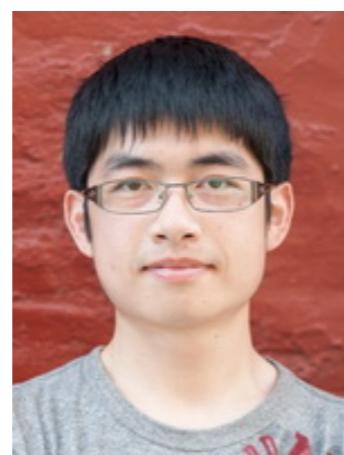
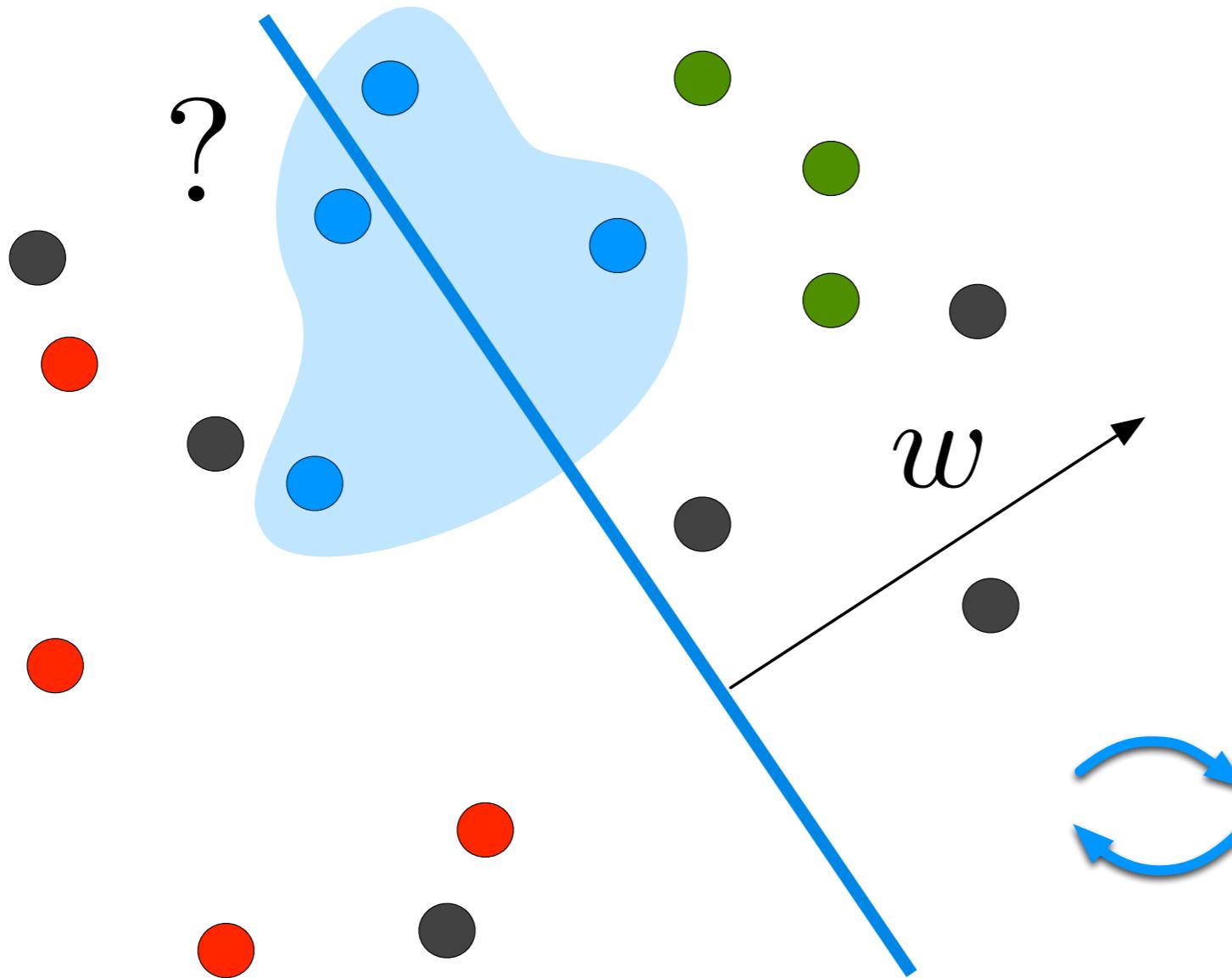


Near-optimal **Batch Mode Active Learning** and **Adaptive Submodular Optimization**

