

```
console.aws.amazon.com/cloud9/ide/f57ef788c87f4dee8f3fa0ca75e5830e?#

File Edit Find View Go Run Tools Window Support Preview Run

Astar.py x bestfirstsearch.py x Astarvialugoj.py x +

1 dict_hn={'Arad':236,'Bucharest':0,'Craiova':1160,'Drobeta':242,'Eforie':161,
2         'Fagaras':176,'Giurgiu':77,'Hirsova':151,'Iasi':226,'Lugoj':244,
3         'Mehadia':241,'Neamt':234,'Oradea':380,'Pitesti':100,'Rimnicu':193,
4         'Sibiu':253,'Timisoara':329,'Urziceni':80,'Vaslui':199,'Zerind':374}
5
6 dict_gn=dict()
7 Arad=dict(Zerind=75,Timisoara=118,Sibiu=140),
8 Bucharest=dict(Urziceni=85,Giurgiu=90,Pitesti=101,Fagaras=211),
9 Craiova=dict(Drobeta=120,Pitesti=138,Rimnicu=146),
10 Drobeta=dict(Mehadia=75,Craiova=120),
11 Eforie=dict(Hirsova=86),
12 Fagaras=dict(Sibiu=99,Bucharest=211),
13 Giurgiu=dict(Bucharest=90),
14 Hirsova=dict(Eforie=86,Urziceni=98),
15 Iasi=dict(Neamt=87,Vaslui=92),
16 Lugoj=dict(Mehadia=70,Timisoara=111),
17 Mehadia=dict(Lugoj=70,Drobeta=75),
18 Neamt=dict(Iasi=87),
19 Oradea=dict(Zerind=71,Sibiu=151),
20 Pitesti=dict(Rimnicu=97,Bucharest=101,Craiova=138),
21 Rimnicu=dict(Sibiu=80,Pitesti=97,Craiova=146),
22 Sibiu=dict(Rimnicu=80,Fagaras=99,Arad=140,Oradea=151),
23 Timisoara=dict(Lugoj=111,Arad=118),
24 Urziceni=dict(Bucharest=85,Hirsova=98,Vaslui=142),
25 Vaslui=dict(Iasi=92,Urziceni=142),
26 Zerind=dict(Oradea=71,Arad=75)

18:21 Python Spaces: 4
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console.aws.amazon.com/cloud9/ide/f57ef788c87f4dee8f3fa0ca75e5830e?#

File Edit Find View Go Run Tools Window Support Preview Run

Astar.py x bestfirstsearch.py x Astarvialugoj.py x +

29
30 start='Arad'
31 goal='Bucharest'
32 result=''
33
34 def get_fn(citystr):
35     cities=citystr.split(',')
36     hn=gn=0
37     for ctr in range(0,len(cities)-1):
38         gn=gn+dict_gn[cities[ctr]][cities[ctr+1]]
39         hn=hn+dict_hn[cities[len(cities)-1]]
40     return(hn,gn)
41
42 def printout(cityq):
43     for i in range(0,cityq.qsize()):
44         print(cityq.queue[i])
45
46 def expand(cityq):
47     global result
48     tot,citystr,thiscity=cityq.get()
49     nexttot=999
50     if not cityq.empty():
51         nexttot,nextcitystr,nextthiscity=cityq.queue[0]
52     if thiscity==goal and tot<nexttot:
53         result=citystr+'::'+str(tot)
54         return
55     print("Expanded city-----",thiscity)
56     print("Second best f(n)-----",nexttot)
57     tempq=Q.PriorityQueue()
58     for cty in dict_gn[thiscity]:
59         for cty in dict_gn[thiscity]:
60             tempq.put((get_fn(citystr+','+cty),citystr+','+cty,cty))
61
62     ctrtot,ctrctystr,ctrthcity=tempq.get()
63     if ctrtot<nexttot:
64         cityq.put((ctrtot,ctrctystr,ctrthcity))
65     else:
66         cityq.put((ctrtot,citystr,thiscity))
67
68 printout(cityq)
69 expand(cityq)
70 def main():
71     cityq=Q.PriorityQueue()
72     thiscity=start
73     cityq.put((999,"NA","NA"))
74     cityq.put((get_fn(start),start,thiscity))
75     expand(cityq)
76     print(result)
77     main()
```

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console.aws.amazon.com/cloud9/ide/f57ef788c87f4dee8f3fa0ca75e5830e?#

