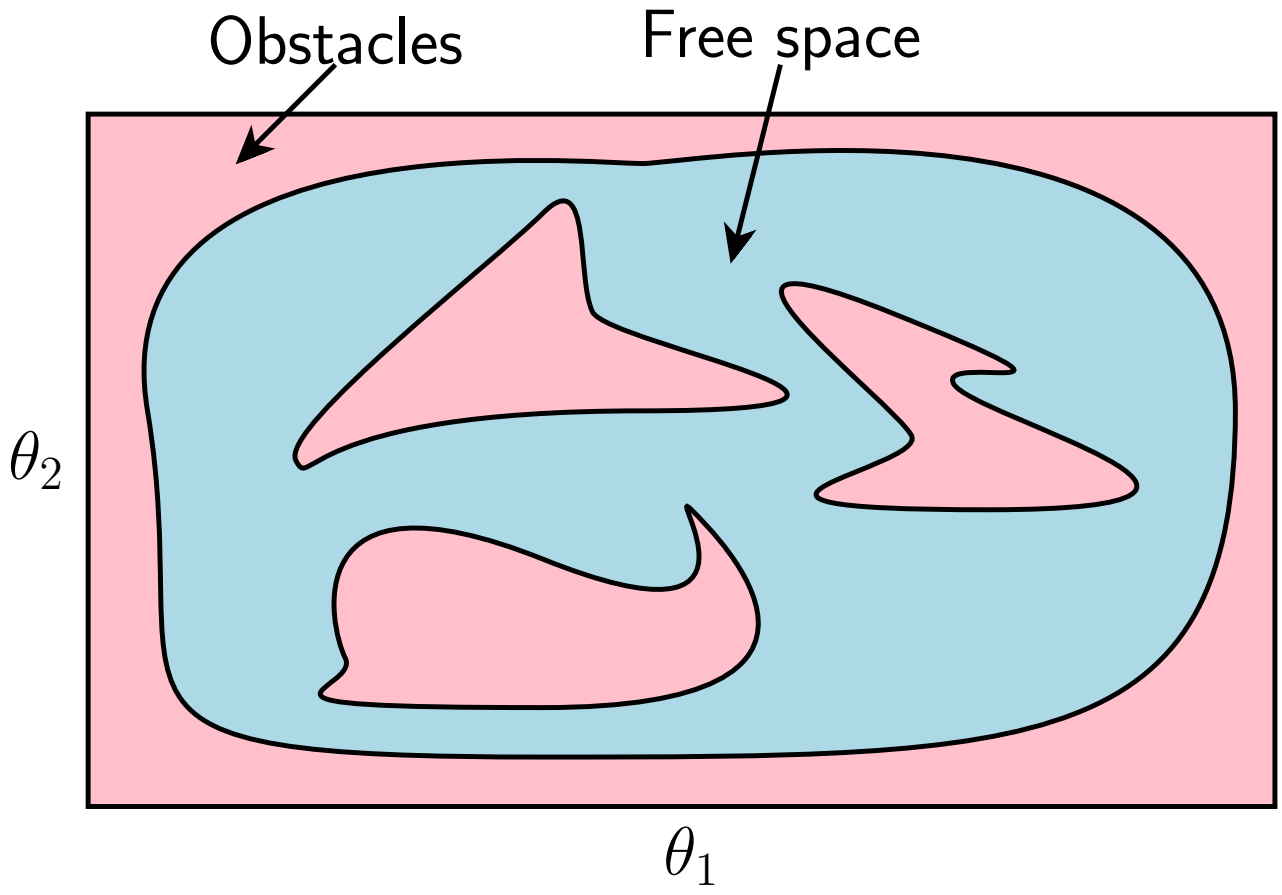
