

Untitled12

December 15, 2022

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[1]: import networkx as nx
import numpy as np

import matplotlib.pyplot as plt
import seaborn as sns
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[2]: G_BA = nx.barabasi_albert_graph(1000, 7)
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[3]: nx.set_node_attributes(G_BA, False, "is_infected")

nx.set_node_attributes(G_BA, 0, 'day_of_infection')
nx.set_node_attributes(G_BA, 0, 'day_of_immunity')
nx.set_node_attributes(G_BA, False, 'has_been_infected')
nx.set_node_attributes(G_BA, False, 'is_dead')

for i in G_BA.nodes(data=True):
    print(i)
```

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(0, {'is_infected': False, 'day_of_infection': 0, 'day_of_immunity': 0,
'has_been_infected': False, 'is_dead': False})
(1, {'is_infected': False, 'day_of_infection': 0, 'day_of_immunity': 0,
'has_been_infected': False, 'is_dead': False})
(2, {'is_infected': False, 'day_of_infection': 0, 'day_of_immunity': 0,
'has_been_infected': False, 'is_dead': False})
(3, {'is_infected': False, 'day_of_infection': 0, 'day_of_immunity': 0,
'has_been_infected': False, 'is_dead': False})
(4, {'is_infected': False, 'day_of_infection': 0, 'day_of_immunity': 0,
'has_been_infected': False, 'is_dead': False})
(5, {'is_infected': False, 'day_of_infection': 0, 'day_of_immunity': 0,
'has_been_infected': False, 'is_dead': False})
(6, {'is_infected': False, 'day_of_infection': 0, 'day_of_immunity': 0,
'has_been_infected': False, 'is_dead': False})
(7, {'is_infected': False, 'day_of_infection': 0, 'day_of_immunity': 0,
'has_been_infected': False, 'is_dead': False})
(8, {'is_infected': False, 'day_of_infection': 0, 'day_of_immunity': 0,
'has_been_infected': False, 'is_dead': False})
(9, {'is_infected': False, 'day_of_infection': 0, 'day_of_immunity': 0,
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'has_been_infected': False, 'is_dead': False})
(994, {'is_infected': False, 'day_of_infection': 0, 'day_of_immunity': 0,
'has_been_infected': False, 'is_dead': False})
(995, {'is_infected': False, 'day_of_infection': 0, 'day_of_immunity': 0,
'has_been_infected': False, 'is_dead': False})
(996, {'is_infected': False, 'day_of_infection': 0, 'day_of_immunity': 0,
'has_been_infected': False, 'is_dead': False})
(997, {'is_infected': False, 'day_of_infection': 0, 'day_of_immunity': 0,
'has_been_infected': False, 'is_dead': False})
(998, {'is_infected': False, 'day_of_infection': 0, 'day_of_immunity': 0,
'has_been_infected': False, 'is_dead': False})
(999, {'is_infected': False, 'day_of_infection': 0, 'day_of_immunity': 0,
'has_been_infected': False, 'is_dead': False})

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[4]: from collections import Counter
def draw_sick(graph):
    color_map = []
    for i in range(len(graph)):
        if graph.nodes[i]["is_infected"]:
            color_map.append('red')
        if graph.nodes[i]["is_dead"]:
            color_map.append('black')
        else:
            color_map.append('blue')
    print(Counter(color_map))
    nx.draw(graph, node_color=color_map)

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[5]: G_BA.nodes[0]["is_infected"] = True
G_BA.nodes[0]["has_been_infected"] = True
G_BA.nodes[0]["day_of_infection"] = 7
infection_count = 0

for day in range(50):
    new_sick = []
    for node in range(1000):
        if G_BA.nodes[node]["is_infected"]:
            for n in G_BA.neighbors(node):
                if np.random.rand(1) < 0.025:
                    new_sick.append(n)
            if np.random.rand() < 0.03:
                G_BA.nodes[node]["is_dead"] = True
                G_BA.nodes[node]["is_infected"] = False
                G_BA.nodes[node]["day_of_infection"] -= 1
            if G_BA.nodes[node]["day_of_infection"] == 0:
                G_BA.nodes[node]["is_infected"] = False
                G_BA.nodes[node]["day_of_immunity"] = 21
            if G_BA.nodes[node]["day_of_immunity"] > 0:

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        G_BA.nodes[node]["day_of_immunity"] -= 1
    for i in set(new_sick):
        if G_BA.nodes[i]["is_infected"] or G_BA.nodes[i]["day_of_immunity"] > 0:
↳ or G_BA.nodes[node]["is_dead"]:
            continue
        G_BA.nodes[i]["is_infected"] = True
        G_BA.nodes[i]["day_of_infection"] = 7

        G_BA.nodes[i]["has_been_infected"] = True
        infection_count += 1

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[6]: draw_sick(G_BA)
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Counter({'blue': 818, 'red': 371, 'black': 182})
```

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↳
↳ -----
↳
↳ ValueError                                Traceback (most recent call↳
↳ last)

↳ <ipython-input-6-a62b6c369a4b> in <module>
↳ ----> 1 draw_sick(G_BA)

↳ <ipython-input-4-99cff0b17920> in draw_sick(graph)
↳ 10         color_map.append('blue')
↳ 11     print(Counter(color_map))
↳ ---> 12     nx.draw(graph, node_color=color_map)

↳ ~/.local/lib/python3.8/site-packages/networkx/drawing/nx_pylab.py in
↳ draw(G, pos, ax, **kwargs)
↳ 119         kwargs["with_labels"] = "labels" in kwargs
↳ 120
↳ --> 121     draw_networkx(G, pos=pos, ax=ax, **kwargs)
↳ 122     ax.set_axis_off()
↳ 123     plt.draw_if_interactive()

