

# Leveraging Physics-informed GNN for enhanced Combinatorial Optimization

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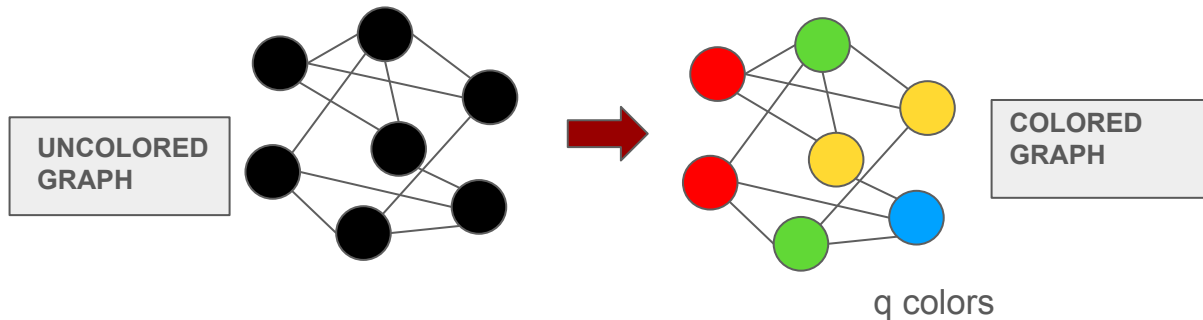
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Future  
Artificial  
Intelligence  
Research

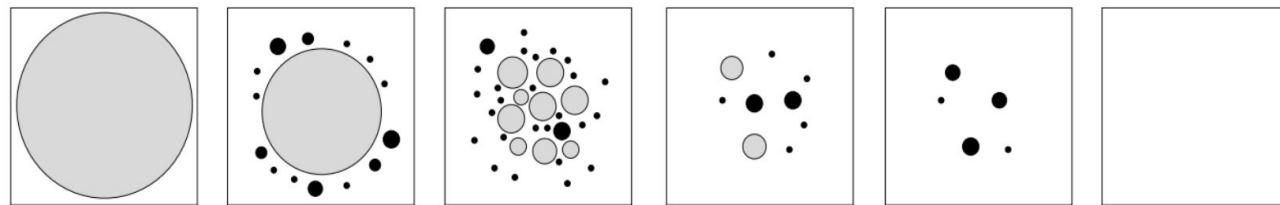


# GRAPH COLORING



- NP-Hard problem
- Numerous applications (eg. scheduling, register allocation)
- Can be studied using statistical mechanics.

$$\mathcal{H} = \sum_{(i,j) \in E} \delta_{\sigma_i \sigma_j}$$



Average connectivity

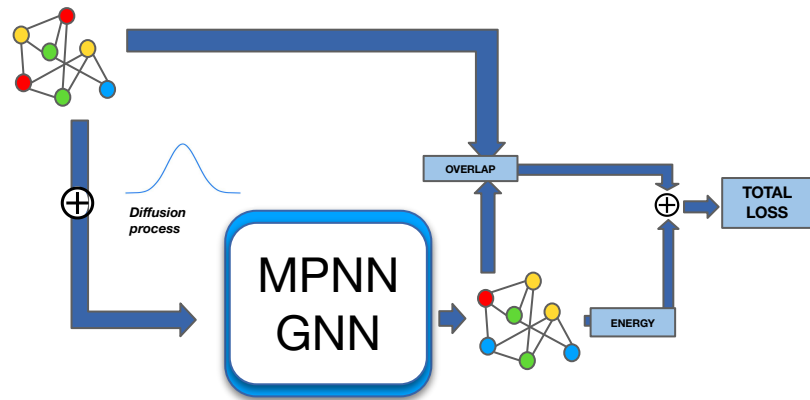
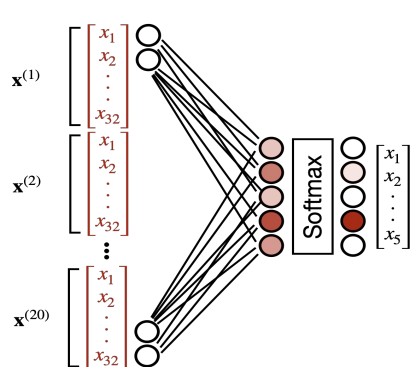
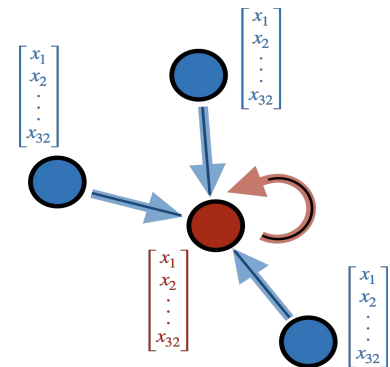
Clustering  
 $c_d$

Condensation  
 $c_c$

Rigidity  
 $c_r$

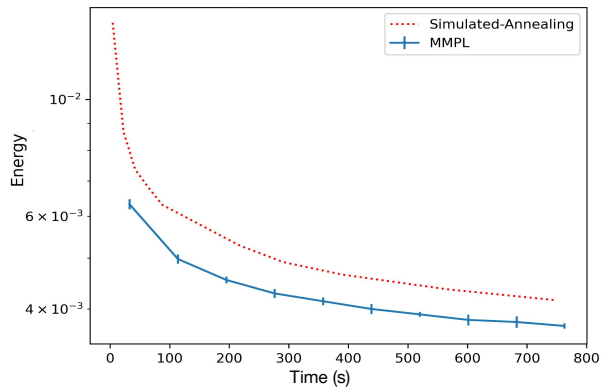
COL/UNCOL  
 $c_s$

# PI-GNN



## Preliminary results

Energy vs time (N=10e5, c=14.0)



Energy vs Connectivity (N=2e5)

