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# Robot Learning



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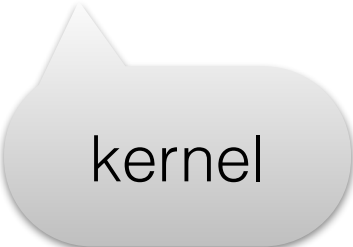
6




Diversity-aware amplifying with leaky kernels

$$D(\{\theta_i\}_{i=1}^n) = \log \det \left( \begin{bmatrix} k(\theta_1, \theta_1) & \cdots & k(\theta_1, \theta_n) \\ \cdots & \cdots & \cdots \\ k(\theta_n, \theta_1) & \cdots & k(\theta_n, \theta_n) \end{bmatrix} \sigma^{-2} + \mathbf{I} \right)$$






kernel



free  
parameter



identity  
matrix



diversity metric

Given past planning experience, we have

Prudential

$$\theta_1(1), \theta_2(1), \dots, \theta_{n_1-1}(1), \theta_{n_1}(1)$$

Prudential 2022



$\theta_1(2), \theta_2(2), \dots, \theta_{n_2-1}(2), \theta_{n_2}(2)$

Principles of Mathematics

$$\theta_1^{(3)}, \theta_2^{(3)}, \dots, \theta_{n_3-1}^{(3)}, \theta_{n_3}^{(3)}$$



similar items

Idea: tune kernel  
parameters to reflect that  
some values are similar

# Diversity-aware sampling with learned kernels

$$D(\{\theta_i\}_{i=1}^n) = \log \det \left( \begin{bmatrix} k(\theta_1, \theta_1) & \dots & k(\theta_1, \theta_n) \\ \dots & \dots & \dots \\ k(\theta_n, \theta_1) & \dots & k(\theta_n, \theta_n) \end{bmatrix} \sigma^{-2} + \mathbf{I} \right)$$

diversity metric

kernel

free parameter

identity matrix

Given past planning experience, we have

Problem 1  $\theta_1^{(1)}, \theta_2^{(1)}, \dots, \theta_{n_1-1}^{(1)}, \theta_{n_1}^{(1)}$

similar items

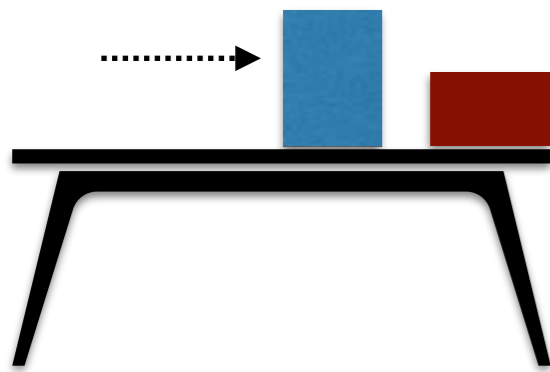
Problem 2  $\theta_1^{(2)}, \theta_2^{(2)}, \dots, \theta_{n_2-1}^{(2)}, \theta_{n_2}^{(2)}$

Idea: tune kernel parameters to reflect that some values are similar

Problem 3  $\theta_1^{(3)}, \theta_2^{(3)}, \dots, \theta_{n_3-1}^{(3)}, \theta_{n_3}^{(3)}$

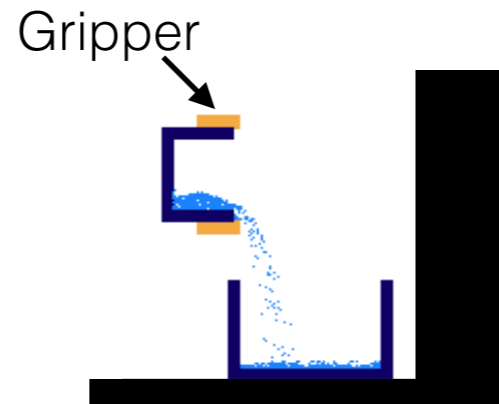
# Comparing different sampling methods

Task I



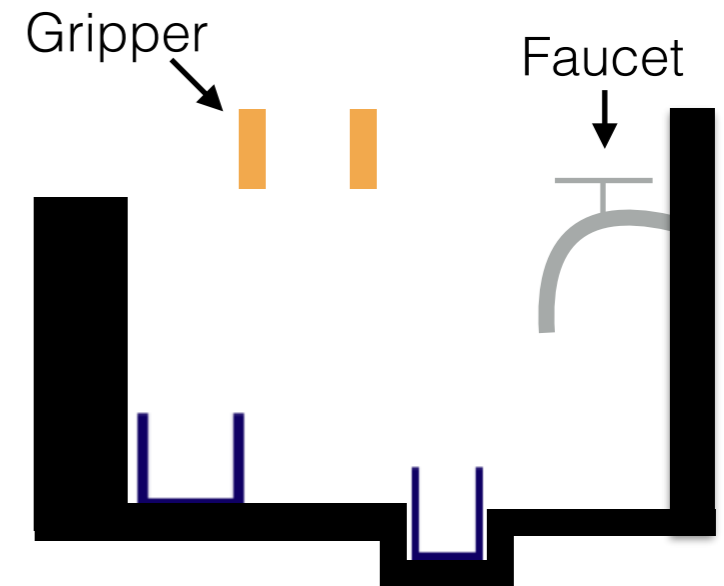
push object off table

Task II



put water in a cup  
next to an obstacle

Task III



put water in a cup next to  
an obstacle while the other  
cup is in a cup holder