Yuxin Chen Andreas Krause

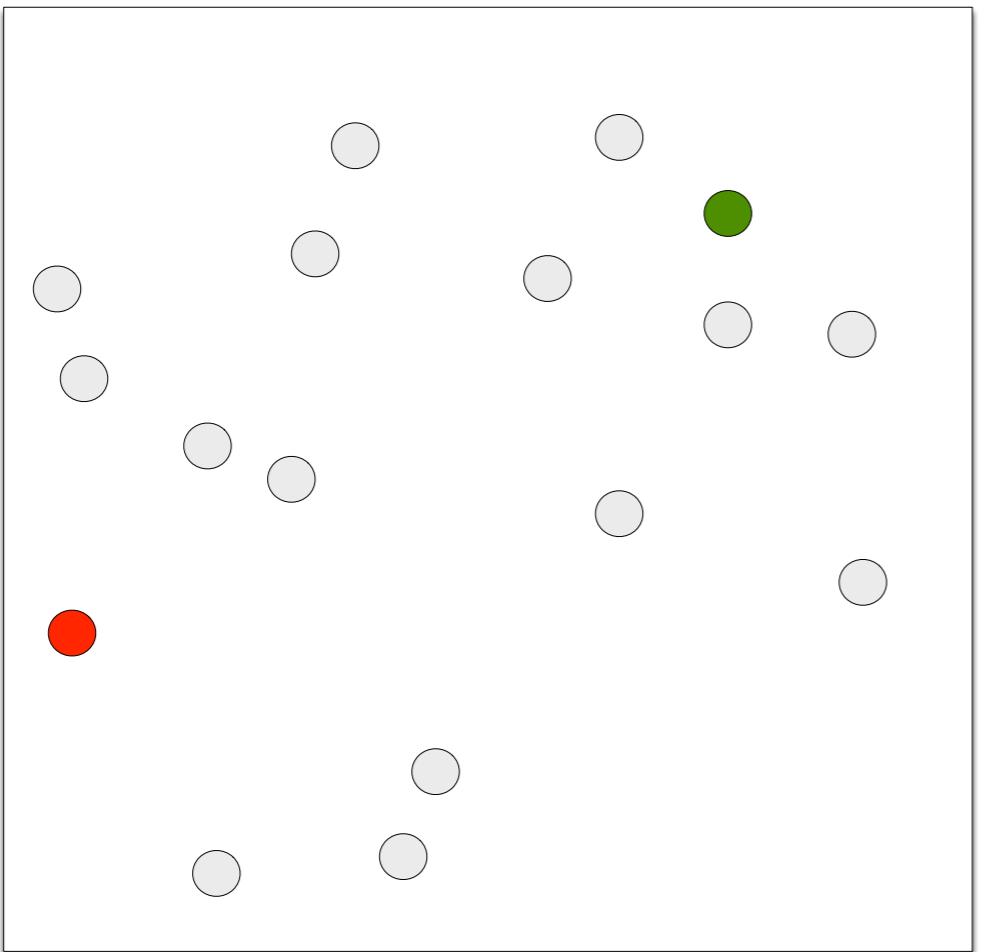
Department of Computer Science, ETH Zurich

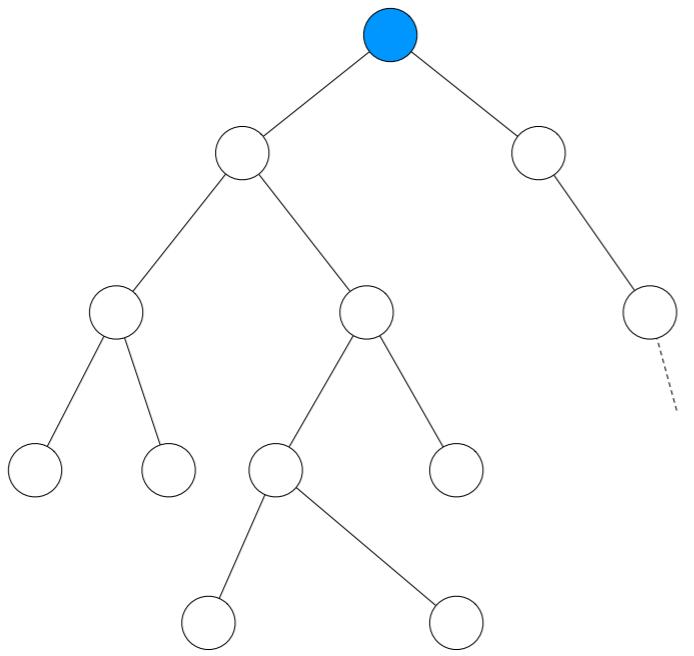
