**SENSOR PLACEMENT IN WATER DISTRIBUTION NETWORKS**

**Motivation For Clustering**

1. Pattern change gradually in the path from source to leak in terms of various parameters like pressure, flow, etc. Hierarchical pruning of the water network to get to the leak by following this pattern

2. Retain spatial closeness which is needed for practical purposes while detecting and localising leak to nodes close to each other.

**Clustering Algorithm**

**Pseudo Code:**

**Input:** G is Graph(vertices(neighbors),edges(source,target,weight))

Components = all vertices (each vertex is a component)

level=0

While components.size>1: #i.e. While whole graph is not single component

Clusters at level = all components (each component is a cluster)

For component in component:

For vertex in components:

For adj in neighbors:

If vertex and adj in different components:

Add NodesInMinPath(vertex,adj) to Union(componentof(vertex),component(adj))

Increase level

Return Cluster at Each Level

**Output:** First level clusters where each node is a cluster and highest level cluster where all nodes in the graph are in a single cluster

**Description:**

Nodes are clustered iteratively with the nodes closest to them - spatial property as weight = pipelength\*diameter, i.e. Capacity of the pipe

At each level the cluster size r the number of nodes in the cluster grows and the total number of clusters reduces

Point is to select the clustering which is ideal to the network in terms of size, leak localisation and sensor placement and also not trivial like at the extreme levels

**Analysis**

Comparison of all the different clustering analysed in terms of the following parameters:**?(Partition Metrics)**

Algorithm performed for Pipelength, Capacity, Flow.

Also compare clustering from Lean Graphs algorithm