File Edit Find View Go Run Tools Window Support Preview Run

Astar.py x bestfirstsearch.py x Astarvialugoj.py x +

48 global result
49 tot,citystr,thiscity=cityq.get()
50 nexttot=999
51 if not cityq.empty():
52     nexttot,nextcitystr,nextthiscity=cityq.queue[0]
53 if thiscity==goal and tot<nexttot:
54     result=citystr+'::'+str(tot)
55     return
56 print("Expanded city-----",thiscity)
57 print("Second best f(n)-----",nexttot)
58 tempq=Q.PriorityQueue()
59 for cty in dict_gn[thiscity]:
60     tempq.put((get_fn(citystr+','+cty),citystr+','+cty,cty))
61
62 for ctr in range(1,3):
63     ctrtot,ctrctystr,ctrthcity=tempq.get()
64     if ctrtot<nexttot:
65         cityq.put((ctrtot,ctrctystr,ctrthcity))
66     else:
67         cityq.put((ctrtot,citystr,thiscity))
68
69 printout(cityq)
70 expand(cityq)
71 def main():
72     cityq=Q.PriorityQueue()
73     thiscity=start
74     cityq.put((999,"NA","NA"))
75     cityq.put((get_fn(start),start,thiscity))
76     expand(cityq)
77     print(result)
78     main()
```

```
bash - "ip-172-31-15-155" x bestfirstsearch.py - Stoppe x Astar.py - Stopped x Astarvialugoj.py - Stoppe x
Run Command: bestfirstsearch.py Runner: Python 3 CWD ENV
Expanded city----- Arad
Second best f(n)----- 999
(393, 'Arad,Sibiu', 'Sibiu')
(999, 'NA', 'NA')
(447, 'Arad,Timisoara', 'Timisoara')
Expanded city----- Sibiu
Second best f(n)----- 447
(413, 'Arad,Sibiu,Rimnicu', 'Rimnicu')
(415, 'Arad,Sibiu,Fagaras', 'Fagaras')
(447, 'Arad,Timisoara', 'Timisoara')
(999, 'NA', 'NA')
Expanded city----- Rimnicu
Second best f(n)----- 415
(415, 'Arad,Sibiu,Fagaras', 'Fagaras')
(417, 'Arad,Sibiu,Rimnicu', 'Rimnicu')
(447, 'Arad,Timisoara', 'Timisoara')
```

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bash - "ip-172-31-15-155" x bestfirstsearch.py - Stoppe x Astar.py - Stopped x Astarvialugoj.py - Stoppe x
Run Command: bestfirstsearch.py Runner: Python 3 CWD ENV
Second best f(n)----- 418
(417, 'Arad,Sibiu,Rimnicu,Pitesti', 'Pitesti')
(999, 'NA', 'NA')
(450, 'Arad,Sibiu,Fagaras', 'Fagaras')
(526, 'Arad,Sibiu,Rimnicu', 'Rimnicu')
Expanded city----- Pitesti
Second best f(n)----- 447
(418, 'Arad,Sibiu,Rimnicu,Pitesti,Bucharest')
(447, 'Arad,Timisoara', 'Timisoara')
(607, 'Arad,Sibiu,Rimnicu,Pitesti', 'Pitesti')
(526, 'Arad,Sibiu,Rimnicu', 'Rimnicu')
(450, 'Arad,Sibiu,Fagaras', 'Fagaras')
(999, 'NA', 'NA')
Arad,Sibiu,Rimnicu,Pitesti,Bucharest:418
```

