Project 0
ARTIFICIAL INTELLIGENCE

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1.Files are edited as required.

2.In addition to the required functions there are some extra functions that are used as helping functions for the required implementation of the programm. Specifically I have implemented the following:

- A class called “`PriorityQueue`” that has the following functions:
- __init__(): Initialize a class with two members, ‘heap’ -> empty list and ‘count’ ->a variable to count the actual number of items in the heap(list)
- isEmpty(): Checks is the heap is empty or not
- findItem(item,priority): Traverse the list and check if the given item corresponds to any of the items in the heap. Returns the index of the corresponding item and -1 if the item we are searching for has no duplicate in the list.
- push(item,priority): Call the previous function and if -1 is returned, inserts the new item in the heap calling the heappush() function of ‘heapq’ python library that inserts a new element on the heap maintaining the heap invariant.
- pop(): Calls heappop() function of ‘heapq’ python library thar, as is mentioned in the documentation: “Pop and return the smallest item from the *heap*, maintaining the heap invariant. If the heap is empty, IndexError is raised”
- update(item,priority): Calling findItem() function, checks if the element that we want to update is already in the heap. If the item is found in the heap, checks if the priority we want to update is greater than the priority that item already have and if so, changes the priority of the element on the heap by using basic list functions (the heap is implemented with e list) and than, calls from ‘heapq’ python library ‘heapify()’ function to transform the new updated list into a heap in

linear time. If the priority of the item found in the heap is greater than the one we want to update, nothing is done and the heap remains as it is. *Priority is expressed using an integer. Larger priority of an item means that this integer that expres its priority is smaller than some other integer. Example if an item called “task1” has priority equal to 1 and an item called “task3” has priority equal to 3, “task1” has greater priority as 1<3.)

- Outside the class is implemented a PQSort(list) function which takes a list of integers as parameters and returns it sorted in increasing order by using the “PriorityQueue” class. Initially the function creates an empty list and an instance of the class (so basically it creates an empty heap) and then calls push(item,priority) function of the class to insert each element of the given list in the heap. Then by calling pop() function of the class delete the smaller item from the heap and insert it on the newly created list using the ‘append()’ function of python library for lists. As the heapworks as a min heap in every iteration , until the heap is left empty, the item with the smallest priority is deleted from the heap and added at the end of the list, the items in the list are added in increasing order. Finally the function returns the sorted list. (In this case the heap stores each integer of the list as a tuple where item is called after the integer and the priority of the item is equal to the value of the integer)