# Triangle Detection on Randomly Generated Graphs

**Experiment 1/2 Results**

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2023-08-16

## Introduction

This document presents the results of our experiment into the transfer learning of Graph Neural Networks (GNNs)

We show that …

## Experiment Summary

The overarching aim of our work is to assess how well various GNN models transfer across graphs. In particular, we are interested in a few-shot learning scenario, in which a model trained on a small graph can be used to make predictions on a larger graph.

In this experiment, we use a triangle prediction task to assess this. Each GNN produces a set of unsupervised node embeddings, which are then used to train a downstream triangle prediction classifier. We train the GNN encoder on a source graph, and use these trained weights to produce embeddings for the target graphs without fine-tuning.

The graphs are drawn from an ensemble of synthetic graphs with identical distributions but different sizes. In this case, they are poisson distributed and have a maximal clique size of 3.

**For more details, see the experimental plan document (2023-08-experiment-plan.pdf).**

## Results

| source_size | target_size | model | mean | sd |
|---|---|---|---|---|
| 250 | 250 | egi | 0.5528053 | 0.0317362 |
| 250 | 250 | graphsage-mean | 0.5001650 | 0.0003690 |
| 250 | 250 | triangle | 0.6074257 | 0.0334102 |
| 250 | 1000 | egi | 0.5532388 | 0.0543888 |
| 250 | 1000 | graphsage-mean | 0.5000000 | 0.0000000 |
| 250 | 1000 | triangle | 0.6353664 | 0.0706912 |
| 250 | 10000 | egi | 0.5528974 | 0.0222259 |
| 250 | 10000 | graphsage-mean | 0.5010357 | 0.0012757 |
| 250 | 10000 | triangle | 0.6580362 | 0.0247529 |
| 250 | 100000 | egi | 0.5360132 | 0.0253314 |
| 250 | 100000 | graphsage-mean | 0.5011674 | 0.0018610 |
| 250 | 100000 | triangle | 0.6553850 | 0.0137790 |
| 1000 | 250 | egi | 0.5622112 | 0.0378307 |
| 1000 | 250 | graphsage-mean | 0.5003300 | 0.0007380 |
| 1000 | 250 | triangle | 0.6668317 | 0.0223565 |
| 1000 | 1000 | egi | 0.6008511 | 0.0273357 |
| 1000 | 1000 | graphsage-mean | 0.5008511 | 0.0012797 |
| 1000 | 1000 | triangle | 0.6982506 | 0.0313778 |
| 1000 | 10000 | egi | 0.6342605 | 0.0155234 |
| 1000 | 10000 | graphsage-mean | 0.5004784 | 0.0009761 |
| 1000 | 10000 | triangle | 0.7052227 | 0.0102492 |
| 1000 | 100000 | egi | 0.5868338 | 0.0103936 |
| 1000 | 100000 | graphsage-mean | NA | NA |
| 1000 | 100000 | triangle | 0.7067900 | 0.0097776 |

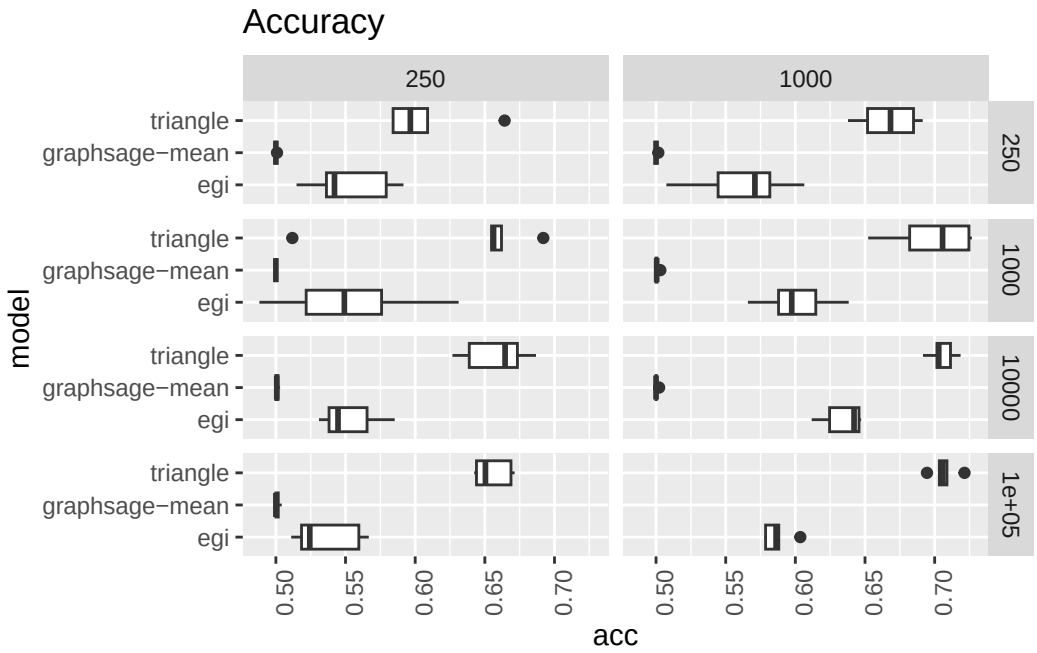


Figure 1: Triangle prediction accuracy

## Discussion