**constants\_.py :**

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|  | **Variable Name** | **Type** | **Use** |
| **Global Variables** | input\_loc | string | To store the location path of the folder where the generated input will be saved. |
| output\_loc | string | To store the location path of the folder where the generated output file will be saved. |
| input\_loc\_path | string | To store the location path of the file which contains the input data. |
| ouput\_loc\_path | String | To store the location path of the file where output will be saved |

**generate\_input.py:**

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|  | **Variable name** | **Type** | **Use** |
| **random\_graph(n)** | n | int | No.s of nodes to be generated. |
| max\_edges | int | Default value for maximum no edges for a certain no of nodes. |
| a | list | To generate the nodes of the graph |
| b | list | To keep track of the nodes which are part of the graph |
| x | int | Used for generating nodes between 1 to N |
| strr | string | Temporary variable to store the generated nodes and edges and weights associated them. |
| node1 | int | To store randomly generated node. |
| node2 | int | To store randomly generated node. |
| wt | int | To store the randomly generated weight between node1 and node2. |
|  | | | |
| **generate\_a\_random \_graph(n)** | n | int | No.s of nodes to be generated. |
| filename | string | To store the name of the file which will store the generated input data. |
| i | int | Used in loop to generate random no between 0 to 10 to make the name of the filename |
| file | io.TextIOWrapper | Used to access the Filename to save the input generated. |

**main.py :**

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|  | **Variable Name** | **Type** | **Use** |
| **Global Variables** | kruskal\_time | list | To store time duration for kruskal algorithm for different no.s of nodes. |
| boruvka\_time | list | To store time duration for boruvka’s algorithm to different no.s of nodes. |
| prim­­\_time | list | To store time duration for prim’s algorithm for different no.s of nodes. |
| nodes | list | To store the input nodes. |
| fig | plotly.graph\_objs. \_figure.Figure | For drawing the graph using data generated using plotly. |
|  | | | |
| **generate\_mst\_will \_all\_methods(n)** | start | float | To record start time of an algorithm. |
| end | float | To record end time of an algorithm. |
|  | | | |
| **check\_with \_increasing\_nodes()** | nodes | list | To store the input given. |
|  | node | int | To access the inputs given. |

**D\_S\_U.py:**

**DSU class:**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Variable name** | **Type** | **Use** |
| **\_\_init\_\_(self, n)** | n | int | Stores no.s of nodes. |
| rank | list | To keep track of rank of each node. |
| par | list | To keep track of parent of each node. |
|  | | | |
| **merge(self, a, b)** | a | int | Store the node1. |
| b | int | Store the node2. |
| x | int | Fetches and stores the parent of a. |
| y | int | Fetches and stores the parent of b |

**kruskal.py :**

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|  | **Variable name** | **Type** | **Use** |
| **Global Variables** | pq | queue.PriorityQueue | To be used in the algorithm for sorting the edges based on weight. |
|  | | | |
| **convert\_to\_mst(n, outputPath)** | n | int | Stores no.s of nodes. |
| gr | dictionary | Stores the input graph. |
| mst\_edges | set | To store the output mst edges. |
| dsu | D\_S\_U.DSU Object | To make union of nodes so that unnecessary nodes do not get added to mst. |
| edge | tuple | To store the tuple removed from pq(priority queue). |
| edge\_ | tuple | Temporary variable to store the edge and it’s weight as tuple which will be added to pq(priority queue). |
|  | | | |
| **getInput(inputPath)** | inputPath | string | Stores the location path of the input file. |
| mygraph | defaultdictionary | To store the input graph. |
| file | io.TextIOWrapper | To read the input file. |
| lines | list | To store the items of input files as list. |
| currentLine | string | To fetch the inputs line by line. |
| x | int | To temporarily store source node. |
| y | int | To temporarily store destination node. |
| w | int | To temporarily store the weight of the edge between x(source node) and y(destination node). |
|  | | | |
| **saveOuput(outputPath, mst\_edges)** | mst\_edges | set | It stores the output mst. |
| outputPath | string | It stores the location path where output has to be saved. |
| output\_str | string | To store output mst with output message. |
| edges | string | To traverse through the generated mst. |
| file | io.TextIOWrapper | To access the output file to save the output data. |
|  | | | |
| **generate\_mst(n)** | n | int | Stores no.s of nodes. |
| inputpath | string | To store the location path of the input file from constants.py |
| ouputpath | string | To store the location path of the output file from constants. py |
| gr | dictionary | To get the input graph from input file and store it temporarily. |

