

## REPORT

->This report tells the work done on the graph analysis using the Node2Vec algorithm

### 1.overview

- A.preparing the graph data.
- B.using Node2Vec to learn node embeddings.
- C.visualizing the embeddings.
- D.detecting communities in the graph.
- E.and at last calculating how well the graph communities are structured.

### 2.Methodology

#### A.Data preparation:-

The main first step was to load and clean the dataset, turning it into a graph where nodes and edges represent the connections between different points.

The tools used:-

- >NetworkX
- >Node2Vec
- >Matplotlib
- >Scikit-learn

#### B.Node Embeddings:-

I have used the Word2vec to generate the embeddings, which are numerical representations of each node. It also captures how the nodes are connected.

#### C.Embedding Visualization:-

After generating embeddings, i used t-SNE its a technique used for dimensionality reduction to plot the embedding in 2D.

#### D.Community Detection:-

The louvain method was used to detect the communities, which are group of nodes that are more connected to each other then the rest of the graph.

### 3.Results

->Node Embeddings: Node2Vec worked well to group the same or familiar nodes together. Nodes with similar roles in the graph were placed near each other in the embedding space.

-> community detection: the louvain method helped showing that certain parts of the graph where strongly connected.

->modularity: 0.2304706098811256 this the score which i have acquired

### 4.insights

->Choosing Patterns: the results of Node2vec were sensitive to the chosen parameters like p and q affecting whether we focused on small neighborhoods or large structures in the graph

->Community Structure: the communities found and showed the parts of the graph are well-organized and Node2vec was effective in revealing these clusters.