DLGMA'20
Workshop

Lagrangian Propagation Graph Neural Networks

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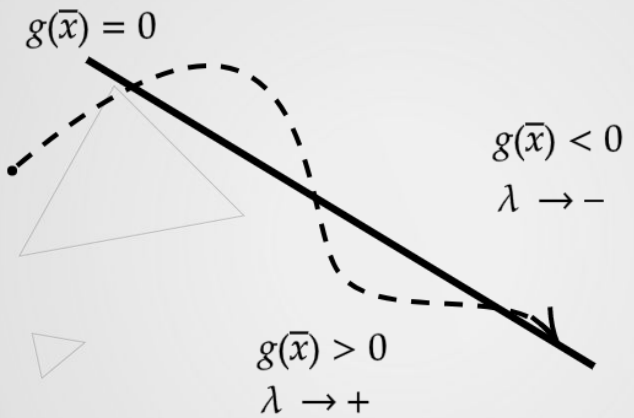

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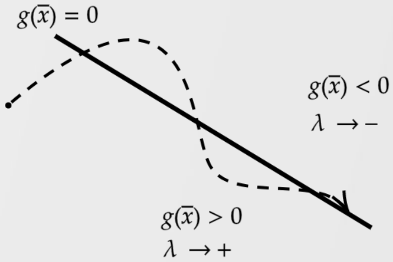
Propose a novel constrained formulation approach to learning w.r.t. GNNs [Scarselli 2009]
Avoid epoch-wise fixed-point convergence, still take advantage of the multi-hop diffusion



$$\min \quad \sum_{v \in S} L(g_w(x_{v,K-1}), y_v)$$

$$\text{s.t.} \quad \mathcal{G}(x_{v,k} - f^k_{w,v}) = 0, \quad \forall\, v \in V, \forall\, k \in [0, K-1]$$

Cast it in the Lagrangian framework.

$$\min_{\theta_{f_w}, \theta_{g_w}, X} \ \max_{\Lambda} \ \mathcal{L}(\theta_{f_w}, \theta_{g_w}, X, \Lambda)$$

- Jointly optimize transition function and node state representation
- Diffusion as a differential optimization process, aimed at fulfilling the constraints
- Mixed strategy:
    - Still rely on BackPropagation to learn the transition and output functions
    - Exploit constraints to define the diffusion mechanism

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