

COLLABORATIVE ML AEC LEARNING : GRAPH NEURAL NETWORK

Agenda

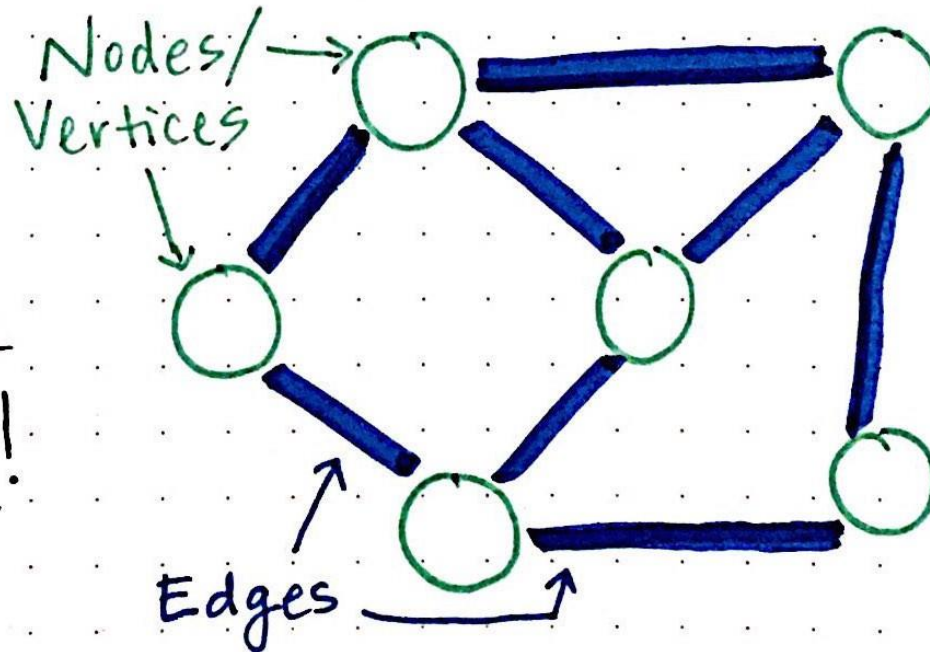
- Recap
- Graph Neural Network Theory
- Colab Implementation
- Paper
- Discussion

Recap

- Neural Network
 - CNN
 - RNN
 - VAE
 - GAN
-
- <https://www.simplilearn.com/tutorials/deep-learning-tutorial/deep-learning-algorithm>

Graph Network Basics

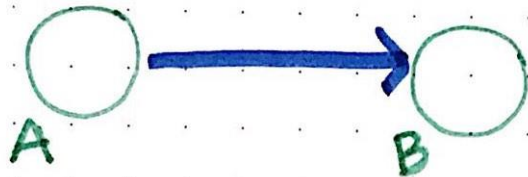
Edges can connect nodes in any possible way! No rules!



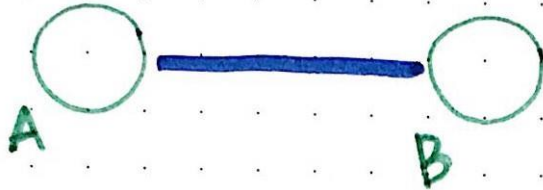
In mathematics, graphs are a way to formally represent a network, which is basically just a collection of objects that are all interconnected.

Graph Network Basics

Different types of edges in graphs



directed edge: There is only a path from A, the origin, to B, the destination



undirected edge: The path between A and B is bidirectional, meaning origin & destination are not fixed.

Graph Network Basics

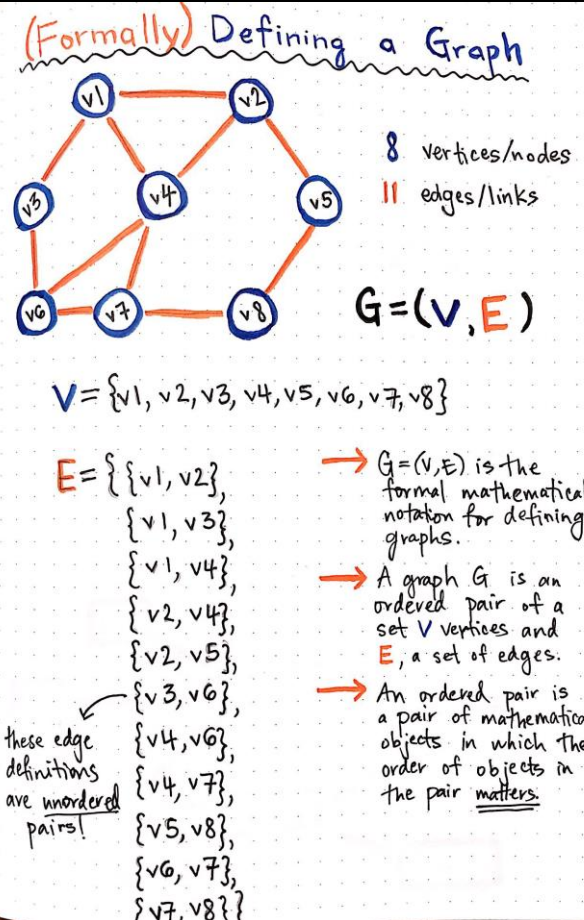
A VERY BRIEF *graph theory* INTRODUCTION TO



