Project Proposal:
Learning Domain-Specific Heuristics with Graph Convolutional Networks

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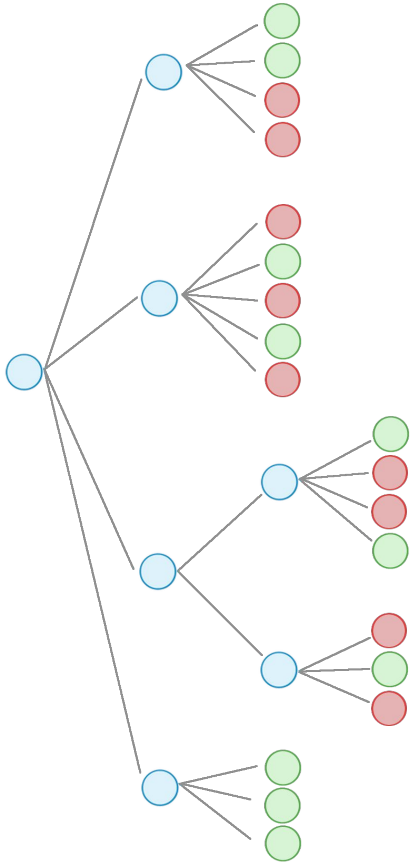
Heuristic Planning

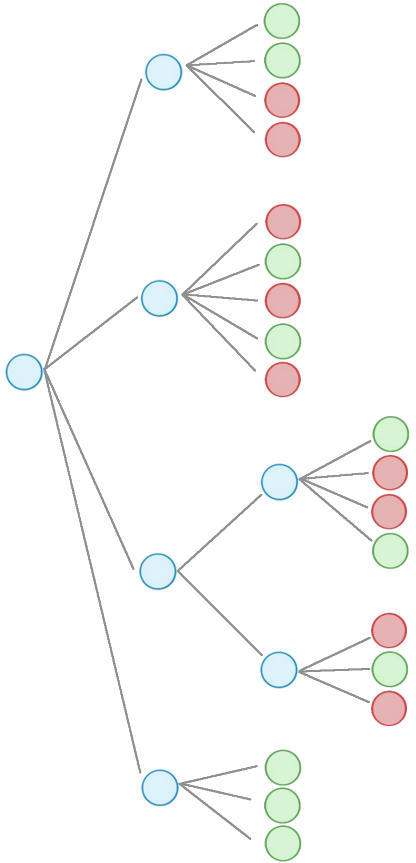
- Planning can become expensive.
- Heuristics focus the search on nodes that seem more promising.
- Might trade optimality, completeness and precision for performance.



Heuristic Planning

- Heuristics need to be **informative.**

- Off-the-shelf heuristics might suffer from poor performance in complex scenarios.



Domain-specific Heuristics

- Domain-independent fail to capture domain singularities.
- Specific design needs expert domain knowledge.

➜ Might be unfeasible for real world problems.

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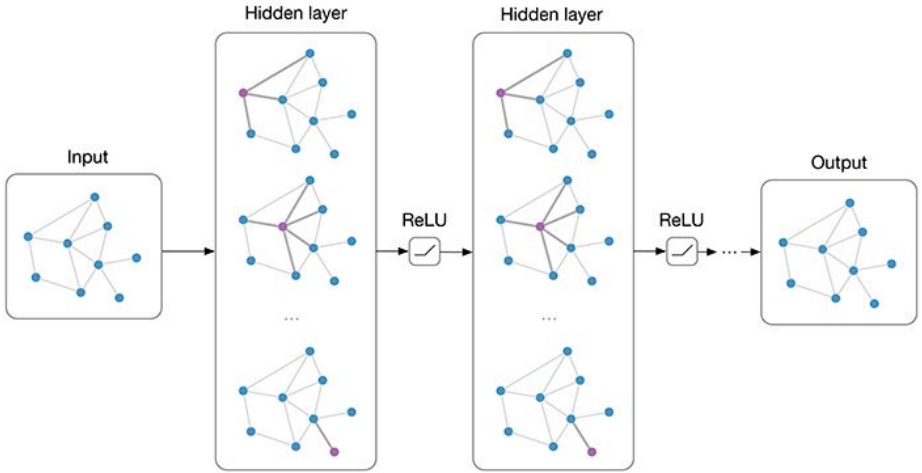
How to find a solution independently of human knowledge?

