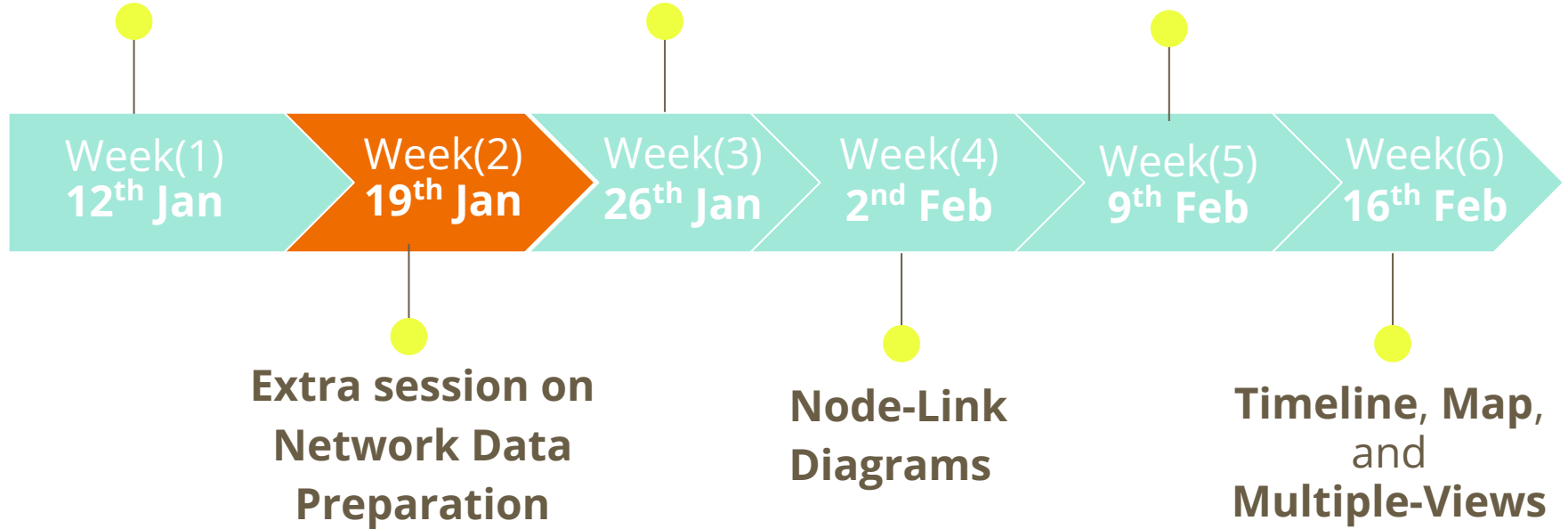# Course Goals

1. **Structure your network data and prepare it** for visualization with the Vistorian.

2. **Define goals of your exploration** and what you aim to learn about your network data using visualizations.

3. **Know a range of network visualizations**, through theory and hands-on use.

4. **Use different types of interactive visualizations** to explore your data.

Network Data Preparation

Data Shaping Techniques and Challenges

Adjacency Matrices

Week(1)
12th Jan

Week(2)
19th Jan

Week(3)
26th Jan

Week(4)
2nd Feb

Week(5)
9th Feb

Week(6)
16th Feb

Extra session on Network Data Preparation

Node-Link Diagrams

Timeline, Map, and **Multiple-Views**

Session Outline

- Discussion on Challenges Faced from Concept Map and Network Tables

- Examples on Company Network

- Re-practice Activities on Creating Network Concept Maps & Tables

Let us hear from you

Types of Data you might dealt with:

- Temporal
- Geolocation
- Numerical
- Strings and text
- Categorical

Have you faced any obstacles in:

- Mapping your nodes and links
- Creating your tables
- Choosing the suitable tables
- Certain data types that you were

Deciding more about your Network

- **Is your network transitioning through time?**
    - E.g. An employee being relocated from department to another
    - E.g. Assigning an employee a new job/assignment/role

- What kind of **link type** should I consider?
    - Check for possible values that you would like to examine how nodes are connected to each other in a different perspective
    -

- What shall I consider for the **link weight** ?
    - ⇒ This shall show how important this relation or how it is distinguishable

Examples of Possible Links in a Company Network

| Example of a **Relation (Link)**	Example of **Link Type**	Example of **Link Weight**
Services provided to clients or other companies	E.g. Service Type	E.g. Cost of a service
Relationship between suppliers and projects	E.g. type of product	E.g. number of project or number of products supplied
Money transferred between projects	E.g. Loan, transfer,..	E.g. Amount of money

Example of Qualitative Data as a Network

Interviews employees and asked them about their complaints and what they want the company to offer

Employee	Complaints	Requests
Shaun	Promotions, Salary	Remote Work
Ann	Salary, Child Care	Remote Work
Martin	Working Hours, Child Care	Recruitment

Exercise (1) : Sample Sketch of your Network (3min)

- Draw an imaginary sketch of how your network would look by choosing 2-4 nodes only.

