NPTEL

NPTEL ONLINE CERTIFICATION COURSE

Discrete Mathematics
Graph Theory – 3 &
Generating Functions

NetworkX - Coloring

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We have seen how to drawn Eulerian graphs, how to obtain the Eulerian circuit, very fine whether a graph is Eulerian or not, we saw something about isomorphic graphs, we were playing around by checking if two graphs are isomorphic or not.

Now moving on to Hamiltonian and planar graphs, it is out of scope of this course to check whether graphs are Hamiltonian or obtaining the Hamiltonian circuit, and the same holds true for planar graph as well.

If you remember the professor had mentioned that it is hard to find out if a graph is Hamiltonian or not, right, the same holds true here to, it is out of the scope of this course.

Now there is a simple command to check whether a graph can be colored or not, and we can also obtain the colors, let us see how? As an always I'll start with import NetworkX as nx, now I'm going to create a graph G = nx.complete_graph on let say 5 vertices,
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IPython 6.4.0 -- An enhanced Interactive Python.

In [1]: import networkx as nx

In [2]: G=nx.complete_graph(5)
```


complete graph on 5 vertices, now the command is nx.coloring.greedy_color (G) you must be wondering what is this greedy color,

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IPython 6.4.0 -- An enhanced Interactive Python.

In [1]: import networkx as nx

In [2]: G=nx.complete_graph(5)

In [3]: nx.coloring.greedy_color(G)
```


well, greedy coloring is the name given for the approach which is followed to color, if you are interested you are welcome to refer and check what is greedy coloring, it is an algorithm which uses the greedy approach to color the graph.

Now you see here,

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IPython 6.4.0 -- An enhanced Interactive Python.

In [1]: import networkx as nx

In [2]: G=nx.complete_graph(5)

In [3]: nx.coloring.greedy_color(G)
Out[3]: {0: 0, 1: 1, 2: 2, 3: 3, 4: 4}

In [4]:
```

we have drawn a complete graph on 5 vertices with labels 0, 1, 2, 3, 4, now since it's a complete graph we need n colors that is 5 colors, so what are the colors given here 0, 1, 2, 3, and 4, so this is called as dictionary, do not worry much, the numbers before the colon represents the vertices and the numbers after the colon represents the colors.

Now let us check for the star graph, H = nx.star_graph on let say 6 vertices, and I'm going to do this nx.greedy coloring of H,

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IPython 6.4.0 -- An enhanced Interactive Python.

In [1]: import networkx as nx

In [2]: G=nx.complete_graph(5)

In [3]: nx.coloring.greedy_color(G)
Out[3]: {0: 0, 1: 1, 2: 2, 3: 3, 4: 4}

In [4]: H=nx.star_graph(6)

In [5]: nx.coloring.greedy_color(H)
Out[5]: {0: 0, 1: 1, 2: 1, 3: 1, 4: 1, 5: 1, 6: 1}

In [6]:
```

so do you see that two colors suffins to color the star graph, the center vertex gets this color 0 and on the other vertices get the color 1.

Now let us generate some random graph nx.gnm_random_graph on let say 10 vertices and 12 edges,
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```
In [4]: H=nx.star_graph(6)

In [5]: nx.coloring.greedy_color(H)
Out[5]: {0: 0, 1: 1, 2: 1, 3: 1, 4: 1, 5: 1, 6: 1}

In [6]: K=nx.gnm_random_graph(10,12)

In [7]: K=nx.gnm_random_graph(10,12)
```

now I'm going to color this graph K,
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```
In [4]: H=nx.star_graph(6)

In [5]: nx.coloring.greedy_color(H)
Out[5]: {0: 0, 1: 1, 2: 1, 3: 1, 4: 1, 5: 1, 6: 1}

In [6]: K=nx.gnm_random_graph(10,12)

In [7]: nx.coloring.greedy_color(K)
Out[7]: {1: 0, 3: 0, 4: 1, 5: 1, 8: 1, 0: 2, 2: 0, 6: 2, 7: 0, 9: 1}

In [8]:
```

do you observe that on 10 vertices this graph has been colored, right, you can probably draw some graph and check if the colors match it.

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