggered** | This is triggered for every point by the child point loop inside of the parent iterations loop |
| **How I Found it** | Thinking about the completeness of the code, I realized it would not work correctly and also it doesn’t correspond to the d1, d2, d3, d4 logic |
| **Exception Type** | None |
| **Type of Error** | Logical |
| **Bug Fix Line #** | 65-72 |
| **Bug Fix Description** | I put in the correct indices, but I also noticed that due to this structure, and the choice of distance calculation, the code would not work with a variable K value |
| **Excp. Screenshot** | None |
| **Bug # 15** | Here the intention is to increment cluster\_changes but there is a typo |
| **Why it is a Bug** | There must be a space between the operator and the variable, and also there is no unary increment operator in Python, += 1 must be used |
| **When Triggered** | This is the first exception triggered when running the code |
| **How I Found it** | I ran the code for the first time and saw this error |
| **Exception Type** | SyntaxError: invalid syntax because it is taken as a variable without and operation |
| **Type of Error** | Lexical |
| **Bug Fix Line #** | 77 was 72 |
| **Bug Fix Description** | I added a space after the variable name and changed the operator to a valid one |
| **Excp. Screenshot** |  |
| **Bug # 16** | Total\_x and total\_y variables not initialized |
| **Why it is a Bug** | Summing the x and y coordinates would not work because the variables aren’t initialized and reset for each cluster |
| **When Triggered** | This is triggered first when the summation code runs |
| **How I Found it** | Thinking about the comments and the code, I realized it was missing something, also I had a hunch a semantic error was coming |
| **Exception Type** | None |
| **Type of Error** | Semantic |
| **Bug Fix Line #** | 87-88 |
| **Bug Fix Description** | Initialized the variables within the for loop to have 0 starting values and these values are refreshed as 0 for each cluster to provide the right totals |
| **Excp. Screenshot** | None |
| **Bug # 17** | A forgotten parentheses makes the interpreter expect one |
| **Why it is a Bug** | The len() function is not closed and so the execution fails |
| **When Triggered** | When running the code this is thrown, indicating line 89 but the problem starts on 86 |
| **How I Found it** | There was a flag in the debugger, and I ran the code and saw an exception |
| **Exception Type** | SyntaxError: invalid syntax |
| **Type of Error** | Syntax |
| **Bug Fix Line #** | 92-95 was 86-89 |
| **Bug Fix Description** | I added a parentheses to complete the len() function |
| **Excp. Screenshot** |  |
| **Bug # 18** | Control statement missing an alternative |
| **Why it is a Bug** | The logic of the program requires that the loop breaks when there is no cluster change |
| **When Triggered** | When the cluster change if statement is triggered the break is triggered |
| **How I Found it** | Thinking about what’s needed for the program I saw it missing |
| **Exception Type** | None |
| **Type of Error** | Semantic |
| **Bug Fix Line #** | 73 |
| **Bug Fix Description** | I added an else: condition to the for loop, otherwise the clusters get cleared when the algorithm converges. This way it breaks the parent loop and prints as soon as the clusters remain unchanged |
| **Excp. Screenshot** | None |
| **Bug # 19** | The bytes object for the number of clusters is not converted to an integer |
| **Why it is a Bug** | The code calls for an integer to use the range() function |
| **When Triggered** | After cleaning up the rest of the code, if you run it an exception is triggered back a t the top, not sure why |
| **How I Found it** | I tried to run the code after going through it once |
| **Exception Type** | TypeError: ‘bytes’ object cannot be interpreted as an integer |
| **Type of Error** | Semantic |
| **Bug Fix Line #** | 18 |
| **Bug Fix Description** | I added an int() conversion to num\_clusters |
| **Excp. Screenshot** |  |
| **Bug # 20** | The point is still a bytes object |
| **Why it is a Bug** | Much like the last bug, the bytes object needs to be converted to an integer to be used by the range() function, I noticed the file was opened in “rb” mode |
| **When Triggered** | After fixing the last bug and running the code an exception pops up, I’m not sure why it wasn’t triggered the first time I ran the code |
| **How I Found it** | I keep trying to run the code after going through it once, now spotting more bugs, here the file is opened in the wrong mode |
| **Exception Type** | TypeError: invalid literal for int() with base 10: b’83,13’ |
| **Type of Error** | Semantic |
| **Bug Fix Line #** | 33 and 9 was 32 and 9 |
| **Bug Fix Description** | I changed the read mode to “r” to get strings in |
| **Excp. Screenshot** |  |
| **Bug # 21** | The string is not being split because it’s missing an argument |
| **Why it is a Bug** | The points are provided in a comma delimited format, so they need to be split according to the comma |
| **When Triggered** | When trying to run the code an exception is raised early in the code, line 32 |
| **How I Found it** | I fixed the read mode, and it still didn’t run, an exception was raised |
| **Exception Type** | ValueError: invalid literal for int() with base 10: ‘83’13’ |
| **Type of Error** | Semantic |
| **Bug Fix Line #** | 31 was 32 |
| **Bug Fix Description** | I added the comma to the split argument |
| **Excp. Screenshot** |  |
| **Bug # 22** | The input file contains improper values |
| **Why it is a Bug** | In this case a O letter is substituted for a 0 |
| **When Triggered** | When running the code as the points list is constructed the exception is thrown |
| **How I Found it** | I ran the code to find the input error |
| **Exception Type** | ValueError: invalid literal for int() with base 10:P ‘4O’ |
| **Type of Error** | Input Error |
| **Bug Fix Line #** | 33 was 32 |
| **Bug Fix Description** | I used a try except block the skip the line when it encounters ValueErrors |
| **Excp. Screenshot** |  |
| **Bug # 23** | The input file contains improper values |
| **Why it is a Bug** | The points are x and y pairs. There can contain errors where the comma is missing. This is seen by Python as one x value |
| **When Triggered** | When appending to the list, an Error is thrown |
| **How I Found it** | I keep running the code to find out if the pieces of the code are working. I put in a print statement to look at the list of points and then I checked the input file |
| **Exception Type** | IndexError: list out of range` |
| **Type of Error** | Input Error |
| **Bug Fix Line #** | 37 |
| **Bug Fix Description** | I added to the try except block to skip lines with errors of this type |
| **Excp. Screenshot** |  |
| **Bug # 24** | Missing range() function for cluster\_indexes |
| **Why it is a Bug** | The list index is not specified properly so the for loop doesn’t work |
| **When Triggered** | When running through the code the error is thrown |
| **How I Found it** | Running the code sequentially |
| **Exception Type** | IndexError: list index out of range |
| **Type of Error** | Semantic |
| **Bug Fix Line #** | 51 was 53 |
| **Bug Fix Description** | I added range(len()) to the iterable |
| **Excp. Screenshot** |  |
| **Bug # 25** | There was a missing function call to range(len()) |
| **Why it is a Bug** | The for loop doesn’t work without it |
| **When Triggered** | When running the code it occurs in order |
| **How I Found it** | I ran the code |
| **Exception Type** | IndexError: list index out of range |
| **Type of Error** | Semantic |
| **Bug Fix Line #** | 45 was 48 |
| **Bug Fix Description** | I added range(len()) to make it work |
| **Excp. Screenshot** |  |

**Screenshot of Output**

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