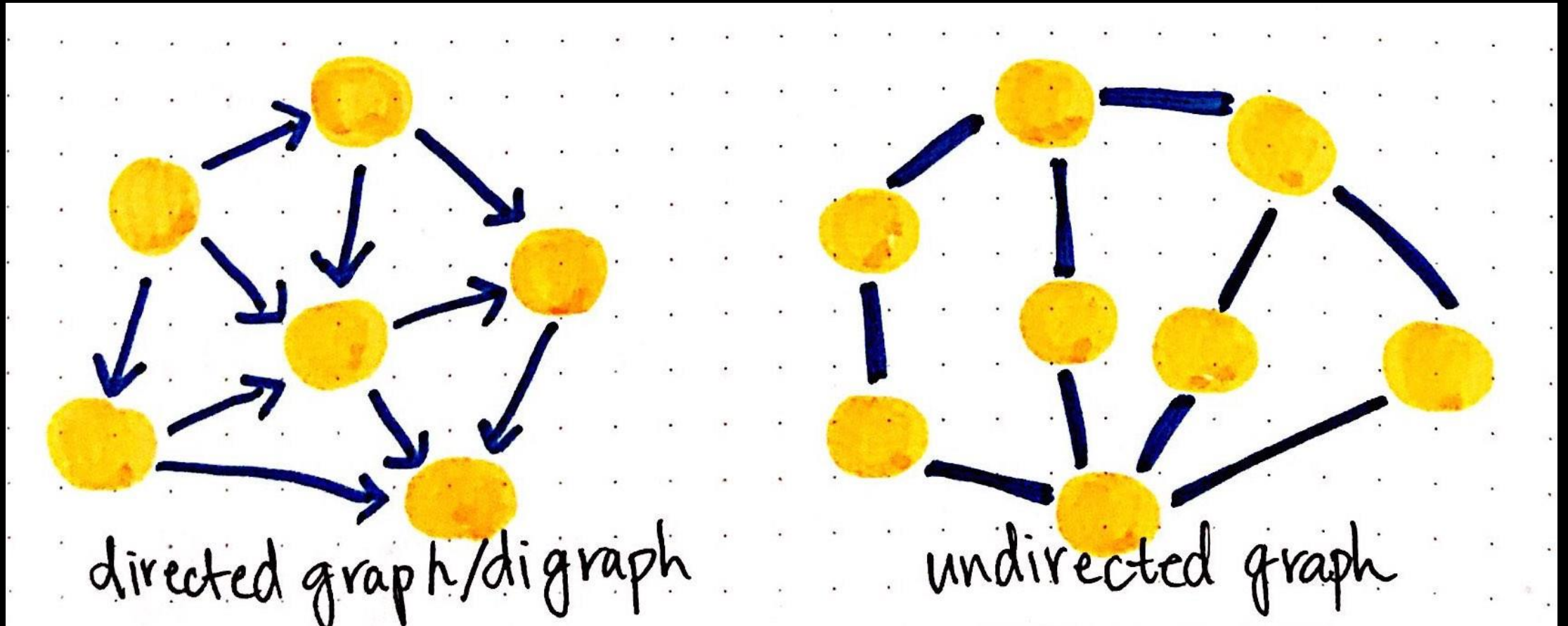
- Graphs are a way to formally represent a network, or a collection of inter connected objects.
- In mathematics, graphs are defined as ordered pairs, with two parts: vertices + edges.

So, what's the definition of a graph?