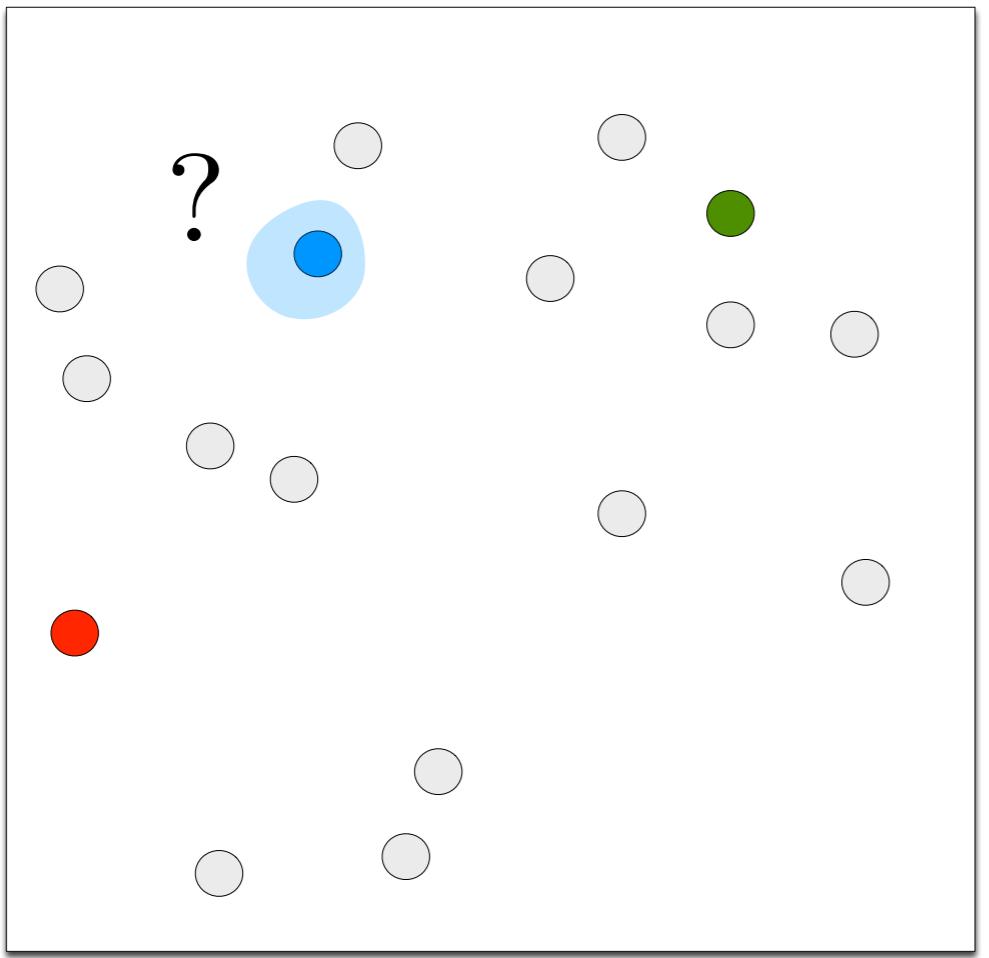


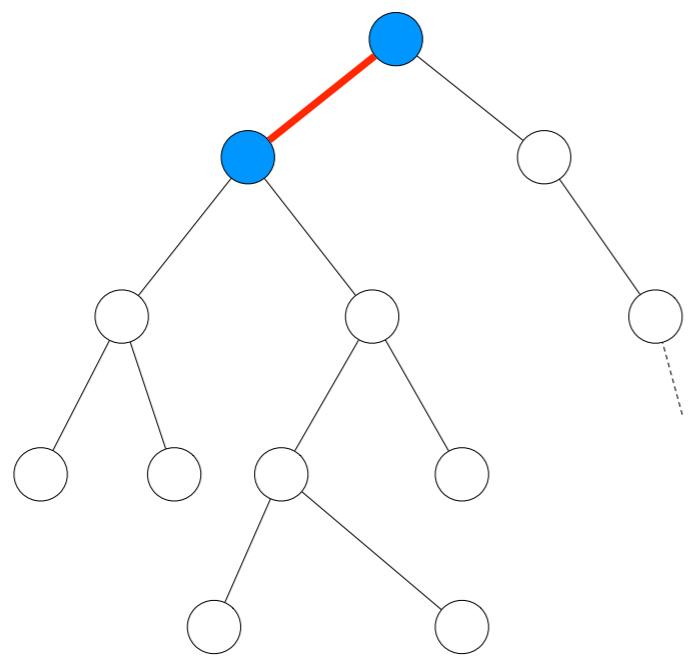
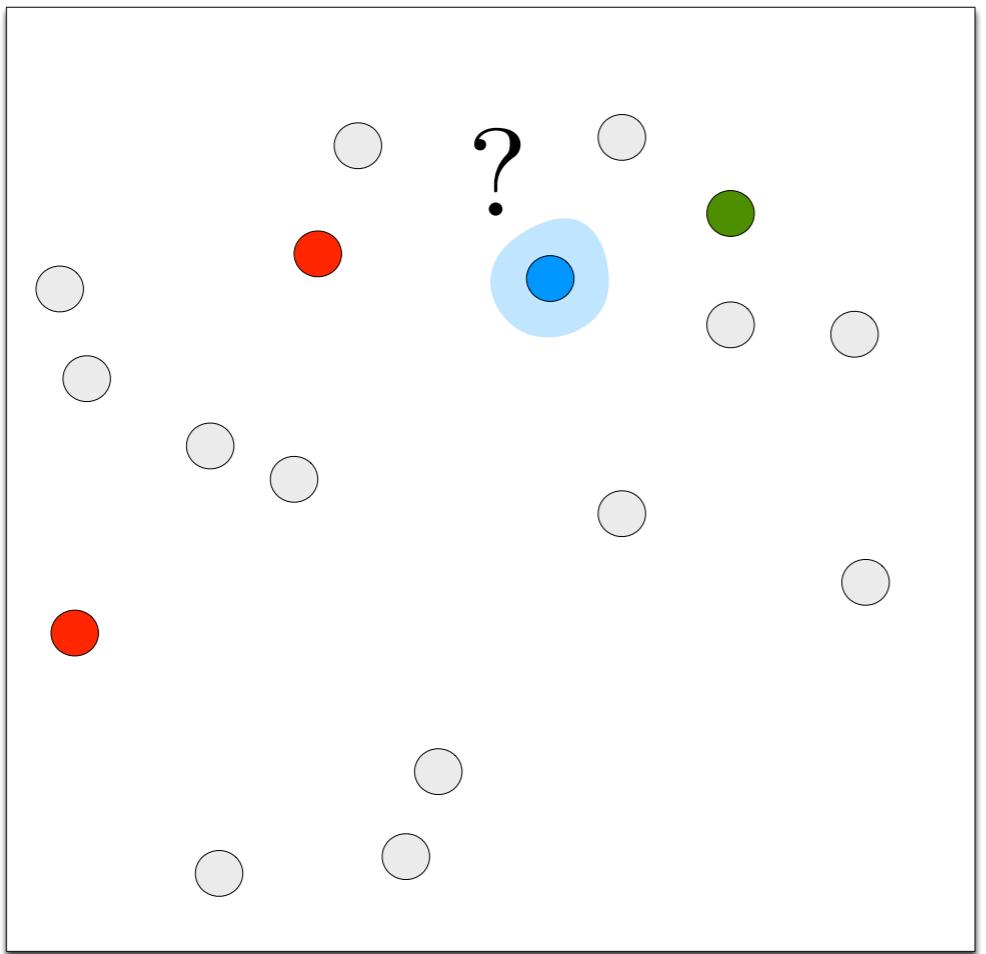


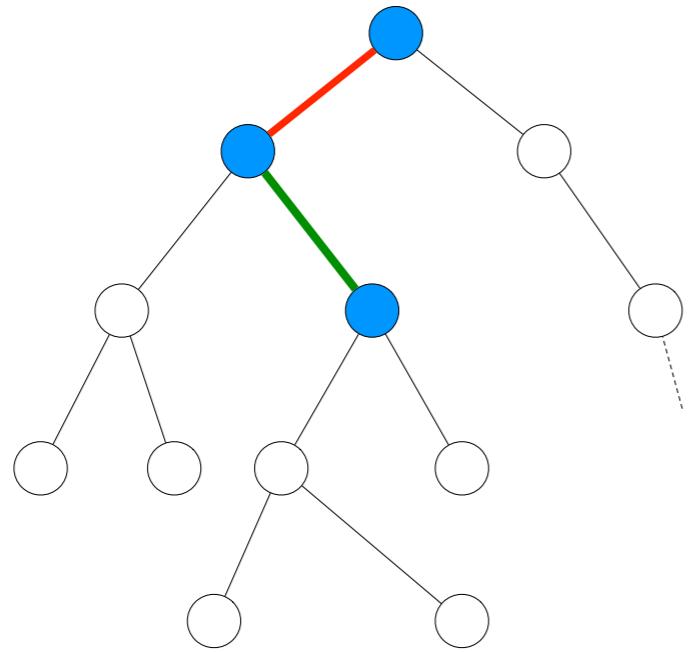
