The Curse of Dimensionality

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With a Classical 32-card game

Possible distribution $32! = \quad 2.6 \times 10^{35}$

Human life: around 5×10^{7} seconds

Probability to play 2 times the same distribution in a human life is very close to 0

Decision Making

Is about controlling linked variables:

- Learning correlation
- Optimize trajectories

Matematically:

- Manipulate Cartesian Product (Set Theory)
- Estimate functions
- Exploring large graph

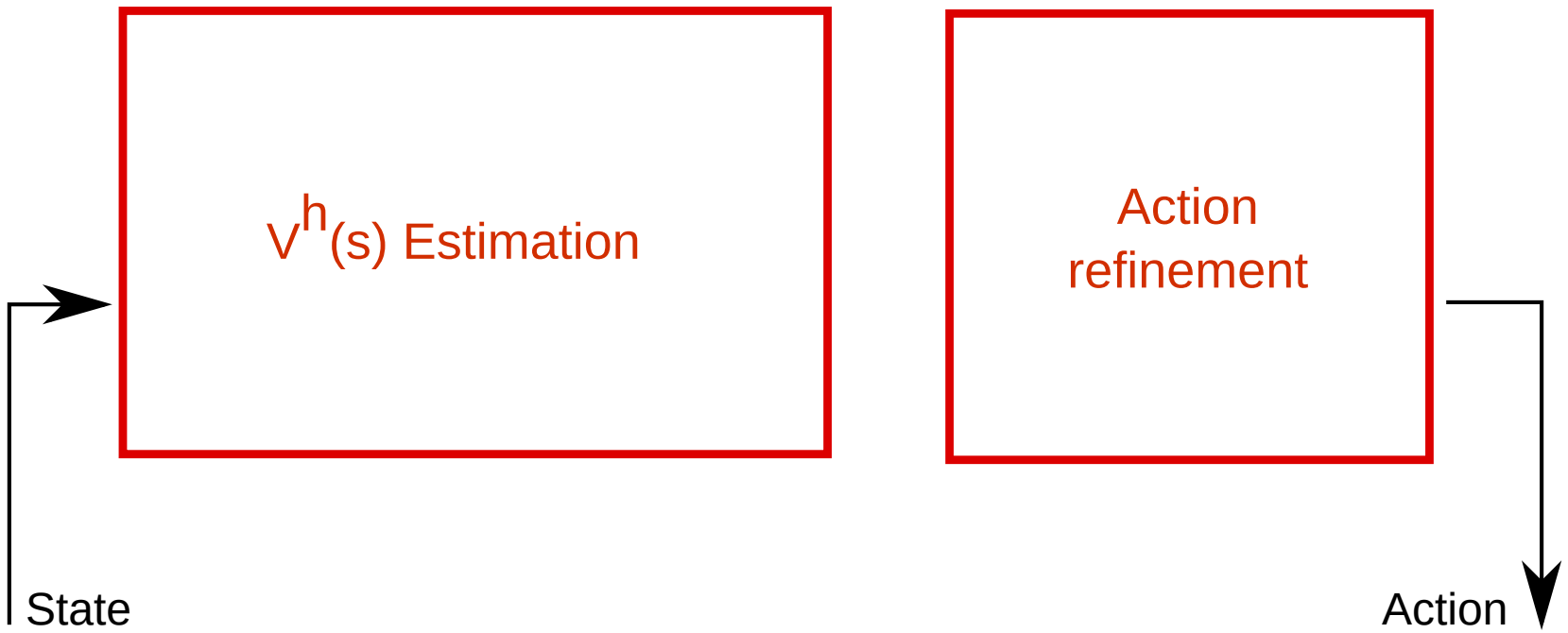
Dealing with large State Space

Reduce the state space

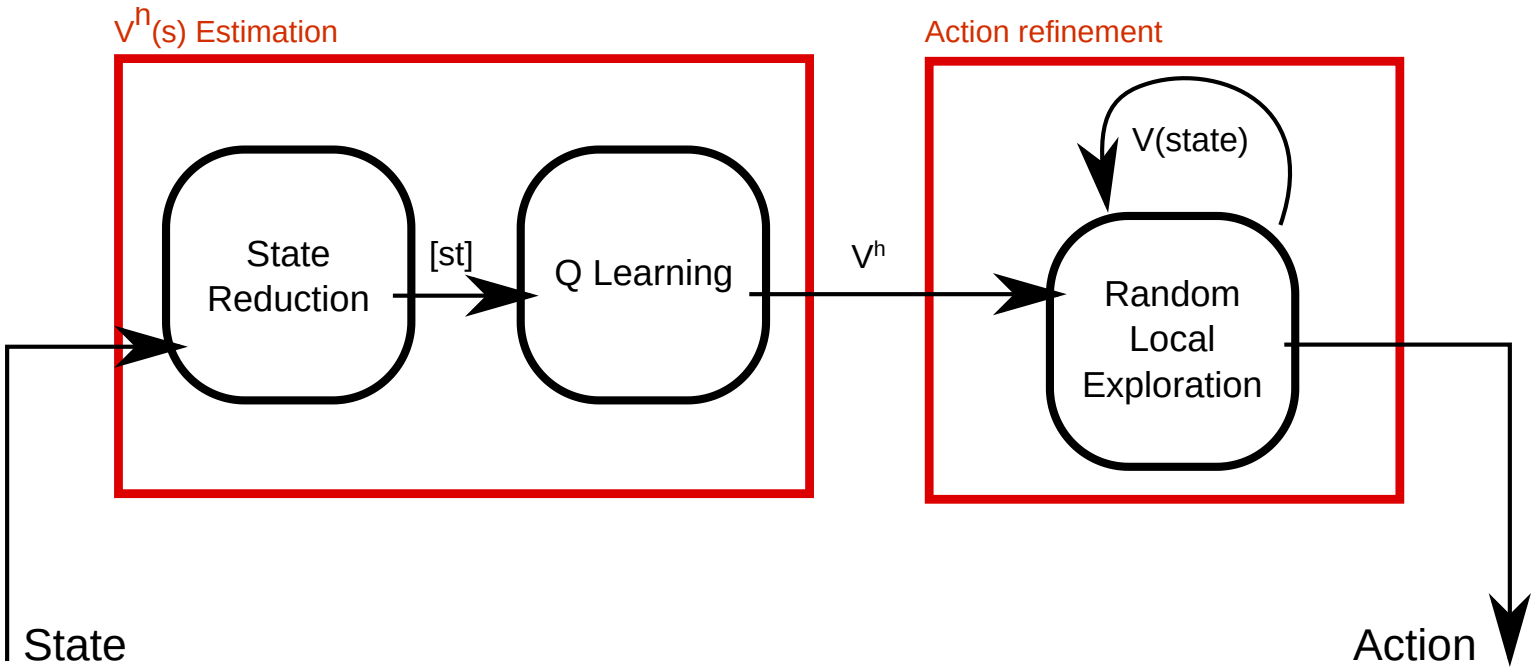
Work locally

A combination of these 2 solutions

A Complete Decision Architecture



A Complete Decision Architecture



State reduction (or identification)