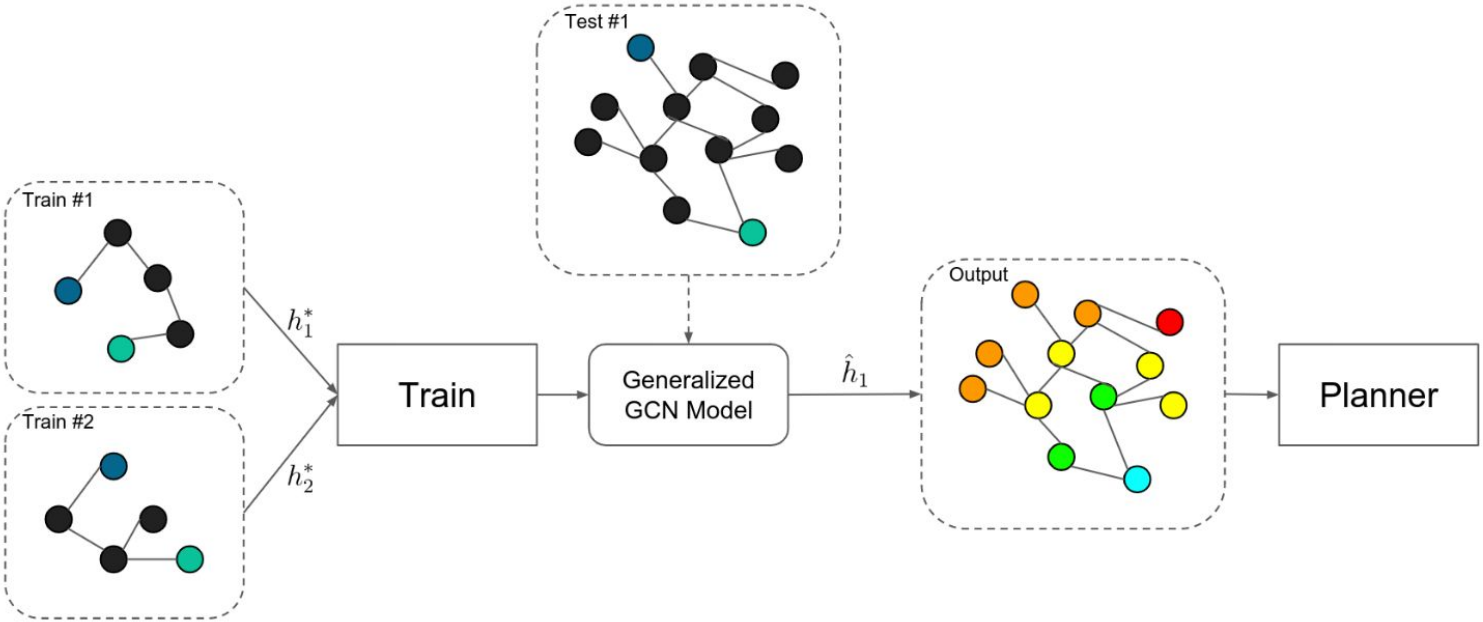
Proposed Method

Graph Convolutional Networks (GCNs):

- Graph-based model with node-wise heuristic values as output.

