**Efficient Distribution for Deep Learning on Large Graphs**

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**DeepGalois Overview**

- Scalable distributed GNN framework
- Generalize GNN to **vertex programming model**
  - Topology driven: All vertices are active
  - Operators
    - Aggregate features from 1-hop neighbors
    - Local linear transformation
  - **Termination condition**: number of layers
- **Distributed Graph Engine**
  - CuSP [1]: Graph partitioner
  - Gluon [2]: Communication substrate
  - Galois [3]: Computation engine
- Outperform the state-of-the-art
  - 4x speedup over DistDGL [4]

**Synchronization**

- Support arbitrary use-defined partitioning policy
- Optimize communication based on the partitioning policy

**Evaluation**

- **GraphSAGE average epoch time**
- DeepGalois 4x faster than DistDGL
- 32 hosts vs 1 host for reddit
  - DeepGalois: 2.4x speedup
  - DistDGL: 2.8x slowdown

**Graph Partitioning**

- Edges are uniquely assigned among hosts
- Proxies for end points
- One proxy is designated the **master proxy**
- Different policies have different edge/master assignment
- Policies trade-off
  - Computation load-balance
  - Communication overhead

**References**


