Adapting Representation to the Problem

- How do we \textit{represent} our solution?
- Example: using \textit{neural networks}

- Too simple: suboptimal performance
- Divergence and catastrophic performance
  [Baird 1995] [Boyan & Moore 1995]

- Too complex: infeasibly slow learning
Adapting Representation to the Problem

- How do we represent our solution?
- Example: using neural networks

- Too simple: suboptimal performance
- Divergence and catastrophic performance
  [Baird 1995] [Boyan & Moore 1995]

- Too complex: infeasibly slow learning

Can RL agents automatically learn effective representations?
NEAT+Q [Whiteson & Stone, JMLR 2006]

**Evolve** agents that are better able to learn

- Evolution chooses representation and initial weights
  - NEAT learns NN topologies [Stanley & Miikkulainen, ’02]
- Q-learning learns weights that approximate value function
Evolve agents that are better able to learn

- Evolution chooses representation and initial weights
  - NEAT learns NN topologies [Stanley & Miikkulainen, ’02]
- Q-learning learns weights that approximate value function
NEAT+Q Results

- Neural net function approx. works on mountain car!
- Tested Q-learning with 24 manual configurations