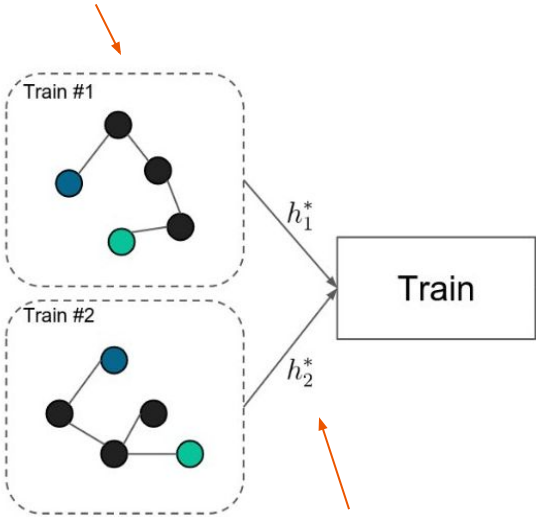


Proposed Method



Proposed Method

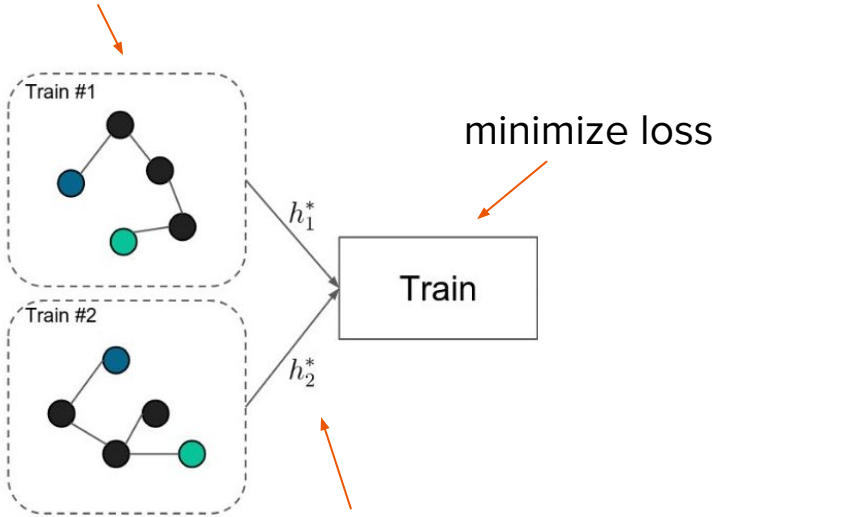
n subgraphs for each task



perfect heuristics for each node

Proposed Method

n subgraphs for each task



Proposed Method

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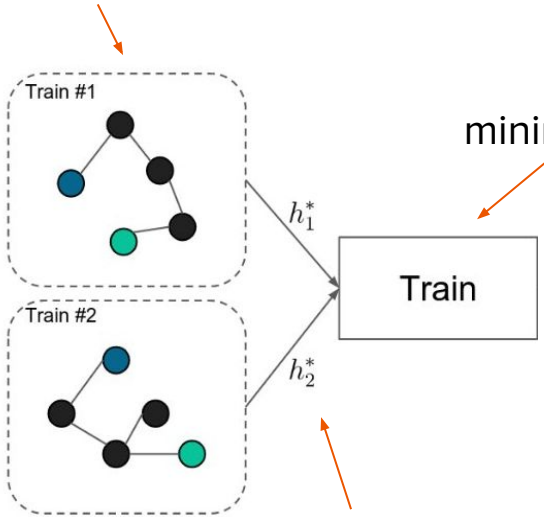
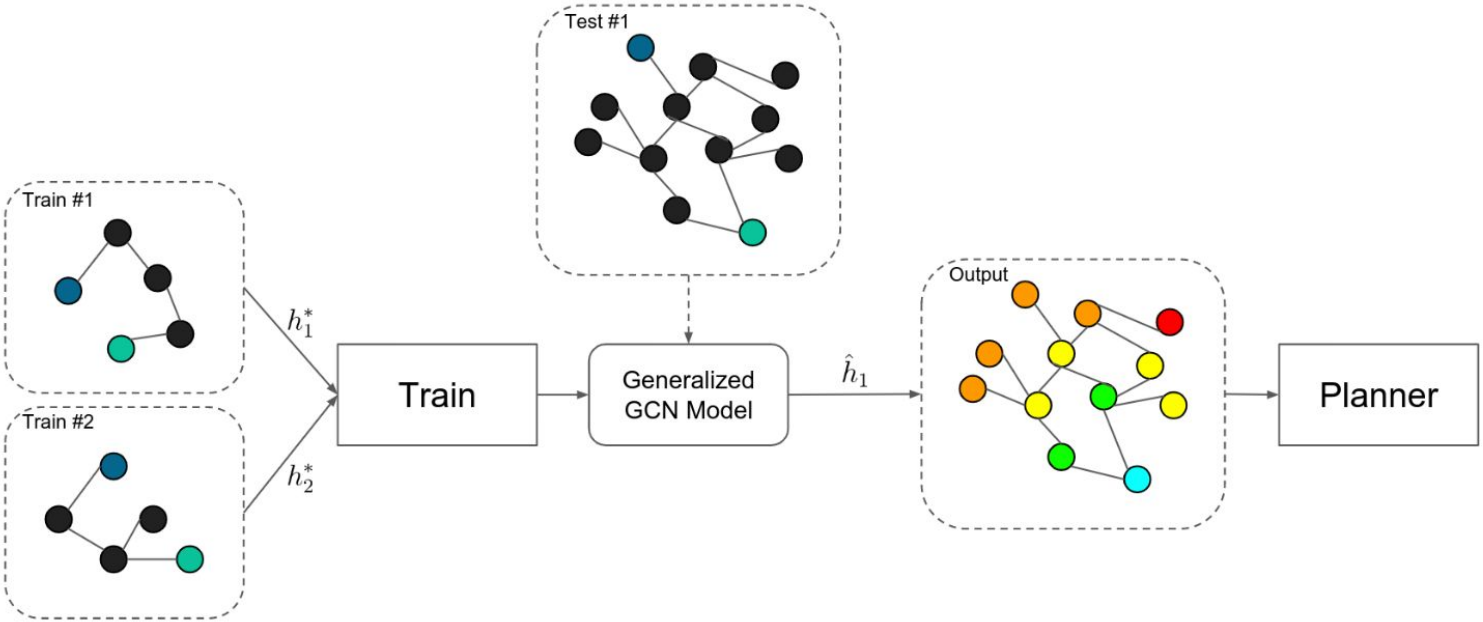


