Adapting Representation to the Problem

Typically, representations given and/or chosen manually

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Adapting Representation to the Problem

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The crucial factor for a successful approximate algorithm is the choice of the parametric approximation architecture..." [Lagoudakis & Parr,'03]
Adapting Representation to the Problem

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

- Too simple: suboptimal performance
- Divergence and catastrophic performance

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] [Boykin & 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
**NEAT+Q** [Whiteson & Stone, JMLR 2006]

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Evolve agents that are better able to **learn**
NEAT+Q Results

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