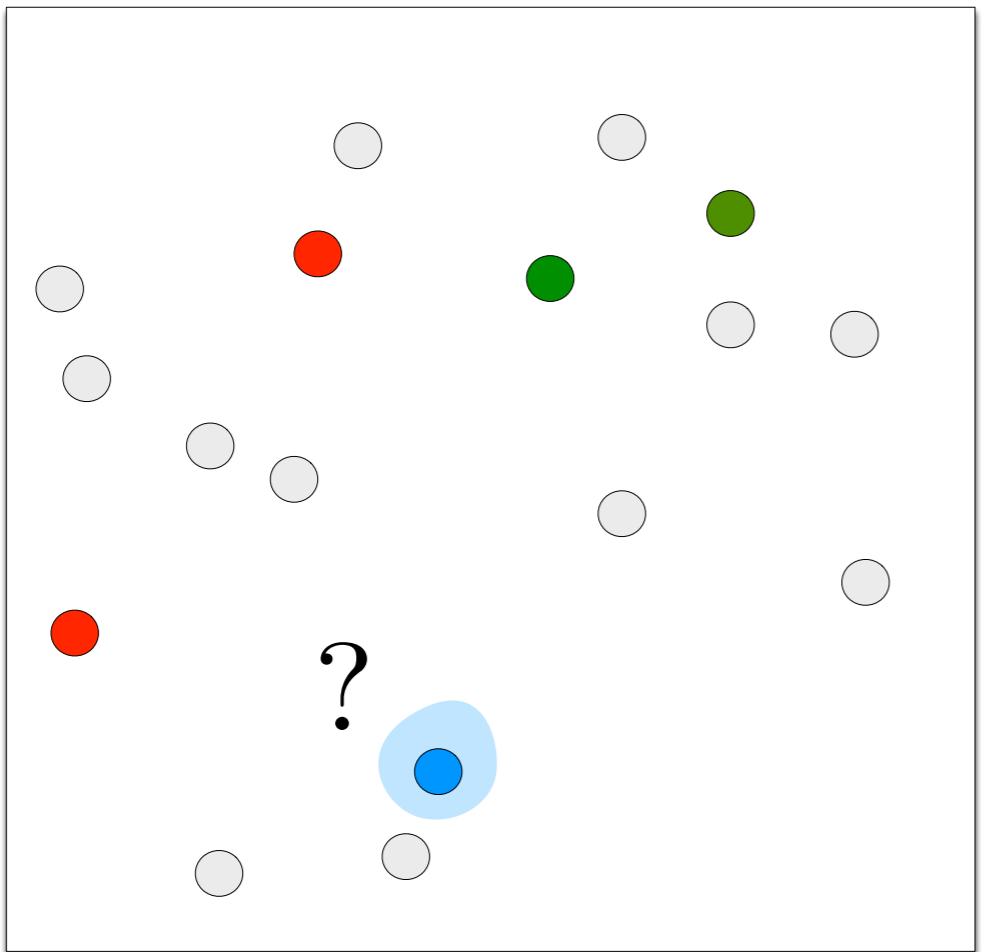
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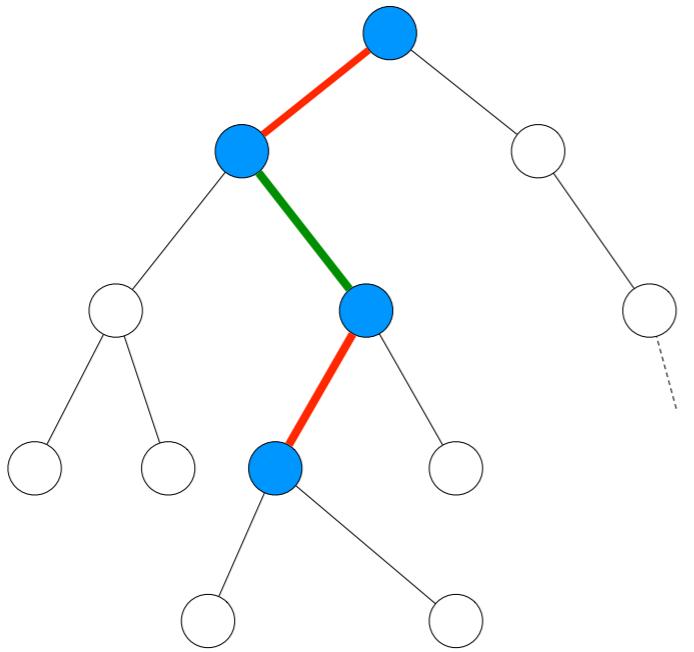
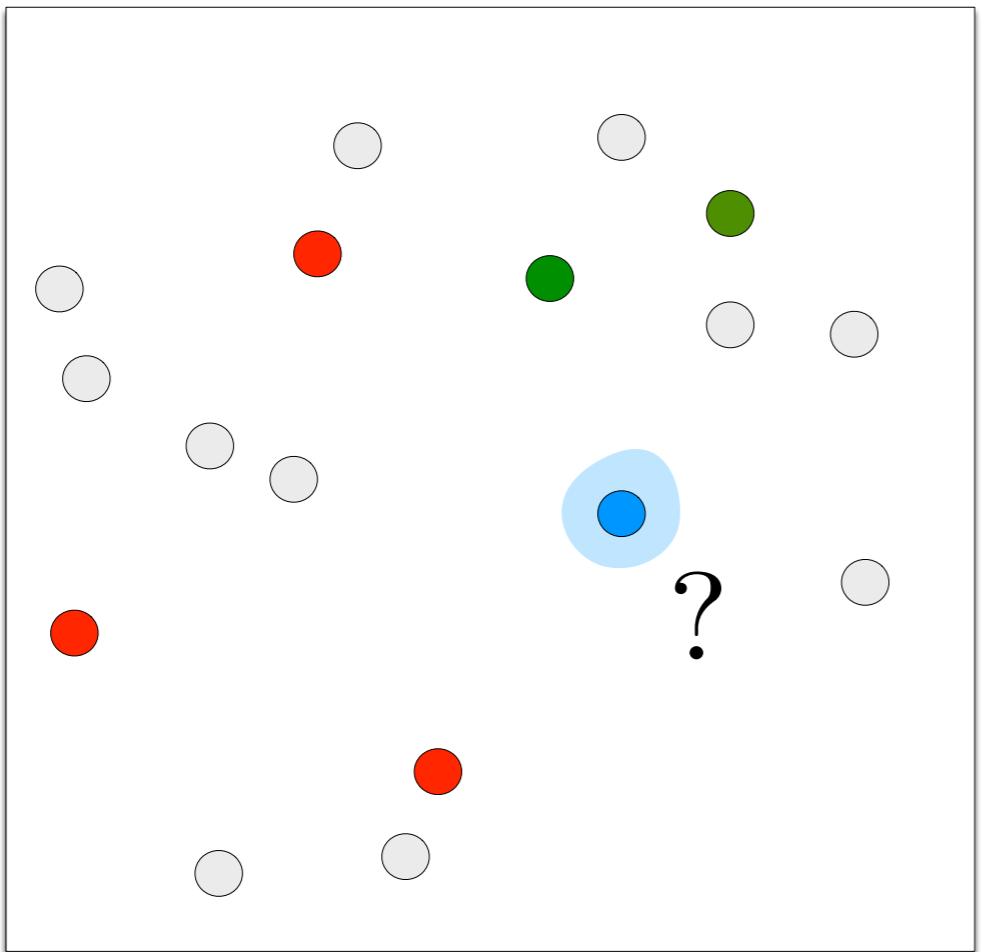
Batch Mode Active Learning

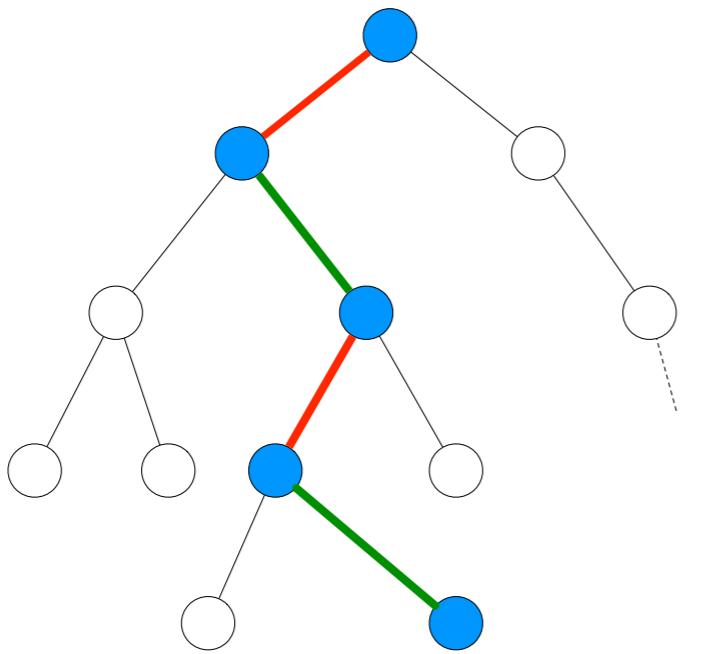
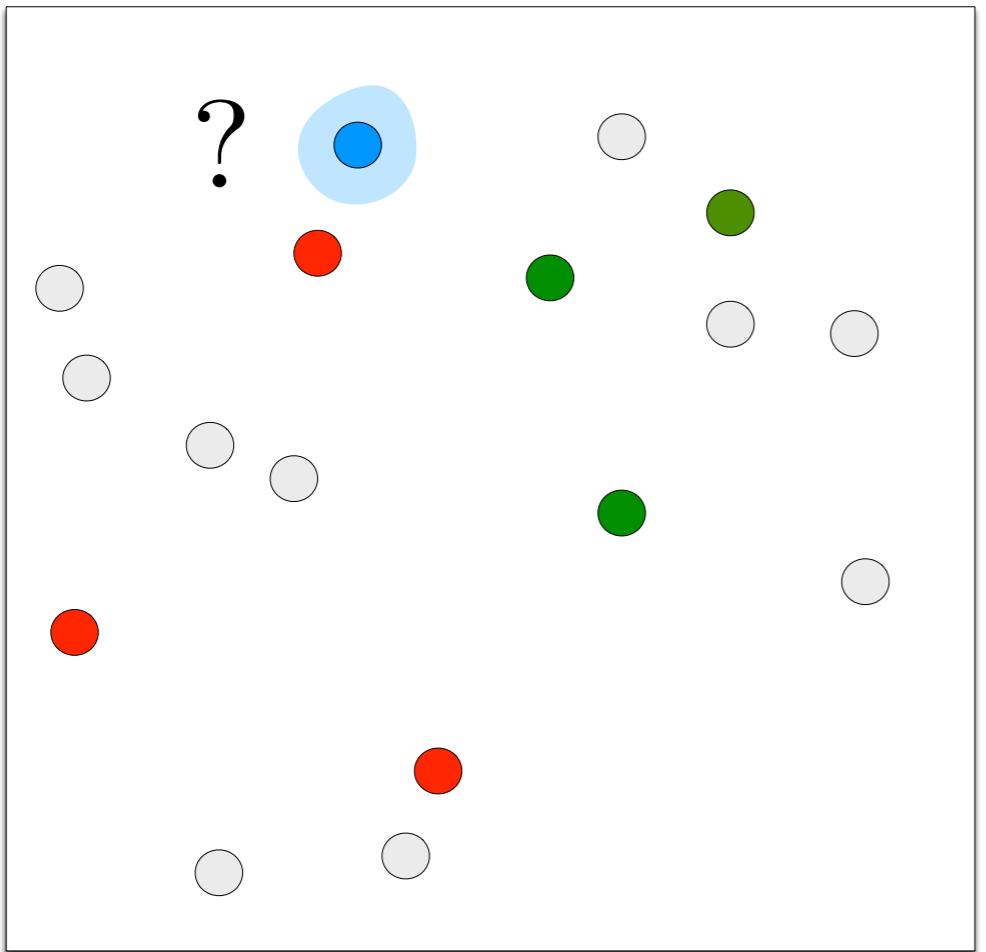


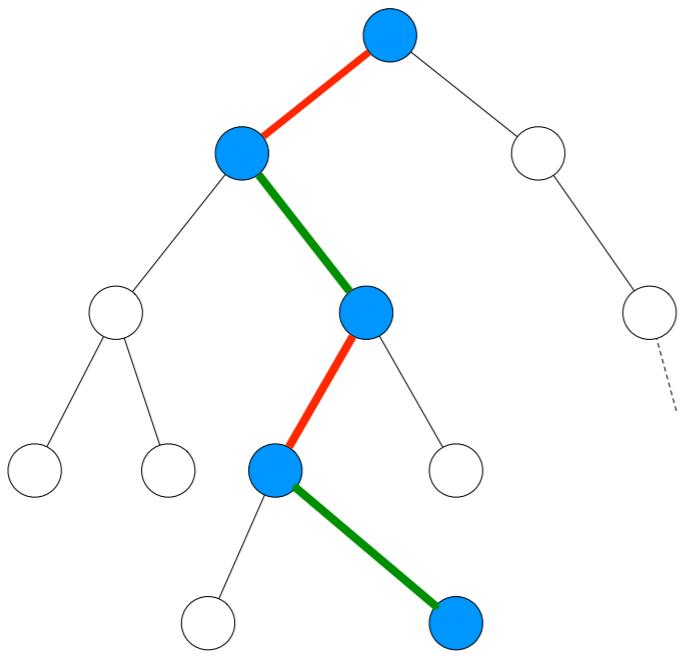
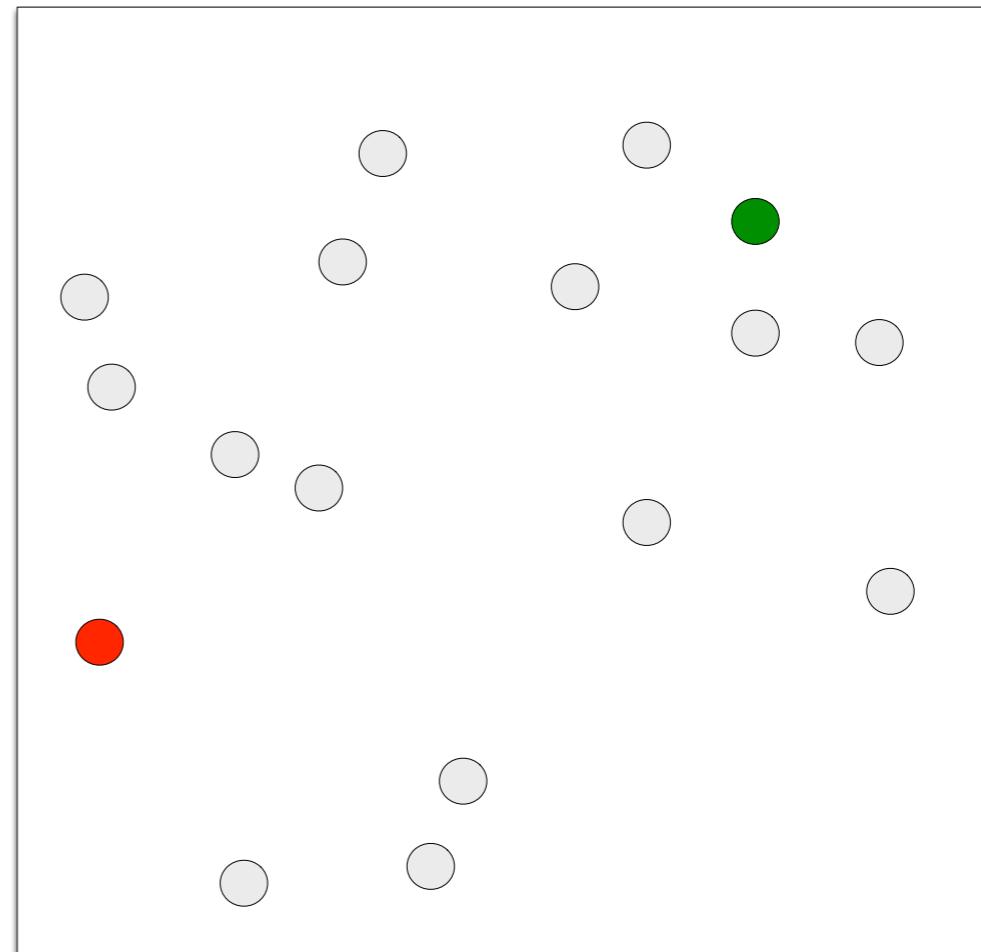