minimize loss

$$L_h(g) = \frac{1}{N}\sum_{i=1}^{N}(\hat{h}_{i,g} - h^*_{i,g})^2$$

perfect heuristics for each node

Proposed Method



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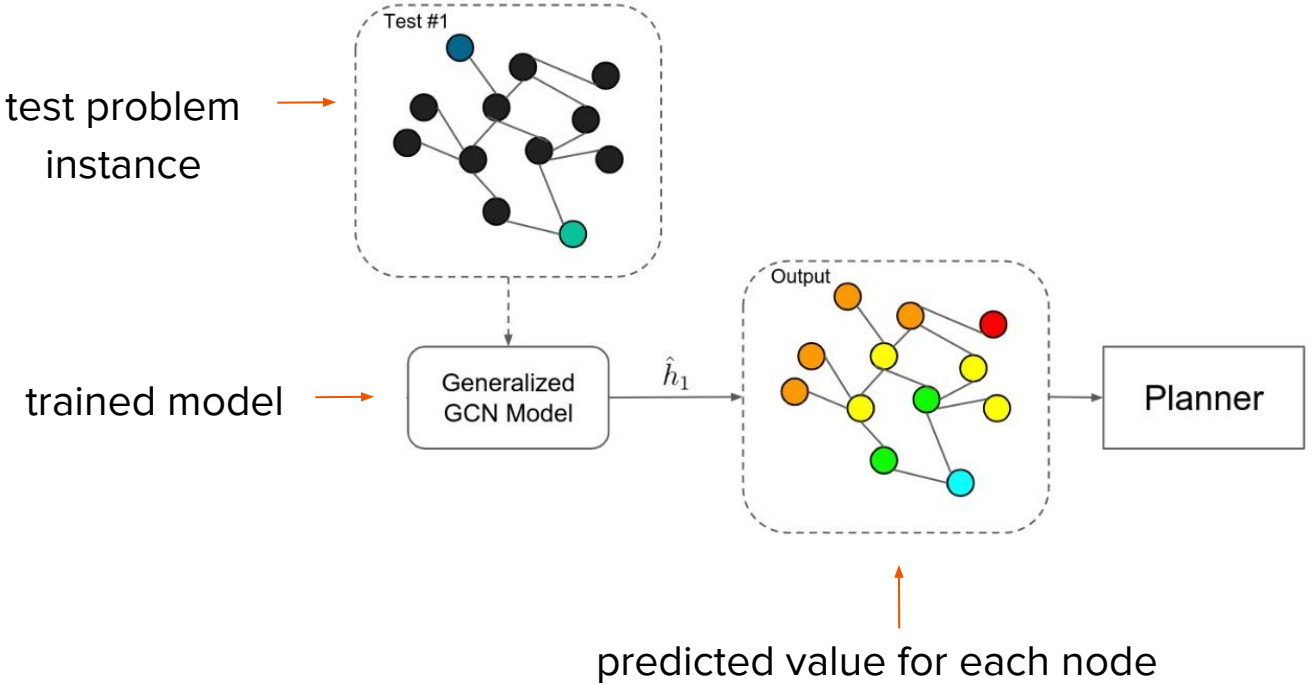

Dataset

PDDL benchmark domains problem generators.

source: Joerg Hoffman, FF Domain Collection

https://fai.cs.uni-saarland.de/hoffmann/ff-domains.html

Used domains: Blocksworld-4ops and Logistics

Future Work

- Find alternatives for generating graphs efficiently.
- Explore different adjacency matrix encodings (heuristics / normalized).
- Investigate heuristic generalization (domain-specific).