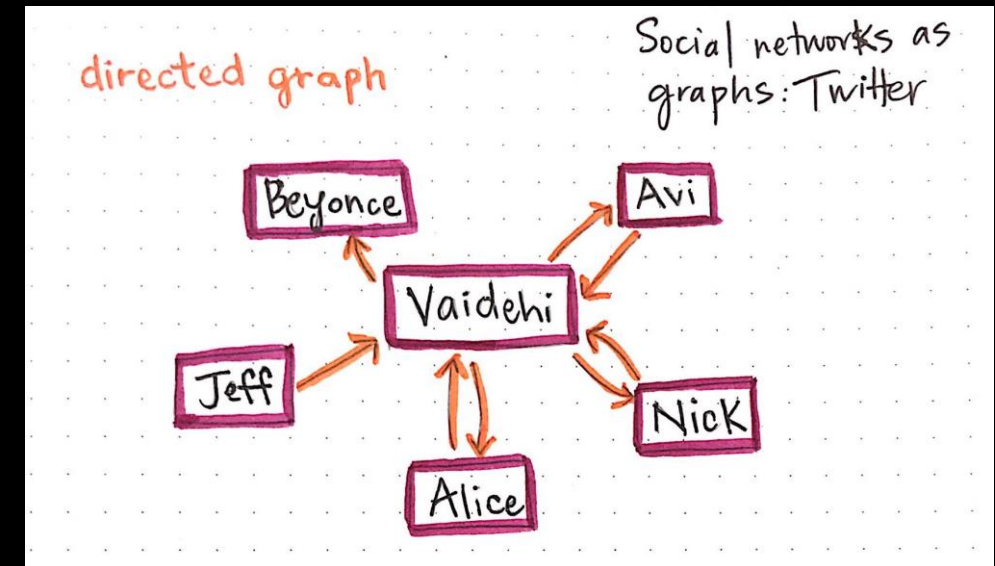
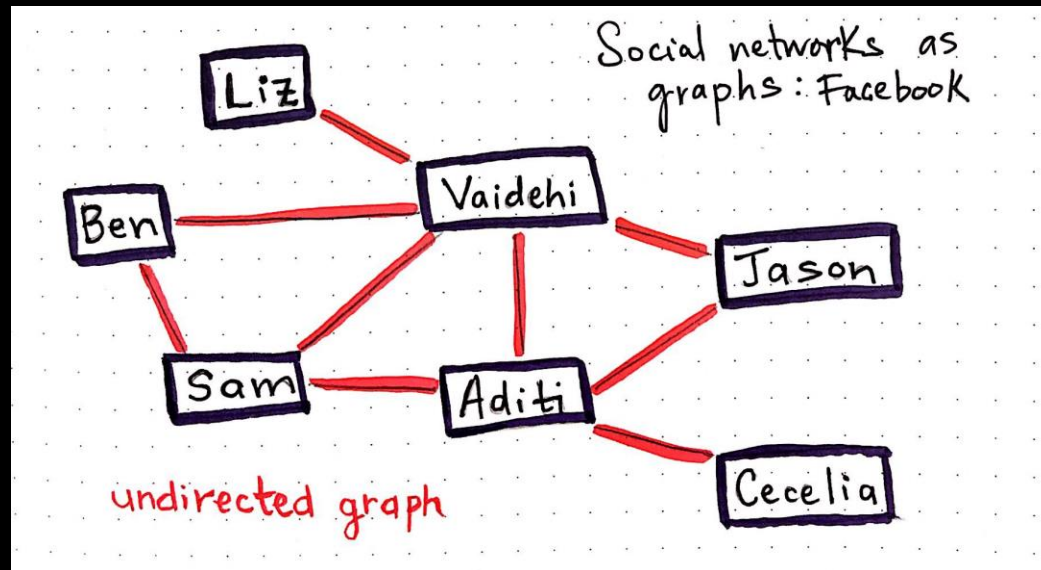
it looks like this! → $G = (V, E)$ where V is a set of nodes, also called vertices and E is a set of edges, also called links.