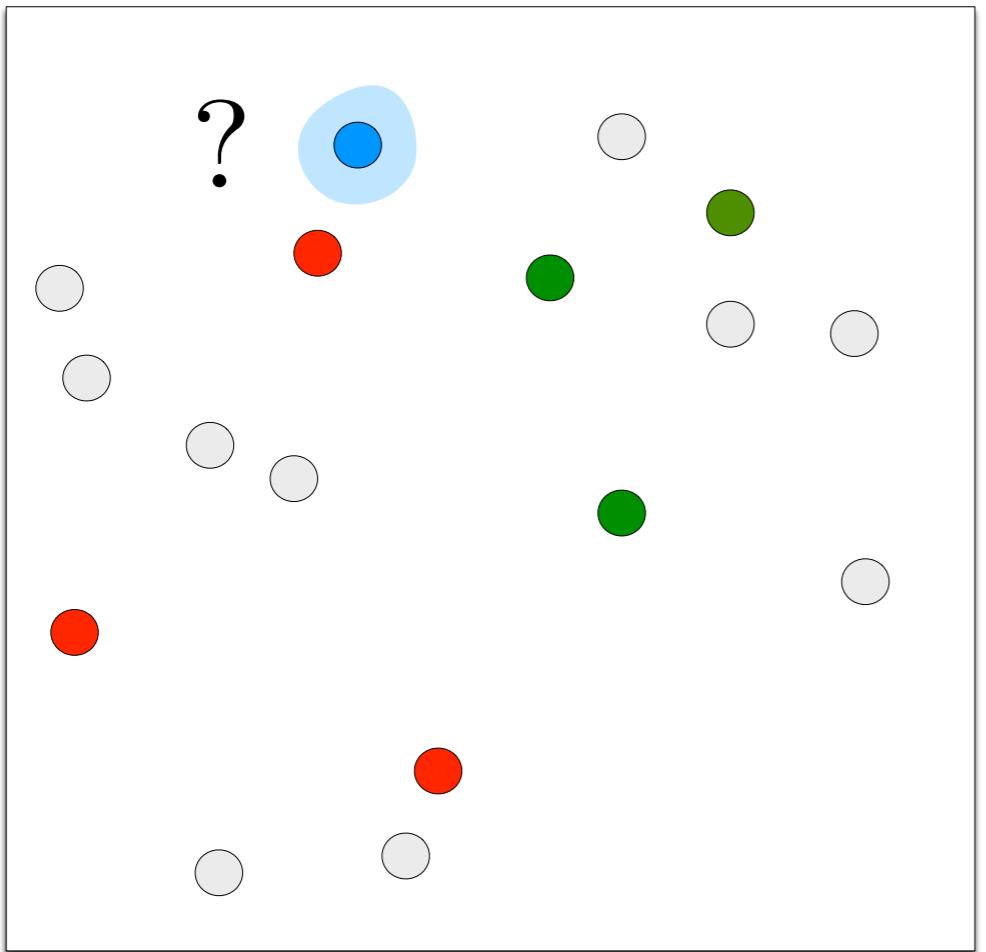


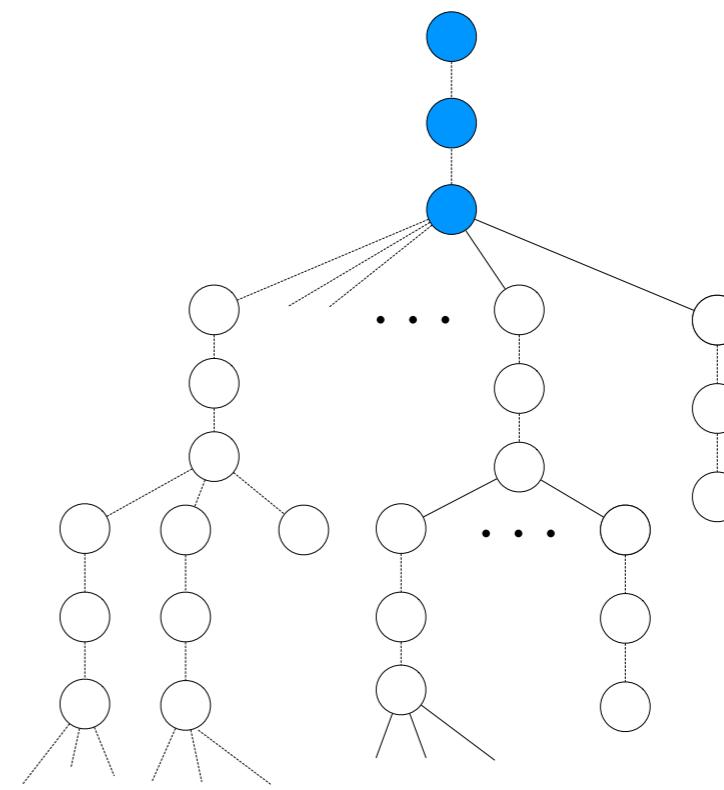
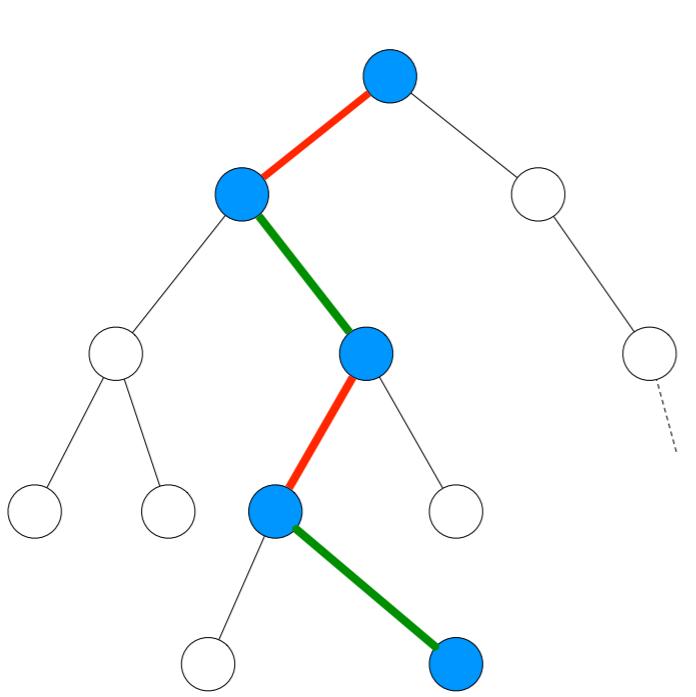
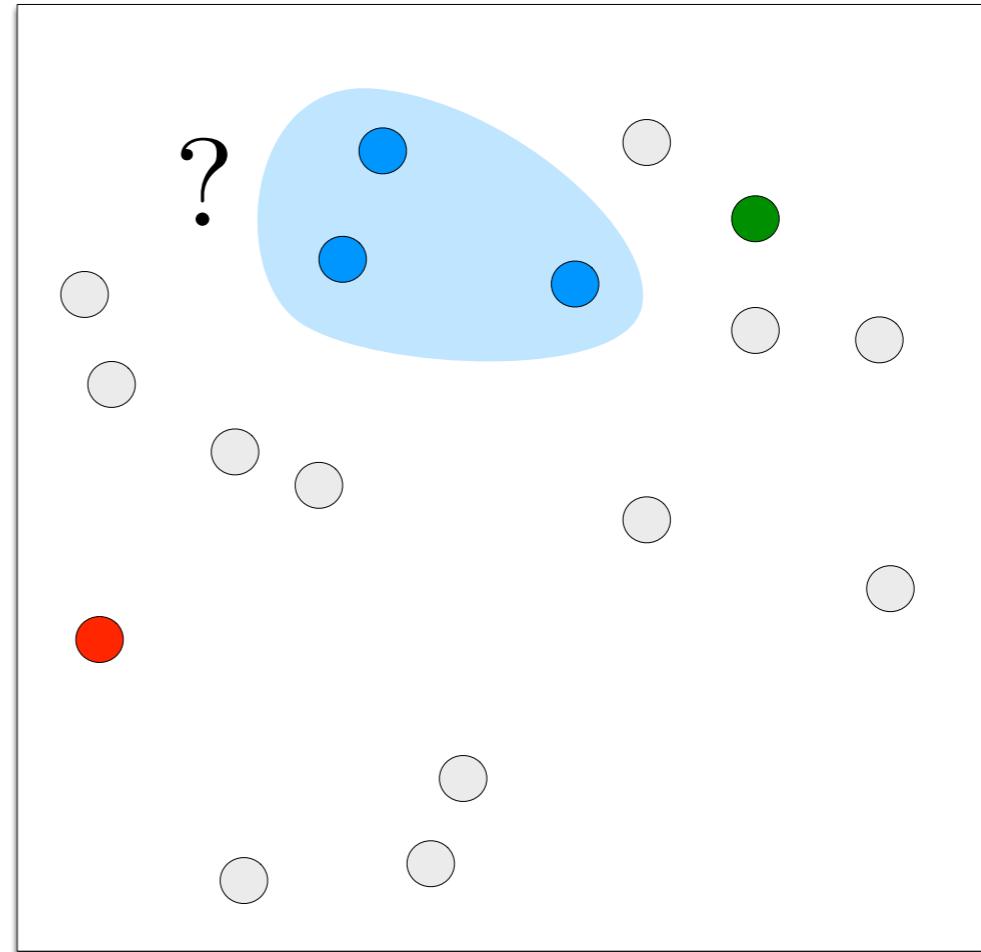