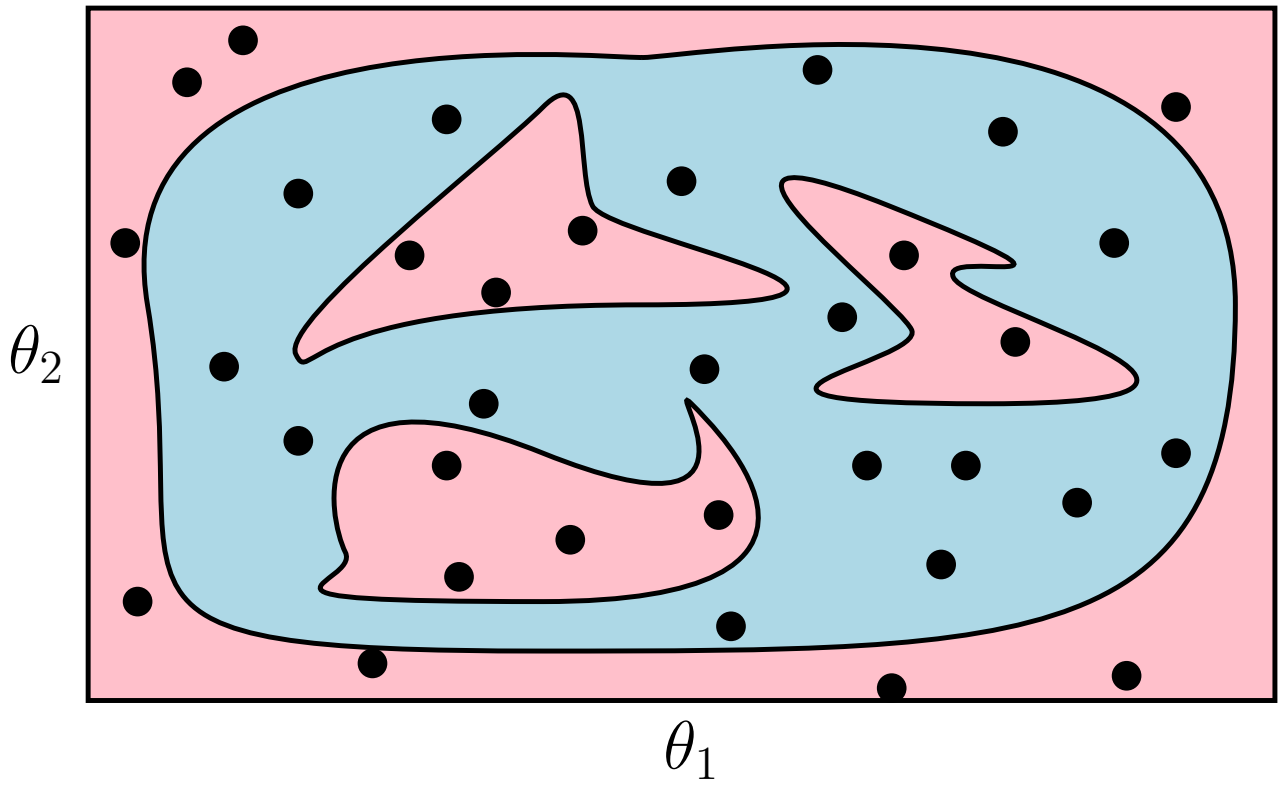
Probabilistic road maps (PRMs)