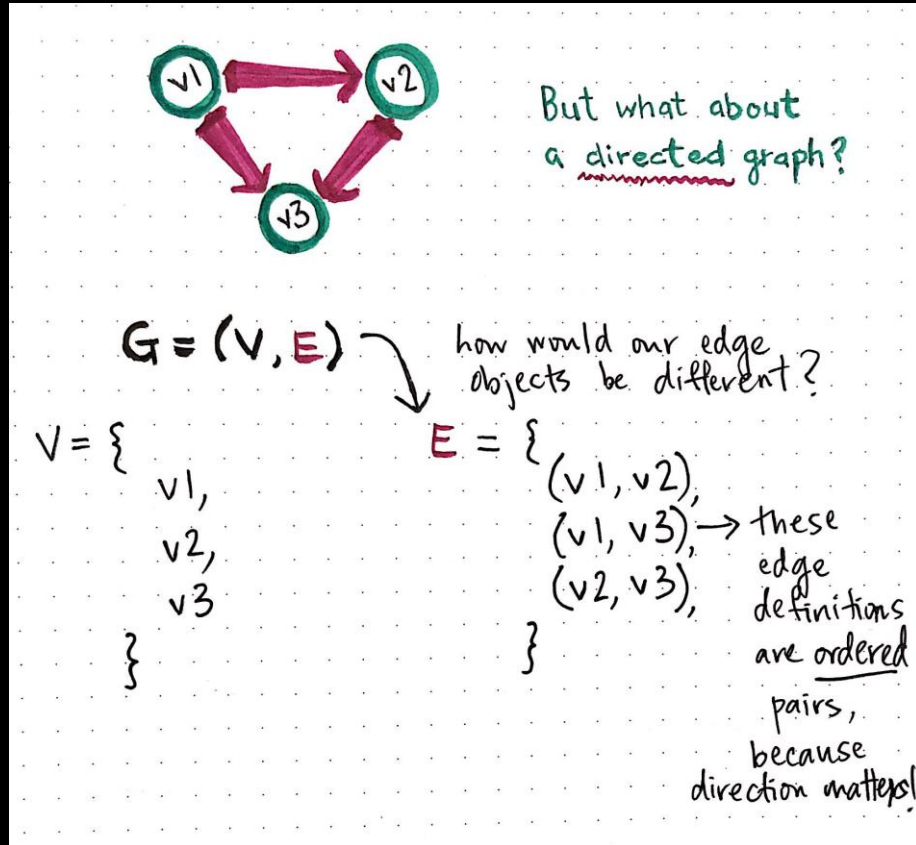
Graph Network Basics



Graph Network Basics

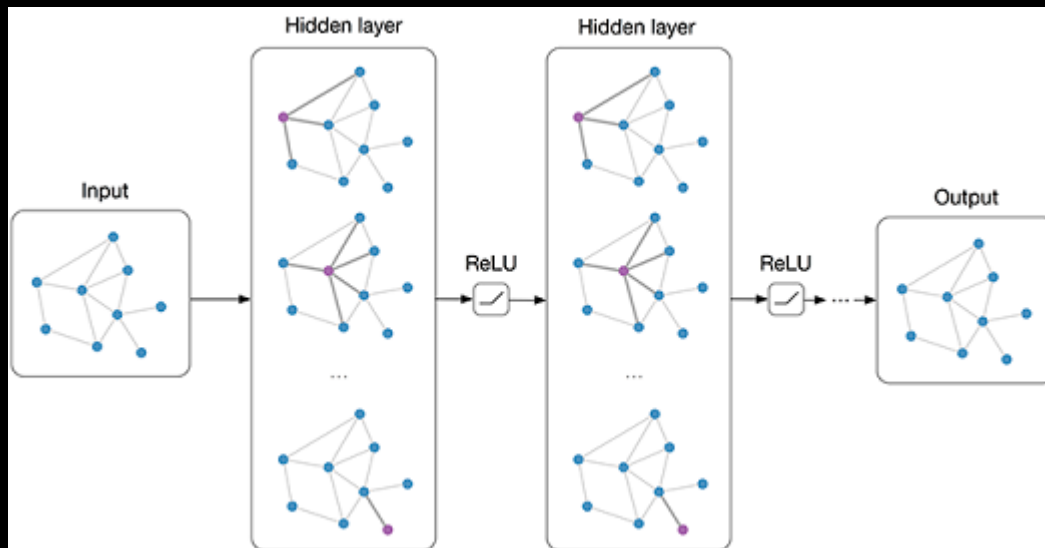


Graph Network Basics



Graph Neural Network

- Graph neural networks (GNNs) are connectionist models that capture the dependence of graphs via message passing between the nodes of graphs. They are extensions of the neural network model to capture the information represented as graphs. However, unlike the standard neural nets, GNNs maintain state information to capture the neighbourhood properties of the nodes