- Draw the possible links/edges between them.

- List a set of questions you think this network can help you answer.
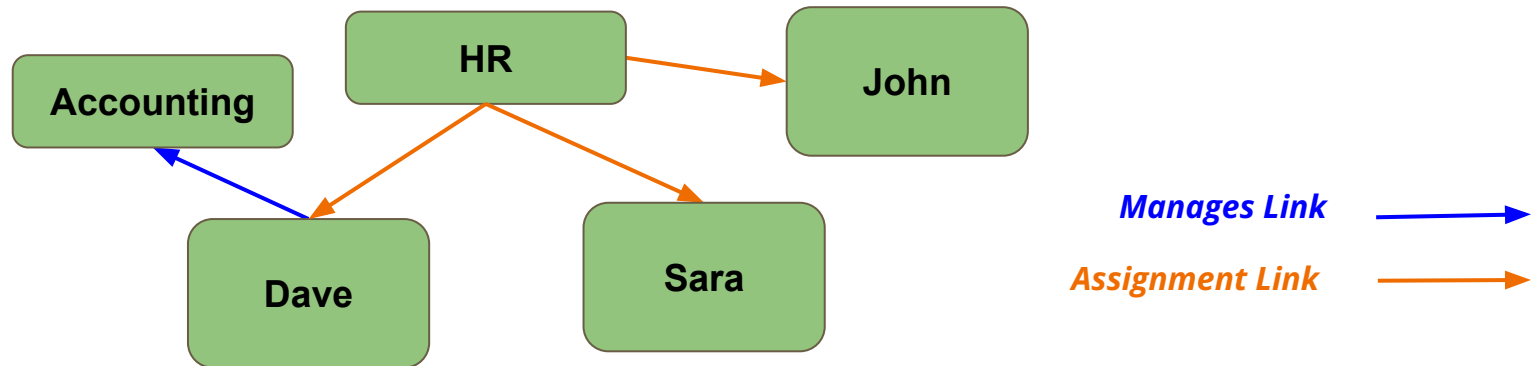
Exercise (2) : Network Concepts (3-5min)

Nodes:

1. List possible nodes in your data. Nodes can be elements or concepts such as person, letter, research paper, .. etc.

2. How many different types of nodes can you identity in your network?

3. Which of your list elements can be selected as node(s) of interests?

# Exercise (2) : Network Concepts (3-5min)

Links:

5. Now, explain how these nodes can be related to each other.
    a. In what type(s) of relation does a node (element) connect to another element?
    b. How many relations can a single node connect to another node?
6. How many different types of links can you identity in your network?
7. Which of those listed you are interested in selecting as edge/links?

Exercise (3) : Create Possible Networks (3 x 3-5min)

1. Pick a set of nodes and and links from previous exercise

2. Draw a small network (around 15 nodes) of **how you imagine** your network topology to look (you can use color, point size, labels, etc. to show additional information).

3. List down questions and possible information you could be able to observe.

4. *Repeat 3 times with different nodes and links.*

Exercise (4) : Concepts Map / Data model (5min)

Assignment Link

Department → **Employee**

Manages Link
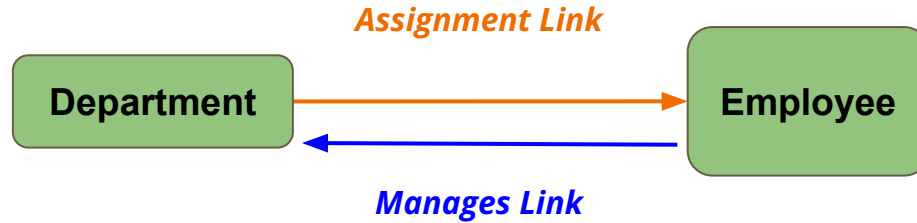
# Exercise (4) : Concepts Map / Data model (5min)

5. For each distinct node type, draw a node shape/entity (ex. rectangle). Write inside the node's shape, the name of the node.
6. Determine the unique ID of your node. In other words, a unique value to distinguish between any two nodes.
7. For each distinct link type, draw a line between the involved nodes' shapes. Write on it the name of the link type.
   a. If it is a directed network : use an arrow to link nodes
   b. If it is a undirected network : use an line to link nodes
   c. If it is a relation between two nodes of the same type: draw a line from the node to itself (recursive).
8. **Congratulations**! Now you have your basic network layout.