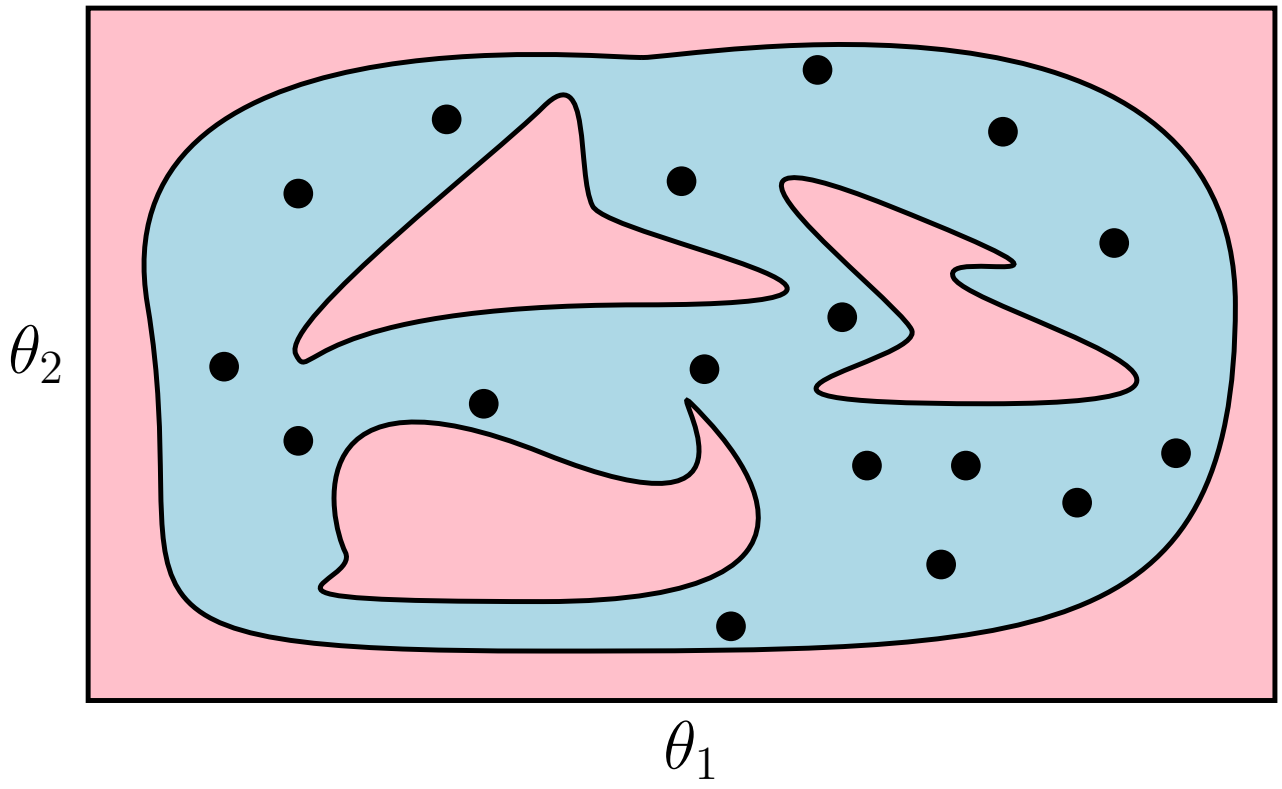
Plot of configuration space of robot

Probabilistic road maps (PRMs)



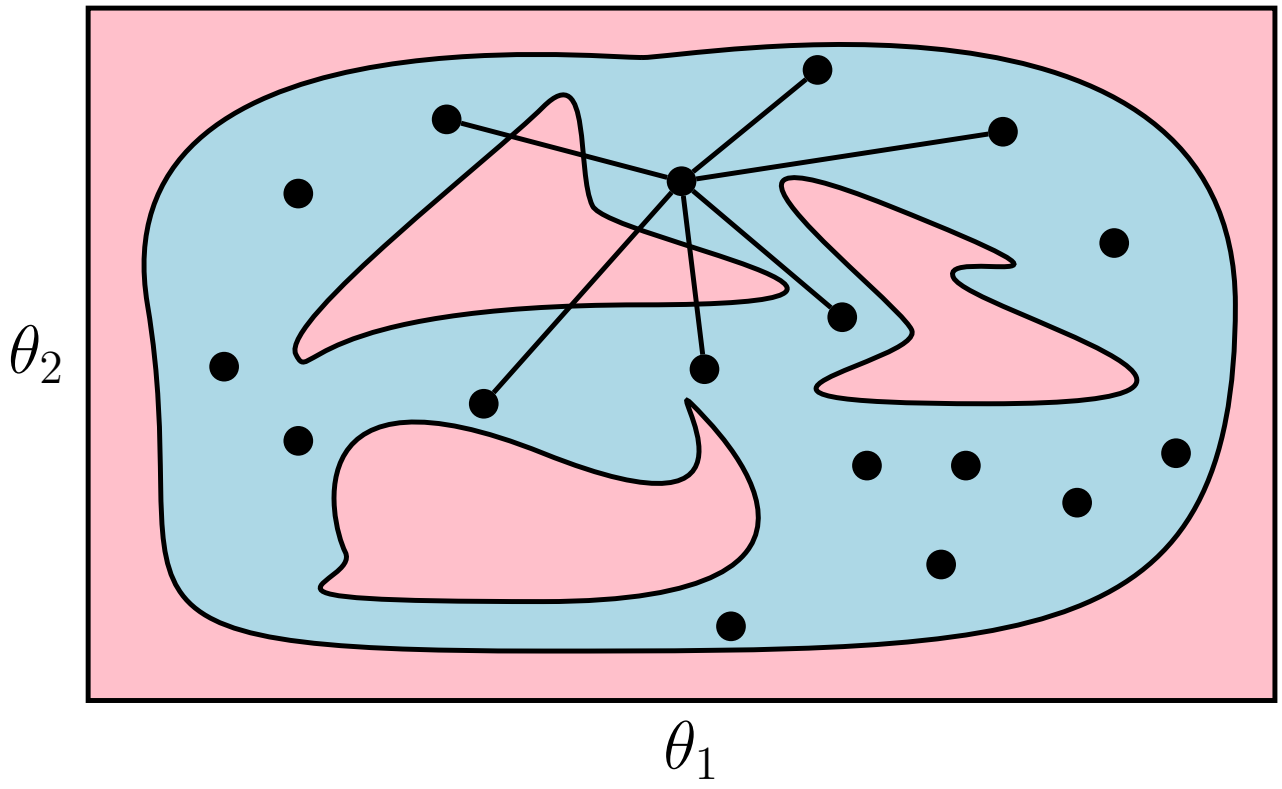
Randomly sample points in configuration space

Probabilistic road maps (PRMs)



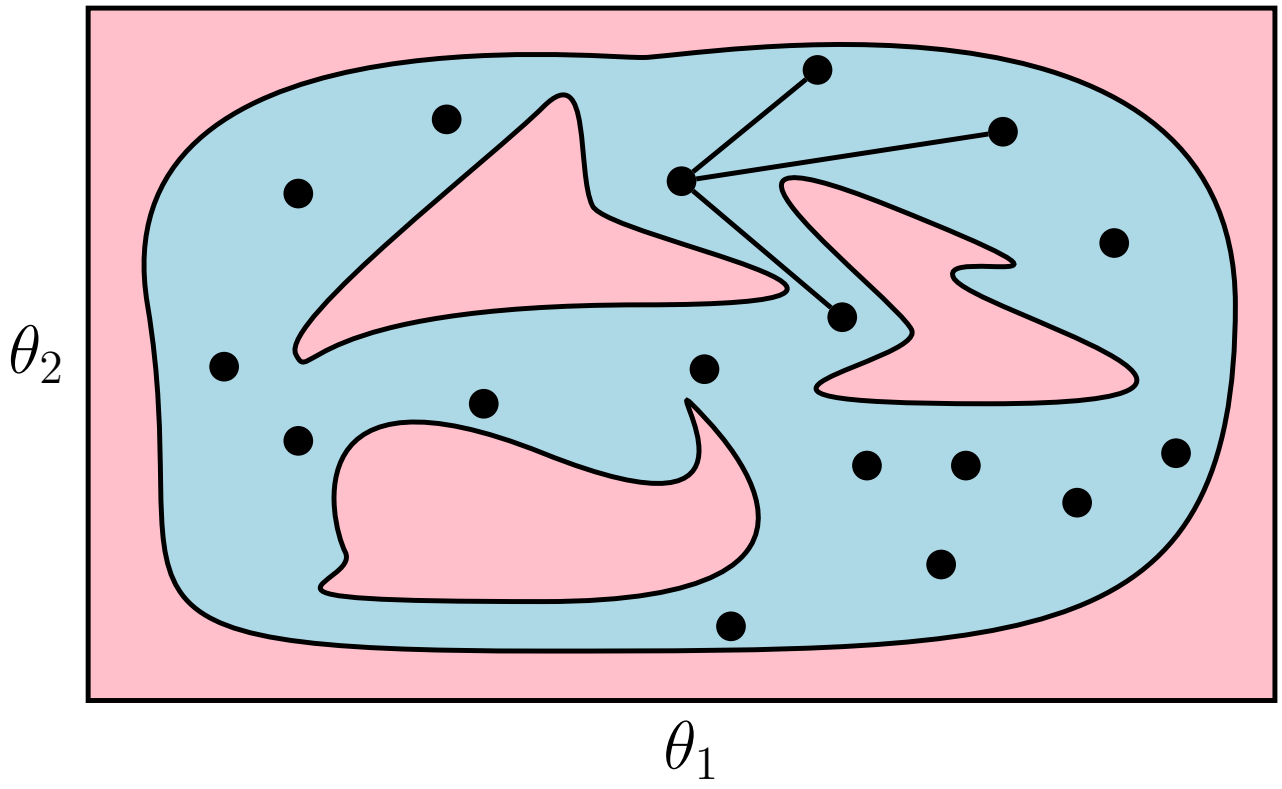
Throw out all points not in free space

Probabilistic road maps (PRMs)



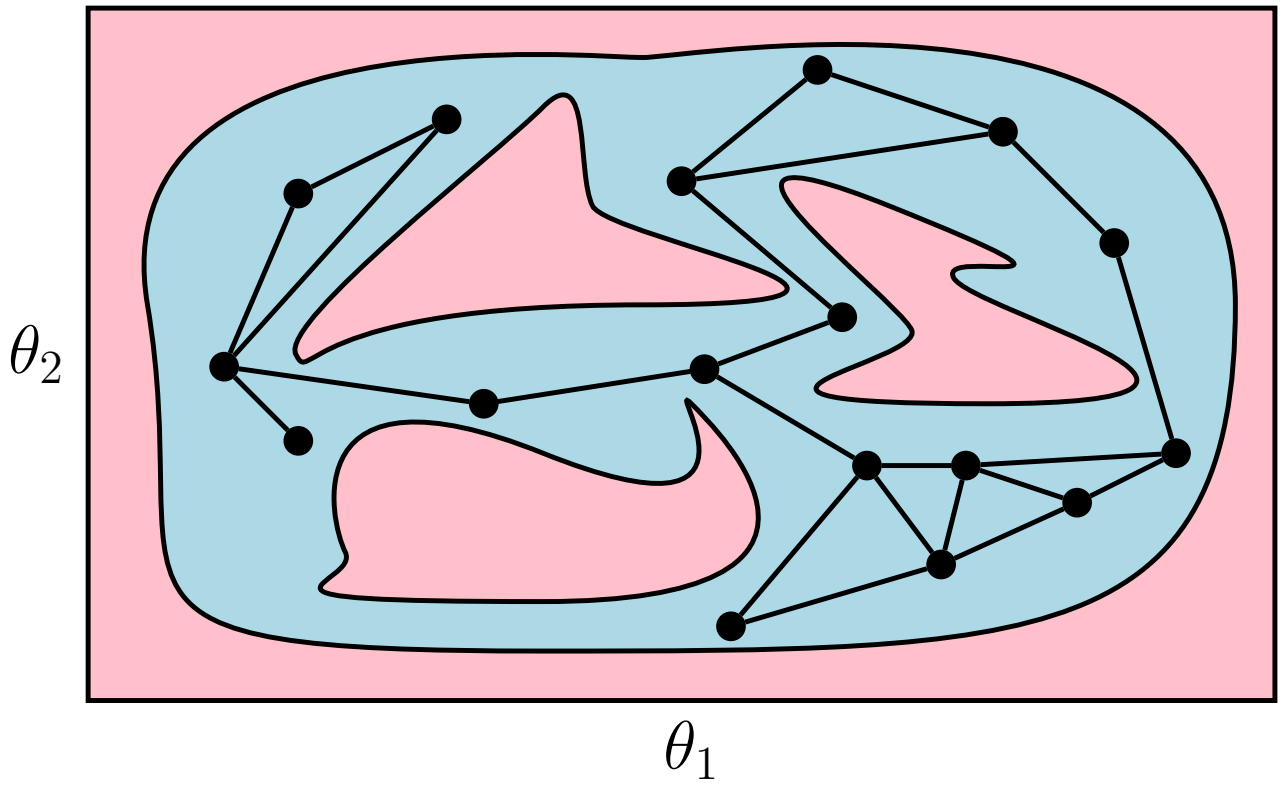
Connect each remaining point to its nearest neighbors