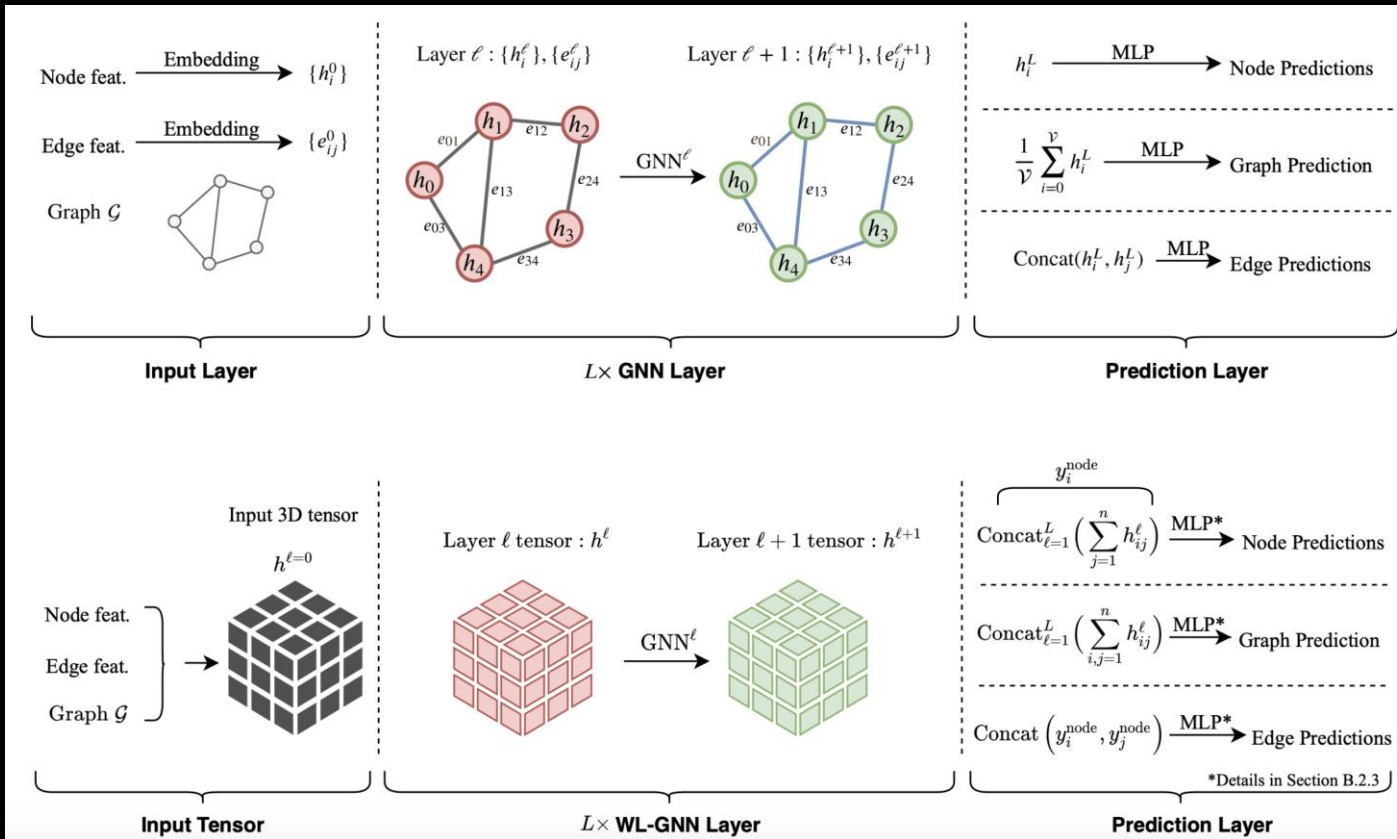
Message Parsing

- <https://youtu.be/ABCGCf8cJOE?t=48>

GNN Application

- <https://towardsdatascience.com/https-medium-com-aishwaryajadhav-applications-of-graph-neural-networks-1420576be574>

GNN Prediction



Colab Implementation

- https://colab.research.google.com/drive/1ydRYa2_CsSMZabj8OxIM3IR4jfVHdICU?usp=sharing

What are the ways it can be applied in AEC

- Takeaways from Autodesk paper
- Structural Engineering : <https://arxiv.org/pdf/2003.09103.pdf>
- Architecture : <https://arxiv.org/pdf/2003.09103.pdf>

General Discussion

- Q n A Topic
- Upcoming Topics for Next Livestream
 - ❑ Reinforcement Learning
 - ❑ Computer Vision (Object Detection)
 - ❑ ML Model Deployment (Tensorflow.js)

Seven Categories:

