

A OVERVIEW OF TGNN BASELINES

TGN. Temporal Graph Network (TGN) (Rossi et al., 2020) proposes a combination of temporal memory to store node states and graph-based operators for learning on continuous-time dynamic graphs. Following interaction in a CTDG, node states of the nodes involved in the event are updated in the memory through a recurrent neural network such as LSTM (Hochreiter & Schmidhuber, 1997) or GRU (Cho et al., 2014).

TNCN. TNCN builds up on memory-based TGNNs (Rossi et al., 2020; Trivedi et al., 2019) by introducing temporal version of a neural-common-neighbour (NCN) and reaching state-of-the-art results on three out of five datasets at TGB Benchmark.

B TGB BENCHMARK

This section provides overview and statistics of TGB Benchmark datasets (Huang et al., 2023).

B.1 DATASET DESCRIPTION

tgbl-wiki. tgbl-wiki dataset stores dynamic information about a co-editing network on Wikipedia pages over a span of one month. The data is stored in a **bipartite** temporal graph where nodes represent editors or wiki-pages they interact with. An edge represents an action user takes when editing a Wikipedia page and edge features contain textual information about a page of interest. The goal is to predict existence and nature of links between editors and Wikipedia pages at a future timestamp.

tgbl-review. tgbl-review dataset stores dynamic information about Amazon electronics product review network covering the years 1997 to 2018. This dataset forms a **bipartite** weighted network, where nodes represent users and products, and edges signify individual reviews—rated on a scale from one to five—submitted by users to products at specific times. The goal is to predict which user will interact in the reviewing process at a given time.

tgbl-coin. tgbl-coin dataset stores cryptocurrency transactions extracted from the Stablecoin ERC20 transactions dataset. Nodes represent addresses, while edges indicate the transfer of funds between these addresses over a period of time. Covering the period from April 1 to November 1, 2022, the network includes transaction data for five stablecoins and one wrapped token. The goal of the task is to predict with which destination a given address will interact at a given time.

tgbl-comment. tgbl-comment dataset captures a directed network of Reddit user replies spanning from 2005 to 2010. Nodes represent individual users, and directed edges correspond to replies from one user to another within discussion threads. The goal of the task is to predict whether a pair of users will interact at a given time.

tgbl-flight. tgbl-flight dataset represents an international flight network from 2019 to 2022. Airports are modeled as nodes, and flights occurring between them on specific days form the edges. Node features include the airport type, the continent of location, ISO region codes, and geographic coordinates (longitude and latitude). Edge attributes consist of the associated flight numbers. The task is to predict if a given flight will exist between a source and destination airport at a given day.

B.2 DATASET STATISTICS

Table 2: TGB Dataset characteristics studied in this work.

Scale	Name	#Nodes	#Edges*	#Steps	Surprise	Metric
small	tgbl-wiki	9,227	157,474	152,757	0.108	MRR
small	tgbl-review	352,637	4,873,540	6,865	0.987	MRR
medium	tgbl-coin	638,486	22,809,486	1,295,720	0.120	MRR
large	tgbl-comment	994,790	44,314,507	30,998,030	0.823	MRR
large	tgbl-flight	18,143	67,169,570	1,385	0.024	MRR

Table 2 shows the statistics of datasets used in this work from TGB. As shown, a wide range of datasets across multiple domains and scales are tested.

C ABLATION STUDY

Choice of expander layer. We compare TGR performance using *three* different baselines for expander layer: *TGR-GCN* (Kipf & Welling, 2016), *TGR-GAT* (Veličković et al., 2017) and *TGR-GIN* (Xu et al., 2018). Results of the study show that the effect of expander layer choice varies but that performance is largely independent of the choice of layer. For experiments, we use the GAT layer which has the highest empirical performance on tgb1-review.

Table 3: Performance comparison of expander layers on tgb1-wiki and tgb1-review datasets.

Model	tgb1-wiki		tgb1-review	
	Val MRR	Test MRR	Val MRR	Test MRR
TGR-TGN-GAT	64.2	58.9	83.4	85.6
TGR-TGN-GCN	64.0	59.6	82.9	85.2
TGR-TGN-GIN	64.8	60.1	78.3	81.7

D MODEL PARAMETERS

We report TGR hyperparameters in Table 4.

Table 4: Model Hyperparameters.

	Value
Temporal Memory Dimension	100
Node Embedding Dimension	100
Time Embedding Dimension	100
Expander Memory Dimension	100
Expander Embedding Dimension	100
# Attention Heads	2
Dropout	0.1