Probabilistic road maps (PRMs)



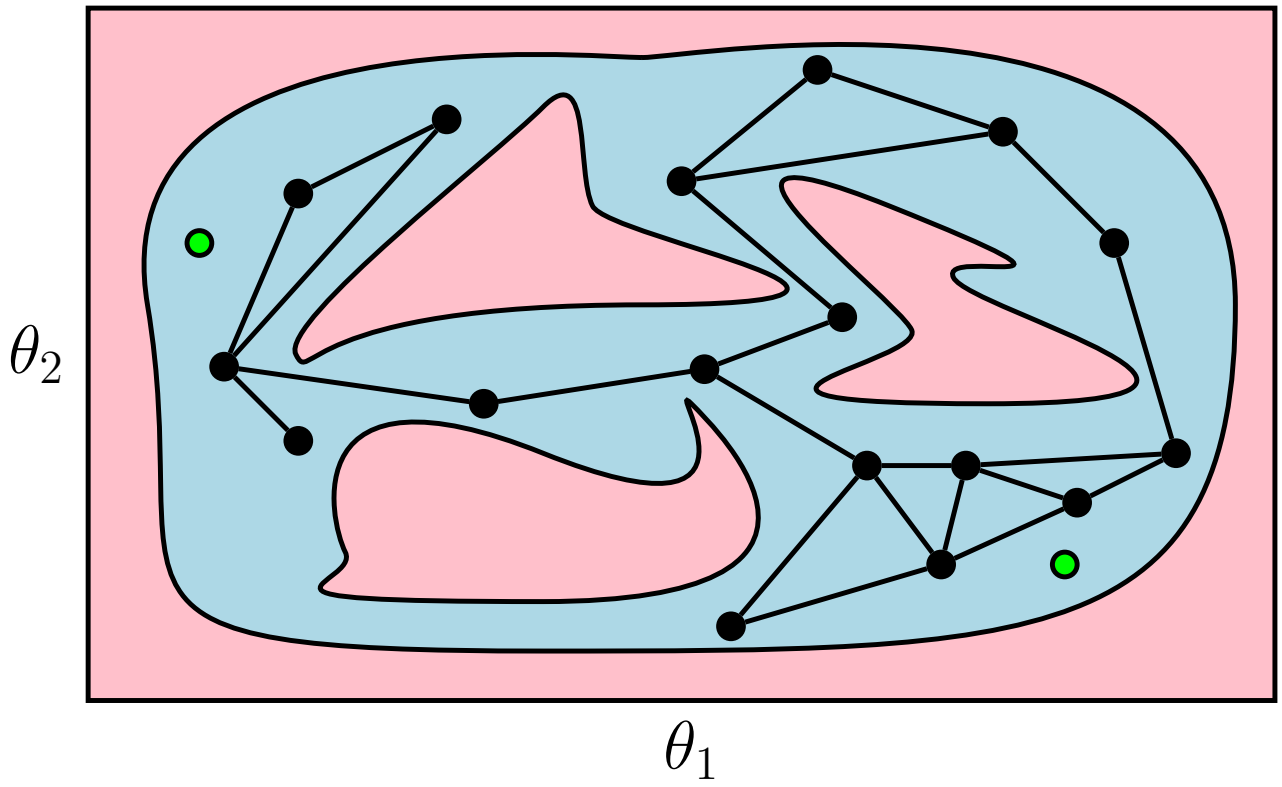
Remove all colliding paths

Probabilistic road maps (PRMs)