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console.aws.amazon.com/cloud9/ide/f57ef788c87f4dee8f3fa0ca75e5830e?#
File Edit Find View Go Run Tools Window Support Preview Run
Go to Anything (Ctrl-P)
Dr.M.Aruna - Ba
RA1911003010663
RA1911003010665
RA1911003010666
RA1911003010667
RA1911003010668
RA1911003010669
RA1911003010670
RA1911003010671
RA1911003010672
RA1911003010673
RA1911003010674
RA1911003010675
RA1911003010676
RA1911003010677
Astar.py
Astarvialugoj
Astarvialugoj.py
bestfirstsearch.py
bfs.py
CamelBanana.py
1 dict_hn={'Arad':136,'Bucharest':9,'Craiova':160,'Drobeta':242,'Eforie':161,
2 'Fagaras':176,'Giurgiu':77,'Hirsova':151,'Iasi':220,'Lugoj':144,
3 'Mehadia':241,'Neamt':234,'Oradea':380,'Pitesti':100,'Rimnicu':193,
4 'Sibiu':253,'Timisoara':329,'Urziceni':80,'Vaslui':199,'Zerind':374}
5
6 dict_gn=dict(
7 Arad=dict(Zerind=75,Timisoara=118,Sibiu=140),
8 Bucharest=dict(Urziceni=85,Giurgiu=90,Pitesti=101,Fagaras=211),
9 Craiova=dict(Drobeta=120,Pitesti=138,Rimnicu=146),
10 Drobeta=dict(Mehadia=75,Craiova=120),
11 Eforie=dict(Hirsova=86),
12 Fagaras=dict(Sibiu=99,Bucharest=211),
13 Giurgiu=dict(Bucharest=90),
14 Hirsova=dict(Eforie=86,Urziceni=98),
15 Iasi=dict(Neamt=87,Vaslui=92),
16 Lugoj=dict(Mehadia=70,Timisoara=111),
17 Mehadia=dict(Lugoj=70,Drobeta=75),
18 Neamt=dict(Iasi=87),
19 Oradea=dict(Zerind=71,Sibiu=151),
20 Pitesti=dict(Rimnicu=97,Bucharest=101,Craiova=138),
21 Rimnicu=dict(Sibiu=80,Pitesti=97,Craiova=146),
22 Sibiu=dict(Rimnicu=80,Fagaras=99,Arad=140,Oradea=151),
23 Timisoara=dict(Lugoj=111,Arad=118),
24 Urziceni=dict(Bucharest=85,Hirsova=98,Vaslui=142),
25 Vaslui=dict(Iasi=92,Urziceni=142),
26 Zerind=dict(Oradea=71,Arad=75)
27 )
28 import queue as q
71:28 Python Spaces: 4
bash - "ip-172-31-15-155" x bestfirstsearch.py - Stoppe x Astar.py - Stopped x Astarvialugoj.py - Stoppe x
Run Command: bestfirstsearch.py Runner: Python 3 CWD ENV
```

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console.aws.amazon.com/cloud9/ide/f57ef788c87f4dee8f3fa0ca75e5830e?#

File Edit Find View Go Run Tools Window Support Preview Run

Go to Anything (Ctrl-P)

Dr.M.Aruna - Ba
  RA1911003010663
  RA1911003010665
  RA1911003010666
  RA1911003010667
  RA1911003010668
  RA1911003010669
  RA1911003010670
  RA1911003010671
  RA1911003010672
  RA1911003010673
  RA1911003010674
  RA1911003010675
  RA1911003010676
  RA1911003010677
  Astar.py
  Astarvialugoj
  Astarvialugoj.py
  bestfirstsearch.py
  bfs.py
  CamelBanana.py

28 import queue as Q
29
30
31 start='Arad'
32 goal='Bucharest'
33 result=''
34
35 def get_fn(citystr):
36     cities=citystr.split(',')
37     hn=gn=0
38     for ctr in range(0,len(cities)-1):
39         gn=gn+dict_gn[cities[ctr]][cities[ctr+1]]
40         hn=dict_hn[cities[len(cities)-1]]
41     return(hn+gn)
42
43 def printout(cityq):
44     for i in range(0,cityq.qsize()):
45         print(cityq.queue[i])
46
47 def expand(cityq):
48     global result
49     tot,citystr,thiscity=cityq.get()
50     nexttot=999
51     if not cityq.empty():
52         nexttot,nextcitystr,nextthiscity=cityq.queue[0]
53     if thiscity==goal and tot<nexttot:
54         result=citystr+'::'+str(tot)
55     return
56
57 bash - "ip-172-31-15-155" x bestfirstsearch.py - Stoppe x Astar.py - Stopped x Astarvialugoj.py - Stoppe x
Run Command: bestfirstsearch.py Runner: Python 3 CWD ENV