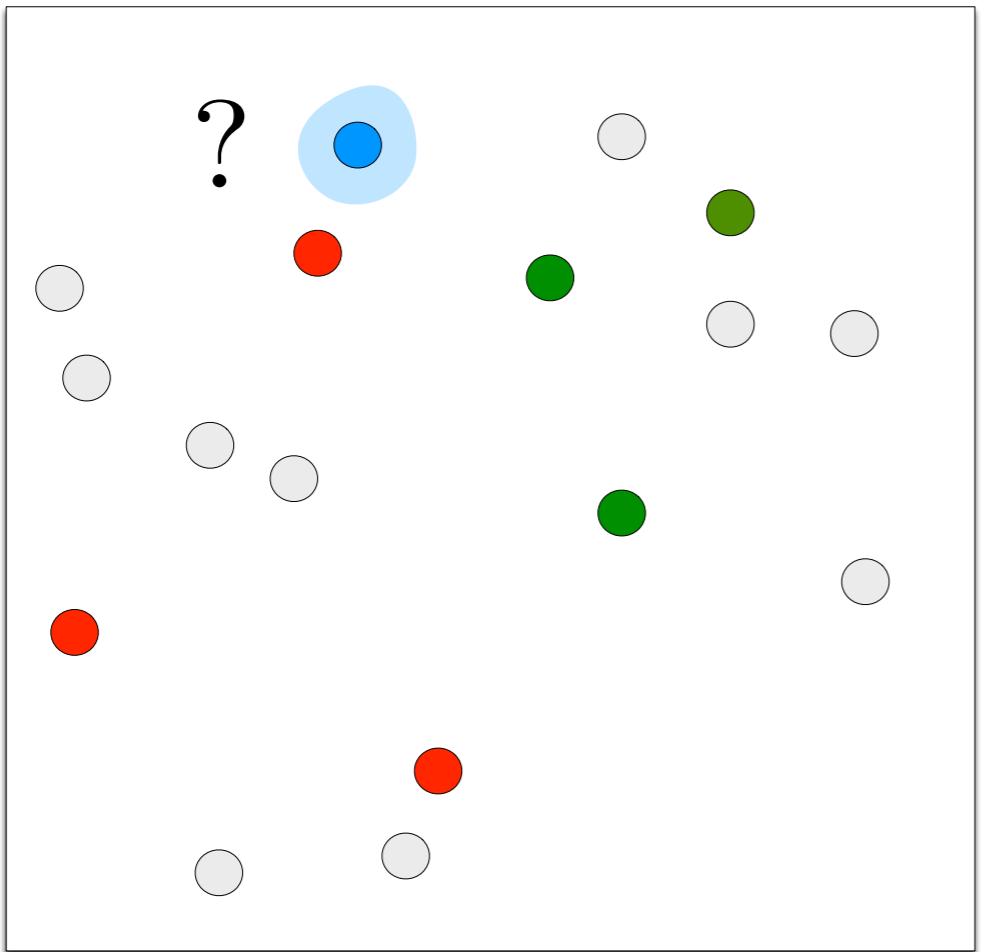


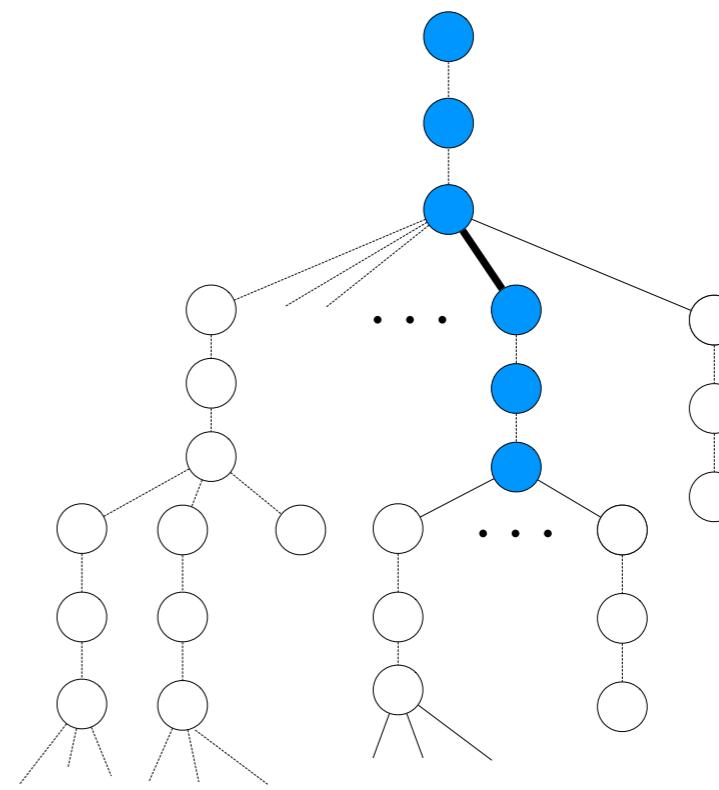
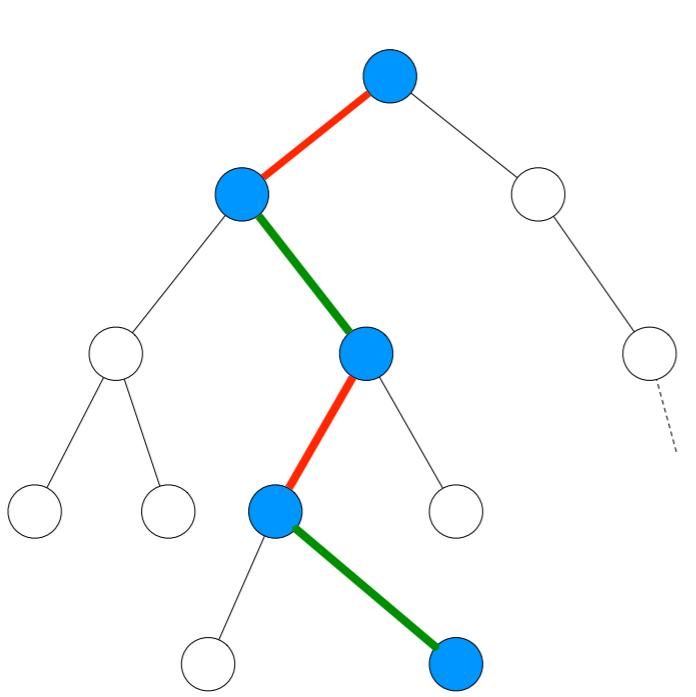
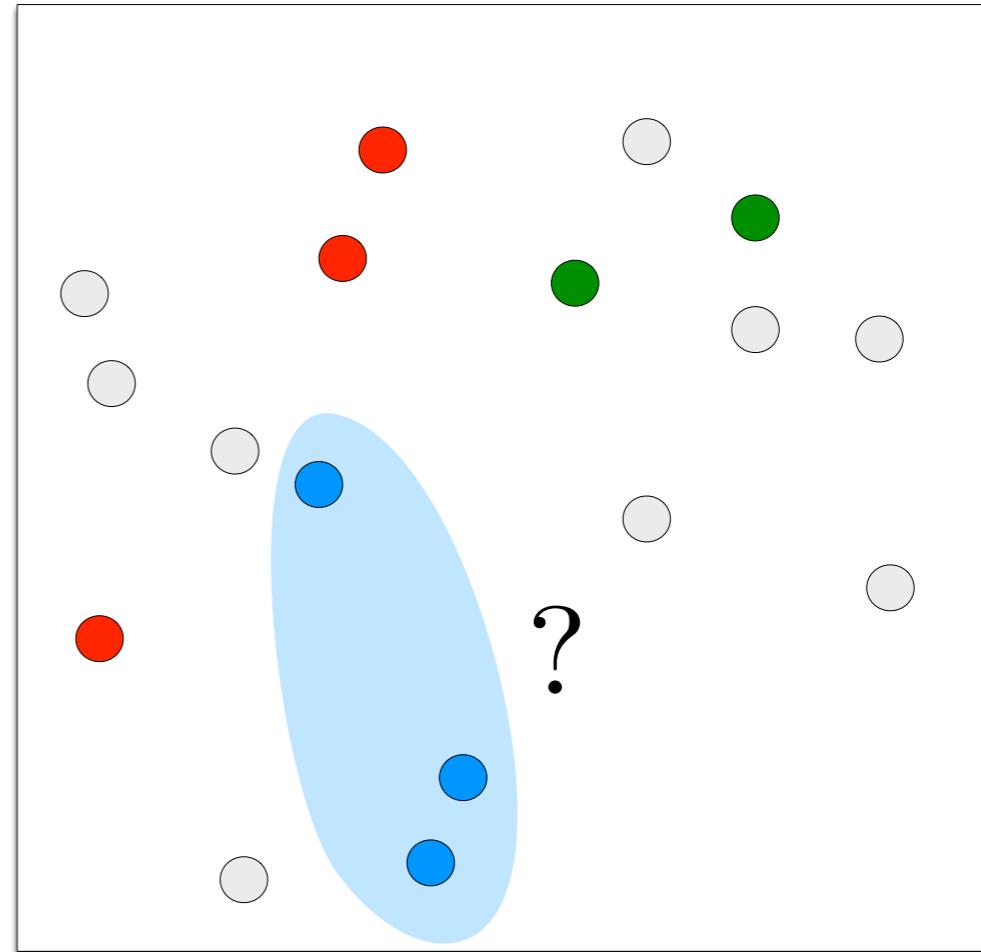
