# Learning and Using Abstractions for Robot Planning

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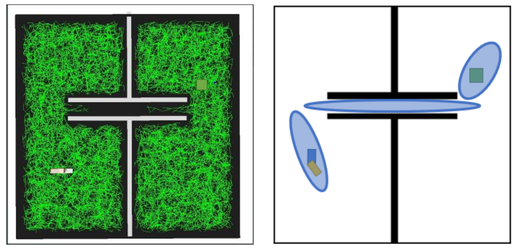
## Motivation



- SBMPs with uniform sampling struggle to solve complex problems

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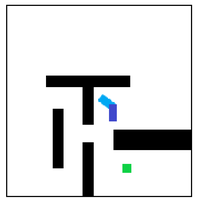
- Our approach learns regions of the C-space that are critical to solve the problem and use them to bootstrap abstraction.

## Structuring Training Data

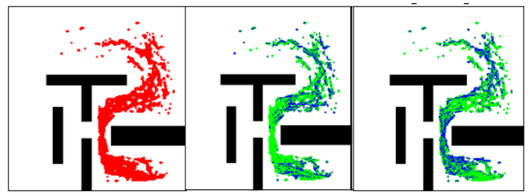
Input



Shape: $(n_d, n_d, m)$
$n_d$ = height/width
m = depth = $n_{dof} + 1$

Channel 1: Occupancy matrix
Channel 2-m: Goals for each joint

Labels



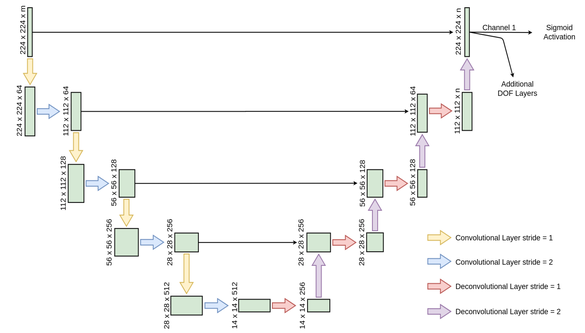
Shape: $(n_d, n_d, n)$
$n_d$ = height/width
$n$ = depth = $\left((n_{dof} - k) * p\right) + 1$

Channel 1: CRs for end-effector's location
Channel 2-n: CRs for each joint

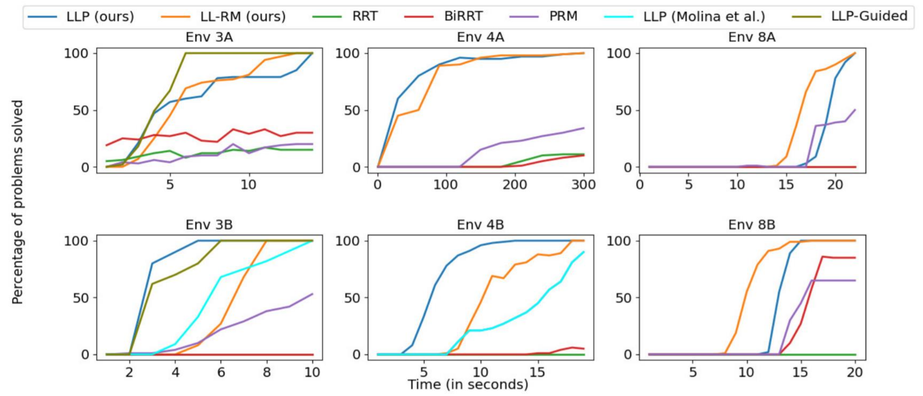
## Network Architecture

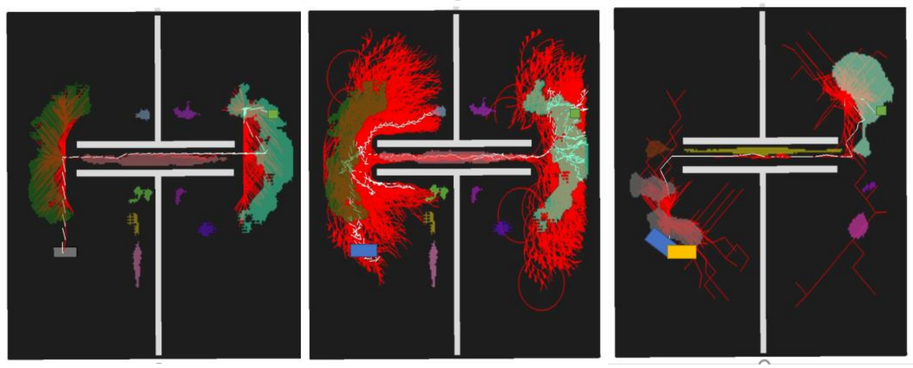
Base: UNet

Additional layers attached using C-space of the robot




## Evaluation



$SE^2$ Robot (3 DOF) | Simple Car | Hinged Robot (4 DOF)

## Overall Approach