Exercise (4) : Network Concepts Map

9. Adding additional (optional info) :

    a. List any properties that describe the nodes themselves: Add those properties to nodes node element (eg. location, type, .. etc)

    b. List any properties that describe the link between any two nodes: Add those properties to link line (eg. location, type, .. etc)

    c. How can I differentiate between adding properties to nodes or links?

        i. If the property describes a node in a persistent nature, then it is a node property.

        ii. If the property describes a node in a varying nature based on the link type, then it is a link property. (for example, the node location changes based on the relation type, or time, or location)

Exercise (4) : Network Concepts Map
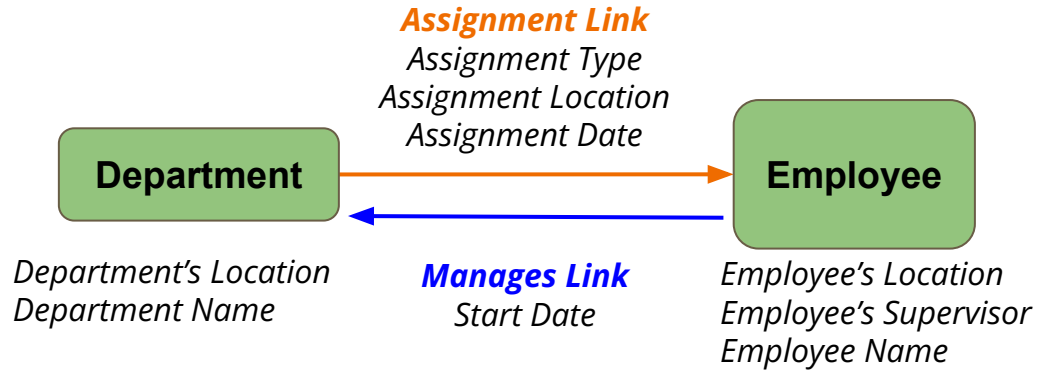
Exercise (4) : Network Concepts Map

Refining your Map:

11. Can you think of any other nodes from different types that you can add and might help answer your questions; if yes go to step 1; else proceed to the next part.

12. In your current node and link lists, do you have any data that you can exclude from your network? That will not contribute to answering any of your questions.

Formatting Network Data into Tables

Types of Network Tables

1. Using **Link table** only

2. Using **Node table** only

3. Complementing **link table and node table** by each other.

Node Table

- Each **row** describes a **single NODE** and it should contains :a **node label** and at least **one relation**
- More descriptive data about the node can be added such as: **node location** and **shape** (differentiates between various types of nodes)

CHILD	MOTHER	FATHER	GOD-FATHER	GOD-MOTHER	PLACE-OF-BIRTH
Bob	Celine	Charles	Dave	Eve	Paris
Ana	Fannie	Gerd	Mike	Dianne	London
Celine	Maria	João	Pedro	Ana	Lisbon

Link Table

- Each row describes a single LINK between Source → Target nodes.
- More descriptive data about the link can be added such as: location, time, type, and weight

ID	Sender	Receiver	Money	Year
0	Anton	Bob	100	1801
1	Anton	Bob	30	1803
2	Anton	Charles	10	1801
3	Anton	Charles	20	1802
3	Anton	Charles	30	1803
4	Anton	Charles	100	1804

Complementing Link Table & Node Table by each other

Eventually, some networks may require both node and link tables:

- link tables to specify links and their attributes, and
- node tables to specify nodes and their attributes.

A node and a link tables are related *through node names*. I.e the node names in the node table must match the names of source and target nodes in the link table.

Exercise 5: Formatting Data

Exercise (5) : Creating your Network Tables

How can I decide the table type that I need?

1. **Link table**: if you have all of your data properties (attributes) placed on links only.

2. **Node table**: if you have your properties placed on nodes only.

3. **Both link and node tables**: if you have properties placed

Exercise (5) : Creating your Network Tables

Pick one of your networks from exercise 3

1. On paper, create a link table for that network (with fake entries if you do not know the real data)
2. If you have node attributes (type, etc..) create a node table for your network.
3. If there is still time, repeat for your other networks from exercise 3.

Wrap up

General Questions?

Next Week

- ***Need your tables***
- Next week's session:
- Ensuring Consistency of your Data
- Tools to assist in Checking Data Consistency
- Common Challenges in Network Visualizations such as:
    - Dealing with unstructured data.
    - Visualizing and exploring large data
- Starting your Exploration Plan
- Importing your Data to the Vistrian

Homework

- Create your tables (at least for a part of your data)

- Pass by our drop-in session for any questions : Monday 3-4 UK time or by email at m.alkadi@sms.ed.ac.uk

- Mini Feedback Form: https://forms.office.com/r/SS4vWNC028