**bourvka.py :**

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|  | **Variable name** | **Type** | **Use** |
| **min\_weighted\_edge(edges)** | edges | list | Stores the edges connected to a supernode. |
| m\_w\_e | tuple | To store the node and edge with minimum weight among all the edges in edge. |
| min\_wt | int | To keep track of minimum weighted edge among edges in edges. |
| i | int | For traversing through the edges |
|  | | | |
| **convert\_to\_mst(n, outputPath)** | n | int | Stores no.s of nodes. |
| gr | dictionary | Stores the input graph. |
| mst\_edges | set | To store the output mst edges. |
| dsu | D\_S\_U.DSU Object | To make union of nodes so that unnecessary nodes do not get added to mst. |
| grh | dictionary | To store a copy of input graph. |
| node | Int | To traverse through the nodes of the graph. |
| x | list | To make a tuple of two nodes and their edges with minimum weight which gets added to mst\_edges. |
| temp\_gr | defaultdictionary | To make supernodes with contracted edges. |
| ax | int | For traversing through the nodes for contracting inner edges. |
| group | int | For traversing through supernodes of temp\_gr. |
| temp\_edges | list | For finding min weighted edge for a group/supernode. |
| nd | int | For traversing through the nodes present in a supernode. |
| node1 | Int | For storing smaller node between nd and the node with minimum weighted edge to it. |
| node2 | int | For storing larger node between nd and the node with minimum weighted edge to it. |
| bx | list | For making a list of node1, node2 and weight of the edge between them. |
| edge | tuple | For finding and storing the minimum weighted edge between the nodes of two supernodes. |
|  | | | |
| **getInput(inputPath)** | inputPath | string | Stores the location path of the input file. |
| mygraph | defaultdictionary | To store the input graph. |
| file | io.TextIOWrapper | To read the input file. |
| lines | list | To store the items of input files as list. |
| currentLine | string | To fetch the inputs line by line. |
| x | int | To temporarily store source node. |
| y | int | To temporarily store destination node. |
| w | int | To temporarily store the weight of the edge between x(source node) and y(destination node). |
| node | int | To traverse through the nodes of the graph for sorting it’s edges. |
|  | | | |
| **saveOuput(outputPath, mst\_edges)** | mst\_edges | set | It stores the output mst. |
| outputPath | string | It stores the location path where output has to be saved. |
| output\_str | string | To store output mst with output message. |
| edges | string | To traverse through the generated mst. |
| file | io.TextIOWrapper | To access the output file to save the output data. |
|  | | | |
| **generate\_mst(n)** | n | int | Stores no.s of nodes. |
| inputpath | string | To store the location path of the input file from constants.py |
| ouputpath | string | To store the location path of the output file from constants. py |
| gr | dictionary | To get the input graph from input file and store it temporarily. |

**prim.py :**

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| --- | --- | --- | --- |
|  | **Variable name** | **Type** | **Use** |
| **Global Variables** | pq | queue.PriorityQueue | To be used in the algorithm for sorting the edges based on weight. |
|  | | | |
| **Convert\_to\_mst(n, gr, outputPath)** | n | int | Stores no.s of nodes. |
| gr | dictionary | Stores the input graph. |
| mst\_edges | set | To store the output mst edges. |
| dsu | D\_S\_U.DSU Object | To make union of nodes so that unnecessary nodes do not get added to mst. |
| edges | set | To keep track that duplicate edges are not added to mst. |
| edge | tuple | To store the tuple removed from pq(priority queue). |
| edge\_ | tuple | Temporary variable to store the edge and it’s weight as tuple which will be added to pq(priority queue). |
| x | list | To traverse through the edges of a node. |
|  | | | |
| **getInput(inputPath)** | inputPath | string | Store the location path of the input file. |
| mygraph | defaultdictionary | To store the input graph |
| file | io.TextIOWrapper | To read the input file. |
| lines | list | To store the items of input files as list. |
| currentLine | string | To fetch the inputs line by line. |
| x | int | To temporarily store source node. |
| y | int | To temporarily store destination node. |
| w | int | To temporarily store the weight of the edge between x(source node) and y(destination node). |
|  | | | |
| **saveOuput(outputPath, mst\_edges)** | mst\_edges | set | It stores the output mst. |
| outputPath | string | It stores the location path where output has to be saved. |
| output\_str | string | To store output mst with output message. |
| edges | string | To traverse through the generated mst. |
| file | io.TextIOWrapper | To access the output file to save the output data. |
|  | | | |
| **generate\_mst(n)** | n | int | Stores no.s of nodes. |
| inputpath | string | To store the location path of the input file from constants.py |
| ouputpath | string | To store the location path of the output file from constants. py |
| gr | dictionary | To get the input graph from input file and store it temporarly. |

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|  | **Variable name** | **Type** | **Use** |
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