wtf

April 26, 2022

[2]:
```
import random
import time
import numpy as np
from scipy.sparse import csr_matrix
from scipy.sparse.csgraph import maximum_flow
```

[3]:
```
#datetime
time.time()
```

[3]:
```
1651000595.1813176
```

[4]:
```
#example of a graph 1-->2 with edge weight of 5
graph = csr_matrix([[0, 5], [0, 0]])
print(graph.toarray())
maximum_flow(graph, 0, 1).flow_value
```

```
[[0 5]
 [0 0]]
```

[4]:
```
5
```

[38]:
```
#setting up the flow network
n = round(time.time()%1 * 1000)
adj_mat = (np.random.rand(n,n) * 1000).round().astype(int)
mask = np.random.binomial(n=1, p=0.1,size=[n*n]).reshape(n, n) #can mess with␣
 ↪p, say .01 or random.random()
adj_mat = np.where(mask, adj_mat, 0)
graph = csr_matrix(adj_mat)
adj_mat
#node i takes in some input and weights it by its output, then pushes it out to␣
 ↪node i + 1
```

[38]:
```
array([[  0,   0,   0, …,   0,   0,   0],
       [  0,  78,   0, …,   0,   0,   0],
       [  0,   0,   0, …,   0, 235,   0],
       …,
       [  0,   0,   0, …,   0,   0,   0],
       [  0,   0,   0, …,   0,   0,   0],
```

```
       [  0,   0,   0, …,   0,   0,   0]])
```

[39]:
```
k = round(random.random()*(n-1)) #number of pushes
print("n = ", n, "k = ", k)
val = 10 ** 6
cumulative_weight = 1
for i in range(k):
    #change seed based on previous seed
    random.seed(round(random.random() * (10 ** 5)))
    #push flow in graph from node i to i+1, restricted by the capacity of each␣
 ↪edge (specified in adj mat)
    #and weighted by a value generated by the node it is traveling from
    weight = random.random()*2 + .5
    val = min(maximum_flow(graph, i, i+1).flow_value, val) * weight
print(val)
print(maximum_flow(graph, 0, k+1).flow_value)
```

```
887
20529.28005332147
41795
```

[ ]:
```
"""
playing around with graph size, probability of a connection between two nodes␣
 ↪(p), and the weighting function
making plots of output val over many trials as a function of different␣
 ↪parameters
"""
```