Literature review of the paper(recommended by Asiri)

**MOTIFNET: A MOTIF-BASED GRAPH CONVOLUTIONAL NETWORK**

**FOR DIRECTED GRAPHS**

Motifnet: A graph CNN able to dealing with directed graphs by exploiting local graph motifs.

Background:

* CNN on graph lacks vector space structure and is shift-invariant(an invariance which CNN has, it allows CNN to detect feature even if a small part of the graph changes a little. This is because of the pooling stage often loses information.)
* Spectral CNN: Uses analogy between the eigenfunction of the graph Laplacian and the classical Fourier Transform. The restriction is that it is only usable in undirected graphs.

1. Graph Laplacian: given a simple graph with n vertices, the graph Laplacian L is a n\*n matrix which is defined as L = D-A. Where D is the degree matrix of the graph and A is the adjacency matrix of the graph. The normalized version is Lsym = D-0.5LD-0.5(implemented in gitlab Utilities.ipynb)

Proposed structure:

* Motif: Let G = (V, E, W) be a directed graph, where W is the adjacency matrix. Let M1,...Mk be some motifs(small directed graphs representing certain meaningful connectivity patterns), for each edge(i,j) in E and each motif Mk, let uk,ij denote the no. of times edge (i,j) participates in the motif(each edge can participate in multiple motifs). A **new edge weight** can be defined as wi,jnew = uk,ijwi,j, w is a symmetric motif adjacency matrix with a prefered direction along structures associated with the respective motif.
* MotifNet:

1. Multivariate polynomial with degree p applied to the motif Laplacian matrix