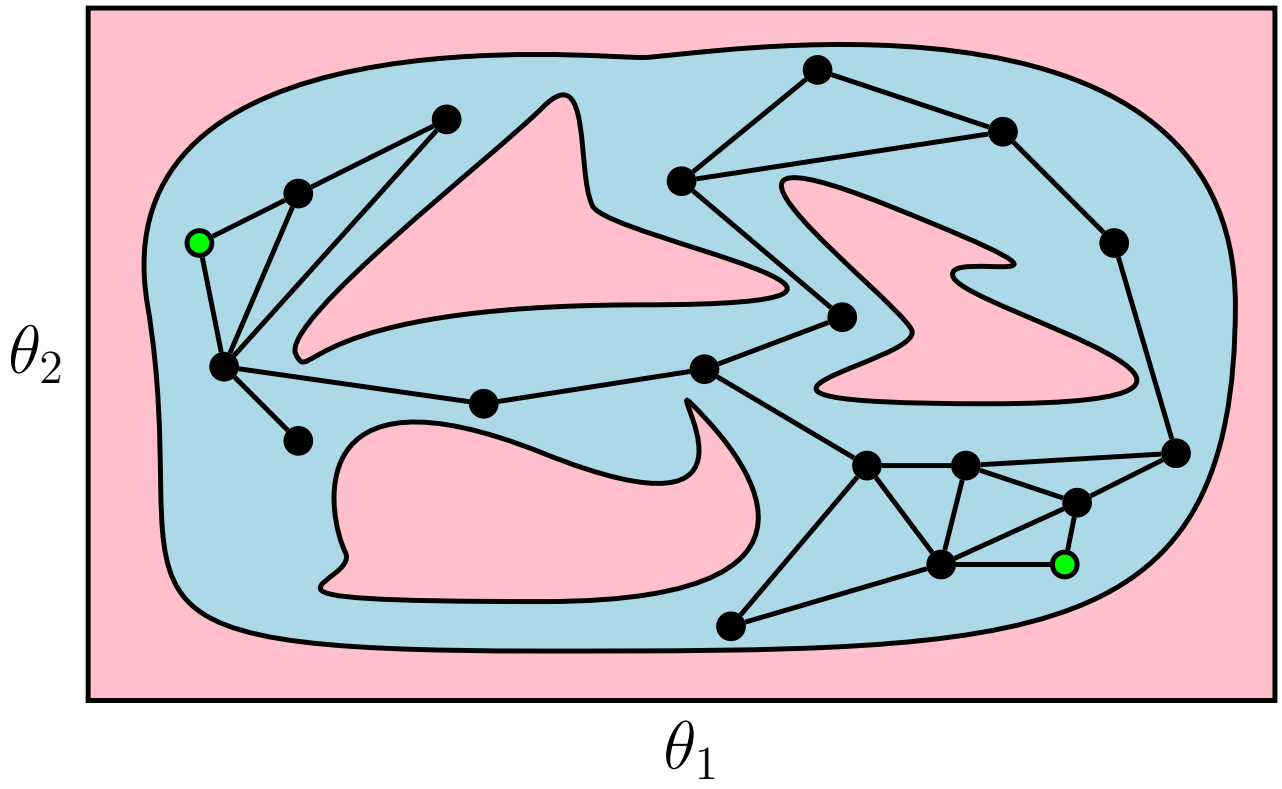
Do this for all the nodes to form a graph

Probabilistic road maps (PRMs)



