## NPTEL

### NPTEL ONLINE CERTIFICATION COURSE

## Discrete Mathematics Graph Theory – 3 & Generating Functions

#### **NetworkX - Coloring**

# By Prof. S.R.S Iyengar Department of Computer Science IIT Ropar

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, (Refer Slide Time: 01:24)

Type "copyright", "credits" or "license" for more information.

IPython 6.4.0 -- An enhanced Interactive Python.

In [1]: import networkx as nx

In [2]: G=nx.complete\_graph(5)

Ŧ



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

(Refer Slide Time: 01:46)

```
Type "copyright", "credits" or "license" for more information.

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, (Refer Slide Time: 02:12)

```
Type "copyright", "credits" or "license" for more information.

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,

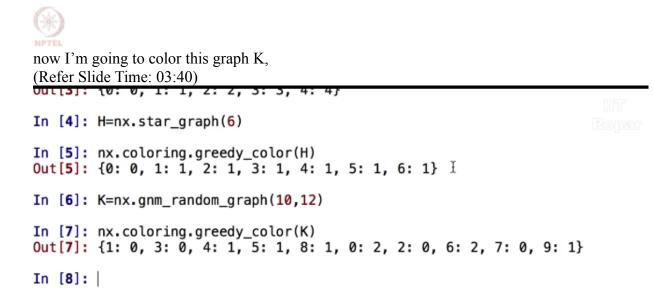
```
(Refer Slide Time: 03:06)
Type "copyright", "credits" or "license" for more information.
IPython 6.4.0 -- An enhanced Interactive Python.
In [1]: import networkx as nx
In [2]: G=nx.complete_graph(5)
In [3]: nx.coloring.greedy_color(G)
Out[3]: {0: 0, 1: 1, 2: 2, 3: 3, 4: 4}
In [4]: H=nx.star_graph(6)
In [5]: nx.colbring.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,

```
(Refer Slide Time: 03:34) ____, ..., ...,
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} I
In [6]: K=nx.gnm_random_graph(10,12)
In [7]: K=nx.gnm_random_graph(10,12)
```





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.

# **IIT MADRAS PRODUCTION**

Founded by Department of Higher Education Ministry of Human Resources Development Government of India

# www.nptel.iitm.ac.in

**Copyrights Reserved**