```

```
console.aws.amazon.com/cloud9/ide/f57ef788c87f4dee8f3fa0ca75e5830e?#

File Edit Find View Go Run Tools Window Support Preview Run

Go to Anything (Ctrl-P)

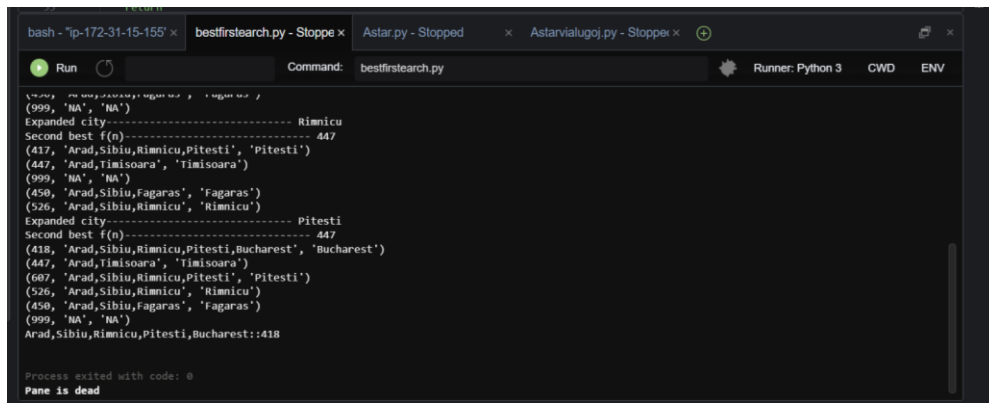
Dr.M.Aruna - Ba
  RA1911003010663
  RA1911003010665
  RA1911003010666
  RA1911003010667
  RA1911003010668
  RA1911003010669
  RA1911003010670
  RA1911003010671
  RA1911003010672
  RA1911003010673
  RA1911003010674
  RA1911003010675
  RA1911003010676
  RA1911003010677
  Astar.py
  Astarvialugoj
  Astarvialugoj.py
  bestfirstsearch.py
  bfs.py
  CamelBanana.py

50 nexttot=999
51 if not cityq.empty():
52     nexttot,nextcitystr,nextthiscity=cityq.queue[0]
53 if thiscity==goal and tot<nexttot:
54     result=citystr+'::'+str(tot)
55 return
56 print("Expanded city-----",thiscity)
57 print("Second best f(n)-----",nexttot)
58 tempq=queue.PriorityQueue()
59 for cty in dict_gn[thiscity]:
60     tempq.put((get_fn(citystr+', '+cty),citystr+', '+cty,cty))
61 for ctr in range(1,3):
62     ctrtot,ctrctystr,ctrthiscity=tempq.get()
63     if ctrtot<nexttot:
64         cityq.put((ctrtot,ctrctystr,ctrthiscity))
65     else:
66         cityq.put((ctrtot,citystr,thiscity))
67 break
68 printout(cityq)
69 expand(cityq)
70 def main():
71     cityq=queue.PriorityQueue()
72     thiscity=start
73     cityq.put((999,"NA","NA"))
74     cityq.put((get_fn(start),start,thiscity))
75     expand(cityq)
76     print(result)
77     main()

bash - "ip-172-31-15-155" x bestfirstsearch.py - Stoppe x Astar.py - Stopped x Astarvialugoj.py - Stoppe x
Run Command: bestfirstsearch.py Runner: Python 3 CWD ENV
```

```
bash - "ip-172-31-15-155" x bestfirstsearch.py - Stoppe x Astar.py - Stopped x Astarvialugoj.py - Stoppe x
Run Command: bestfirstsearch.py Runner: Python 3 CWD ENV

Expanded city----- Arad
Second best f(n)----- 999
(393, 'Arad,Sibiu', 'Sibiu')
(999, 'NA', 'NA')
(447, 'Arad,Timisoara', 'Timisoara')
Expanded city----- Sibiu
Second best f(n)----- 447
(413, 'Arad,Sibiu,Rimnicu', 'Rimnicu')
(415, 'Arad,Sibiu,Fagaras', 'Fagaras')
(447, 'Arad,Timisoara', 'Timisoara')
(999, 'NA', 'NA')
Expanded city----- Rimnicu
Second best f(n)----- 415
(415, 'Arad,Sibiu,Fagaras', 'Fagaras')
(417, 'Arad,Sibiu,Rimnicu', 'Rimnicu')
(447, 'Arad,Timisoara', 'Timisoara')
(999, 'NA', 'NA')
Expanded city----- Fagaras
Second best f(n)----- 417
(417, 'Arad,Sibiu,Rimnicu', 'Rimnicu')
(450, 'Arad,Sibiu,Fagaras', 'Fagaras')
```



```
bash - "ip-172-31-15-155" x bestfirstsearch.py - Stoppe x Astar.py - Stopped Astarvialugoj.py - Stoppe x
Run Command: bestfirstsearch.py Runner: Python 3 CWD ENV

(999, 'NA', 'NA')
Expanded city----- Rimnicu
Second best f(n)----- 447
(417, 'Arad,Sibiu,Rimnicu,Pitesti', 'Pitesti')
(447, 'Arad,Timisoara', 'Timisoara')
(999, 'NA', 'NA')
(450, 'Arad,Sibiu,Fagaras', 'Fagaras')
(526, 'Arad,Sibiu,Rimnicu', 'Rimnicu')
Expanded city----- Pitesti
Second best f(n)----- 447
(418, 'Arad,Sibiu,Rimnicu,Pitesti,Bucharest', 'Bucharest')
(447, 'Arad,Timisoara', 'Timisoara')
(607, 'Arad,Sibiu,Rimnicu,Pitesti', 'Pitesti')
(526, 'Arad,Sibiu,Rimnicu', 'Rimnicu')
(450, 'Arad,Sibiu,Fagaras', 'Fagaras')
(999, 'NA', 'NA')
Arad,Sibiu,Rimnicu,Pitesti,Bucharest:418

Process exited with code: 0
Pane is dead
```

Result:-

A star and Best First Search was successfully implemented on the Romanian Map Problem