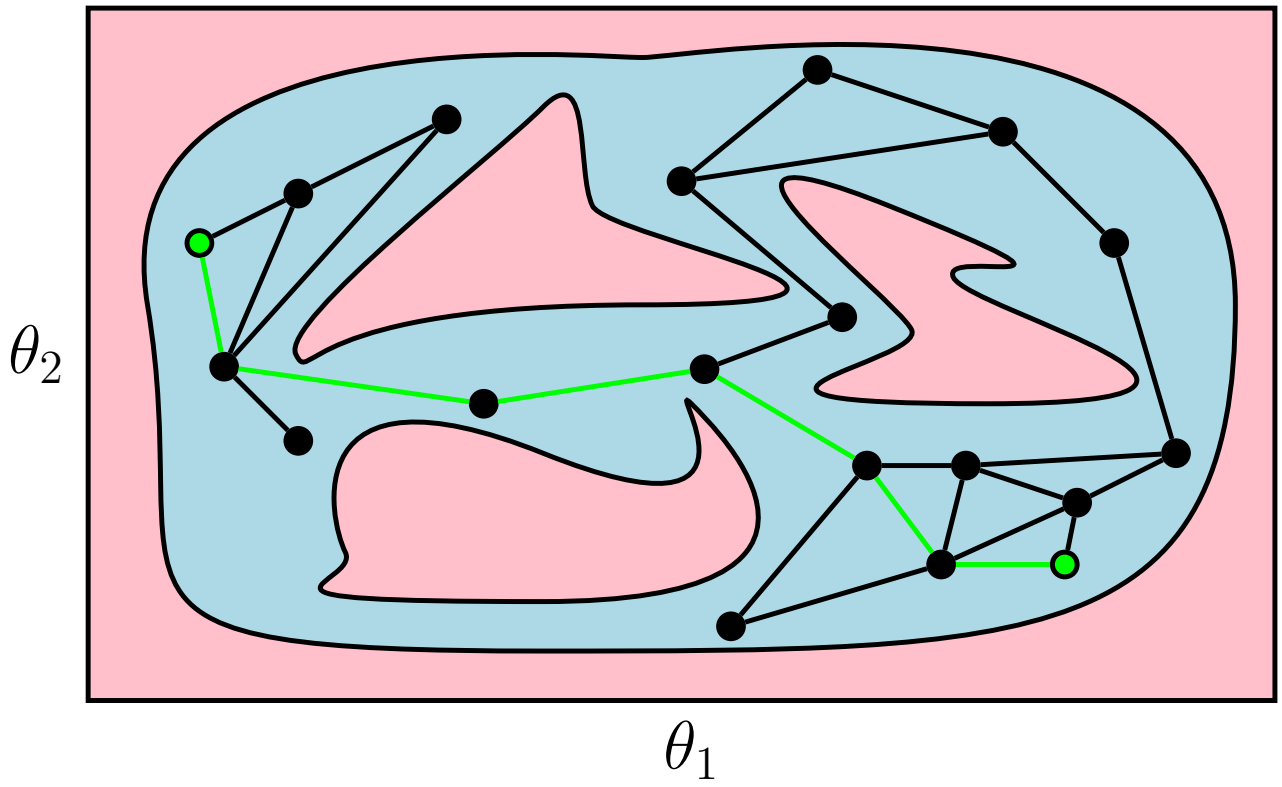
Now, given new start and end points

Probabilistic road maps (PRMs)



Add points to the graph

Probabilistic road maps (PRMs)



Plan motion using any graph search method

Challenges in PRMs

- How do we know if a path is non-colliding? (remember, we can only easily check if individual points in configuration space are non-colliding)
  - Check many points uniformly on line

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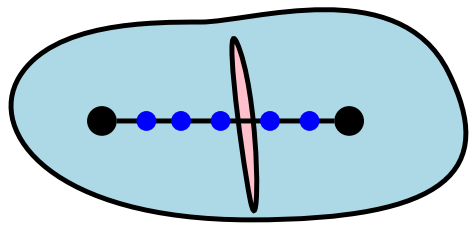
- How do we know if a path is non-colliding? (remember, we can only easily check if individual points in configuration space are non-colliding)
  - Check many points uniformly on line
  - Looks good!



  - Need to ensure the discretization is smaller than narrowest obstacle (e.g. by adding "safety margin" to obstacles)

- Existence of "bottlenecks"
  - Sample more densely in areas that have narrow passages
- Random sampling in $[0, 1]^n$?
- Complexity of constructing graph?
- What about systems with dynamics, can't move arbitrarily between points in configuration space (more on this next time)