data_collection

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In this task, we will summarize all the codes we have mentioned in previous task. You are required to fill the missing parts of the codes of this template by the end of this class.

0.1 Section 1: Create network via networkx

Please create an indirect network with 100 nodes and randomly edge connection. You may use the following template

[ ]:
```
import networkx as nx
import matplotlib.pyplot as plt
import random
```

[ ]:
```
def edge_list():
    # Please finishe the edge list creation in this function ...
```

[ ]:
```
# create edge list from your defined function.
edgelist = edge_list()
 # then you can create the graph using the edge list
G = nx.from_edgelist(edgelist)
```

[ ]:
```
# we use the spring layout to determine the position of nodes. You can find␣
 ↪more types of layout in the website
# https://networkx.org/documentation/stable/reference/generated/networkx.
 ↪drawing.layout.spring_layout.html

pos = nx.spring_layout(G)
# Finish the visualization of the network you just created.
```

0.2 Section 2: Create network via the geographic data

[ ]:
```
import geopandas as gpd
import momepy
```

[ ]:
```
# Please read the data in the folder rivernetwork.
gpd_data = gpd.read_file( )
```

[ ]:
```
# Visualize the data structure of the geopandas data
gpd_data.head()
```

```
[ ]: # using the geopands.explode function to explode multi-line into multiple ␣
      ↪single line.

     gpd_data_exploded = gpd_data.explode(ignore_index=True, index_parts=False)
```

```
[ ]: # Now convert the gpd data into networkx via momepy
```

```
[ ]: # Please use this code to visaulize you network

     pos = {node: node for node in G.nodes()}
```

0.3 Section 3: Create network via hydraulic model

Most common hydraulic models developed by US EPA is the EPANET and SWMM. Both files use an inp format. Each model has a corresponding python package, i.e., the wntr and swmmio. We will visualize both models using networkx in this class.

Install the wntr and pyswmm in your computer:

pip install wntr

pip install pyswmm

```
[ ]: from swmmio import Model
     import networkx as nx
```

```
[ ]: model = Model('Drainage_Example.inp')
     G = model.network
     pos = {}
     for node in G.nodes():
         pos[node] = G.nodes[node]['geometry']['coordinates']
```

```
[ ]: # Plost the drainage system in this cell
```

We also have the graph conversion tool for the hydraulic system

```
[ ]: import wntr

     wn = wntr.network.WaterNetworkModel("Drinking_example.inp")

     G =wntr.network.io.to_graph(wn)

     pos = {}
     for node in G.nodes():
         pos[node]  = G.nodes[node]['pos']
```

```
[ ]: nx.draw_networkx(G,
         pos=pos,
         width=0.5,
         with_labels=False,
```

```
    node_color="lightblue",
    edge_color="gray",
    arrowsize = 0.5,
    node_size=0,)
```