↳ ~/.local/lib/python3.8/site-packages/networkx/drawing/nx_pylab.py in
↳ draw_networkx(G, pos, arrows, with_labels, **kwargs)
↳ 331         pos = nx.drawing.spring_layout(G) # default to spring layout
↳ 332
↳ --> 333     draw_networkx_nodes(G, pos, **node_kwargs)

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334     draw_networkx_edges(G, pos, arrows=arrows, **edge_kwds)
335     if with_labels:

~/local/lib/python3.8/site-packages/networkx/drawing/nx_pylab.py in
↳ draw_networkx_nodes(G, pos, nodelist, node_size, node_color, node_shape,
↳ alpha, cmap, vmin, vmax, ax, linewidths, edgecolors, label, margins)
    460         alpha = None
    461
--> 462     node_collection = ax.scatter(
    463         xy[:, 0],
    464         xy[:, 1],

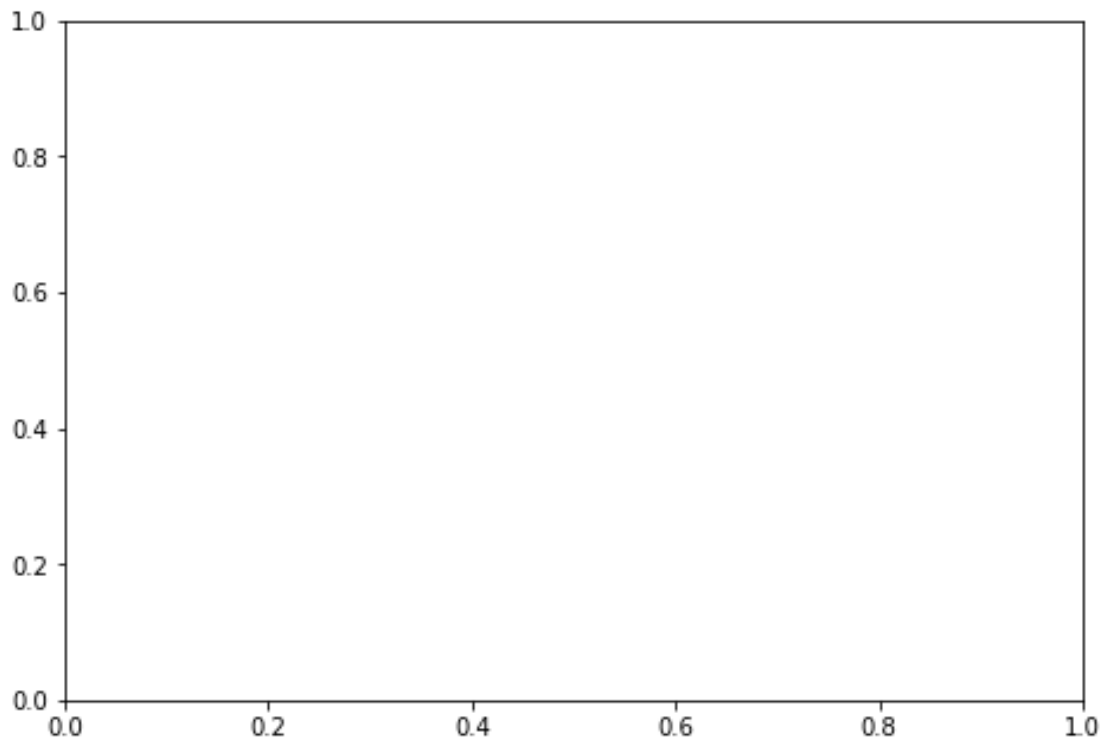
~/local/lib/python3.8/site-packages/matplotlib/__init__.py in inner(ax,
↳ data, *args, **kwargs)
    1359     def inner(ax, *args, data=None, **kwargs):
    1360         if data is None:
-> 1361             return func(ax, *map(sanitize_sequence, args), **kwargs)
    1362
    1363         bound = new_sig.bind(ax, *args, **kwargs)

~/local/lib/python3.8/site-packages/matplotlib/axes/_axes.py in
↳ scatter(self, x, y, s, c, marker, cmap, norm, vmin, vmax, alpha, linewidths,
↳ edgecolors, plotnonfinite, **kwargs)
    4514         orig_edgecolor = kwargs.get('edgecolor', None)
    4515         c, colors, edgecolors = \
-> 4516         self._parse_scatter_color_args(
    4517             c, edgecolors, kwargs, x.size,
    4518             get_next_color_func=self._get_patches_for_fill.
↳ get_next_color)

~/local/lib/python3.8/site-packages/matplotlib/axes/_axes.py in
↳ _parse_scatter_color_args(c, edgecolors, kwargs, xsize, get_next_color_func)
    4364         # NB: remember that a single color is also
↳ acceptable.
    4365         # Besides *colors* will be an empty array if c
↳ == 'none'.
-> 4366         raise invalid_shape_exception(len(colors), xsize)
    4367     else:
    4368         colors = None # use cmap, norm after collection is
↳ created

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ValueError: 'c' argument has 1371 elements, which is inconsistent with 'x' and 'y' with size 1000.



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[7]: i_count = 0
      for i in range(len(G_BA)):
          if G_BA.nodes[i]["has_been_infected"]:
              i_count += 1
```

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[8]: (0.97**7 - 1) * (-1)
```

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[8]: 0.1920171552188702
```

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[9]: i_count
```

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[9]: 873
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[ ]:
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