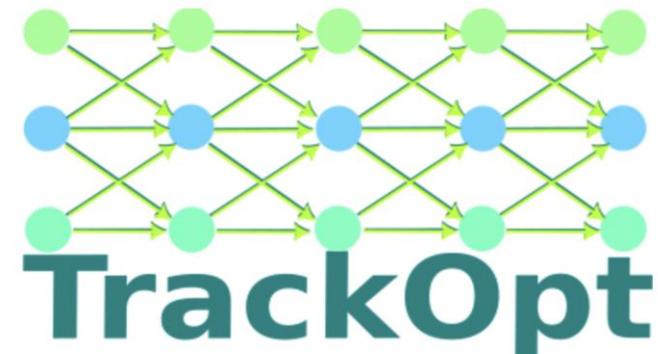


# Vertex LMC problem

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## Simple (used up to now and doesn't show satisfactory results)

Graph  $G=(V,E)$

Every edge  $e=\{u,w\} \in E$  has a learned  $GNN^{(*)}$  probability to be true  $p_e$  which

is transformed to the edge weight  $w_e = \log\left(\frac{p}{1-p}\right)$ .

LMC problem - find edge labels  $c_e(\text{cut})$ :  $\min_{c_e \in \{0,1\}^E} \sum_{e \in E} w_e \cdot c_e$

Target - truth graph  $G^T=(V,E^T)$ ,  $E^T \subseteq E$

## Addition (after yesterday discussion)

A1) Every node  $u \in V$  receives a learned  $GNN^{(*)}$  binary label  $S=\{0,1\}$  to be secondary.

Constraint:  $\forall e=\{u,w\}$  must be cut if  $S_u \neq S_w$ .

A2) More advanced: Every node  $u \in V$  receives a learned continuous  $GNN^{(*)}$  probability  $S=[0,1]$  to be secondary.

LMC problem - find edge labels  $c_e(\text{cut})$ :  $\min_{c_e \in \{0,1\}^E} \sum_{e=\{u,w\} \in E} (w_e - |S_u - S_w|) \cdot c_e$

(\*)  $GNN$  design and used physics information is unrelated here

## Cluster compactness

Graph  $G=(V,E)$

Every edge  $e=\{u,w\} \in E$  has a learned  $GNN^{(*)}$  probability to be true  $p_e$  which is transformed to the edge weight  $w_e = \log\left(\frac{p}{1-p}\right)$ .

Every node  $u \in V$  receives a learned continuous  $GNN^{(*)}$  probability  $S=[0,1]$  to be secondary.

For all nodes  $\forall u$  and all edges of this node  $\forall_w e_{\{uw\}}$  there is a weight  $W_{uww'}$

A3) Constraint:  $\forall_{u,w,w'} W_{uww'} < Z$

(\*)  $GNN$  design and used physics information is unrelated here