Approach:

Distance based approach:

- Principal Component Annalysis (**PCA**) (+ Discretization)
- Clustering: **k-means**, Simple Vector Machine (**SVM**)

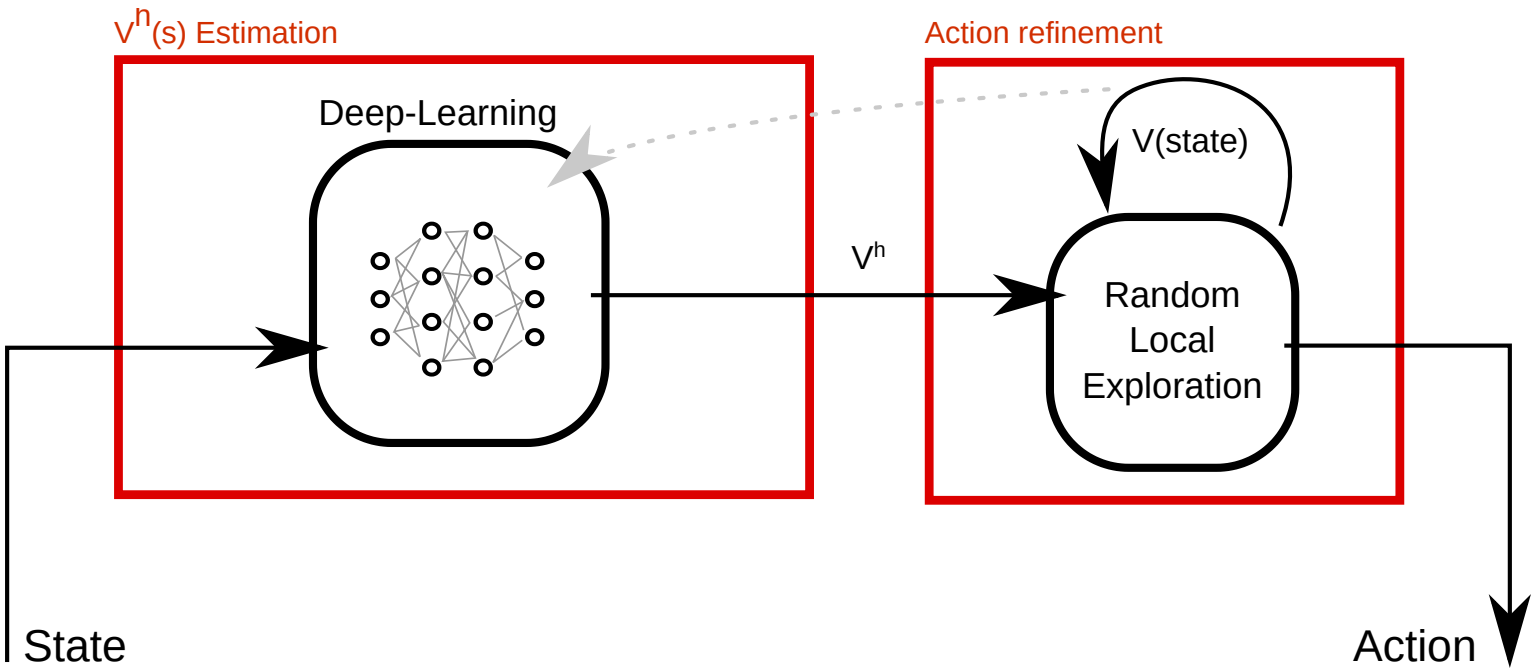
Discrete approach:

- Decision-Tree (ID3 algorithm family)

Goals:

Macro-States merge states with supposed similar values.

Deep-Learning-based Decision Architecture



Requirement:

Labeled data with valid *values*...

Action refinement at run time

Local computation of the Values and the policy from current state.

- Constrained Value Iteration (from the current state, with a limited horizon)
- Monte Carlo Approach (based on deep, but random trajectories)

Requirement:

Simulation: a model of the controlled system

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