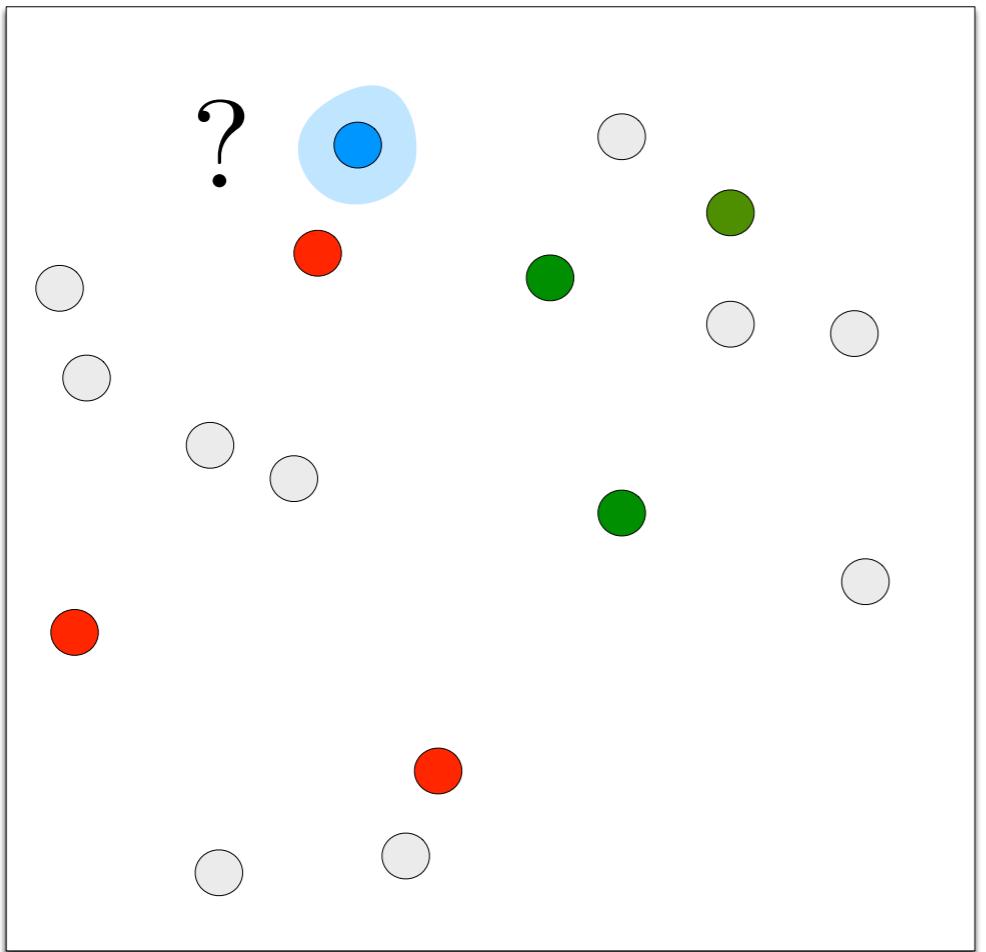


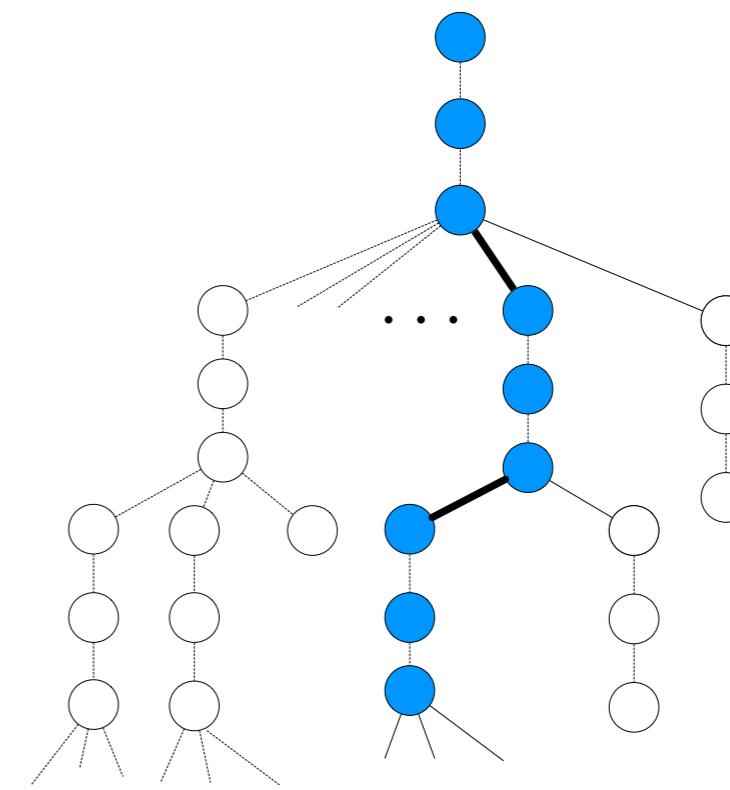
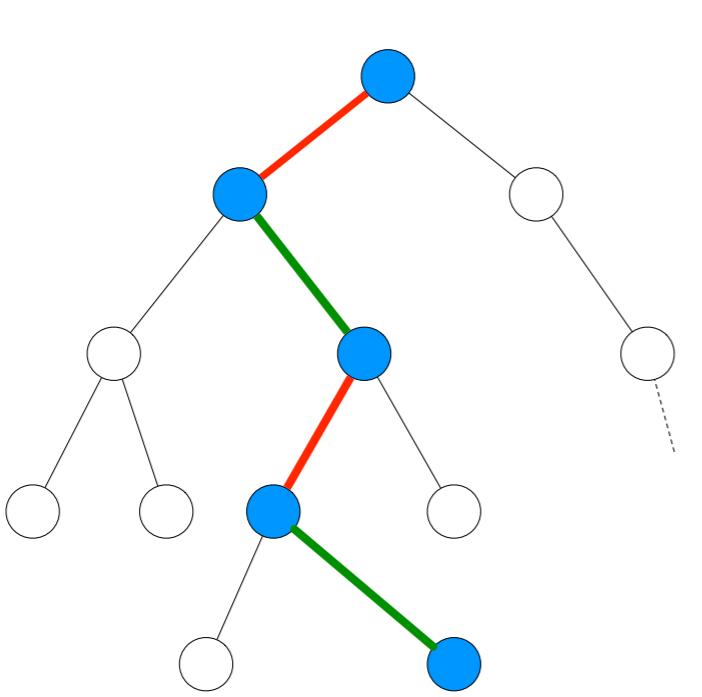
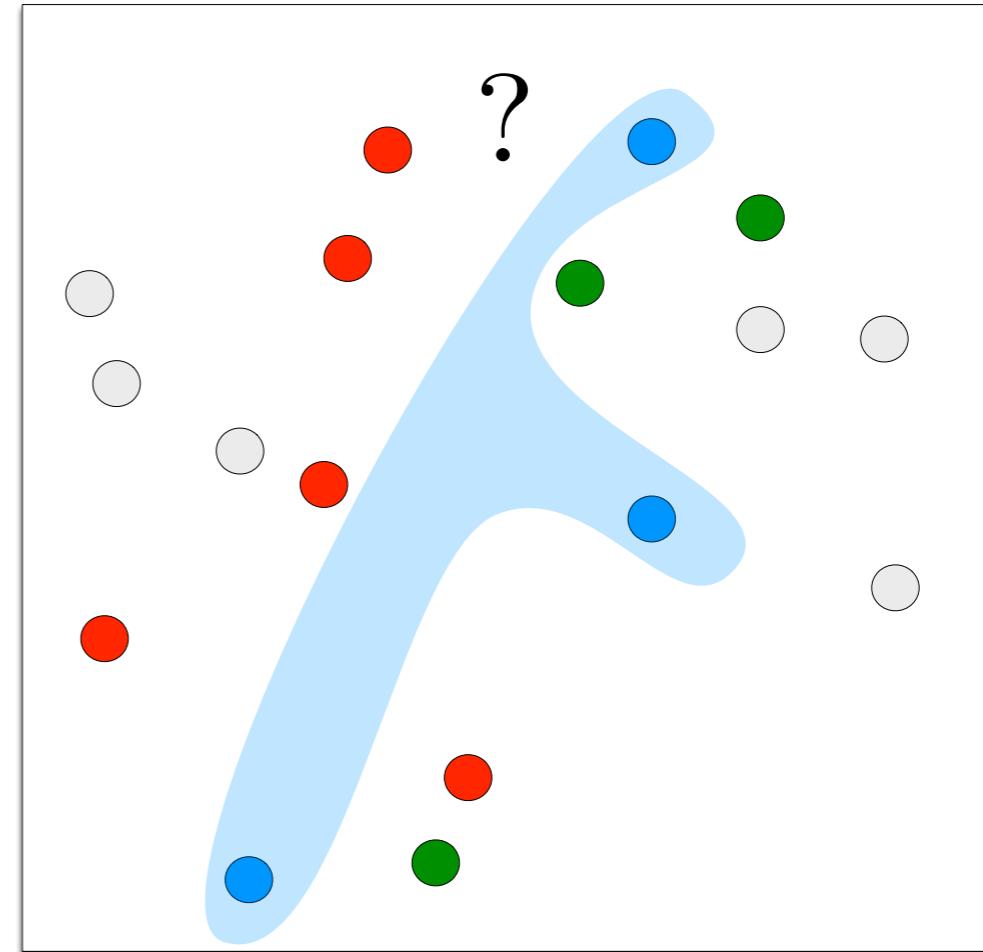
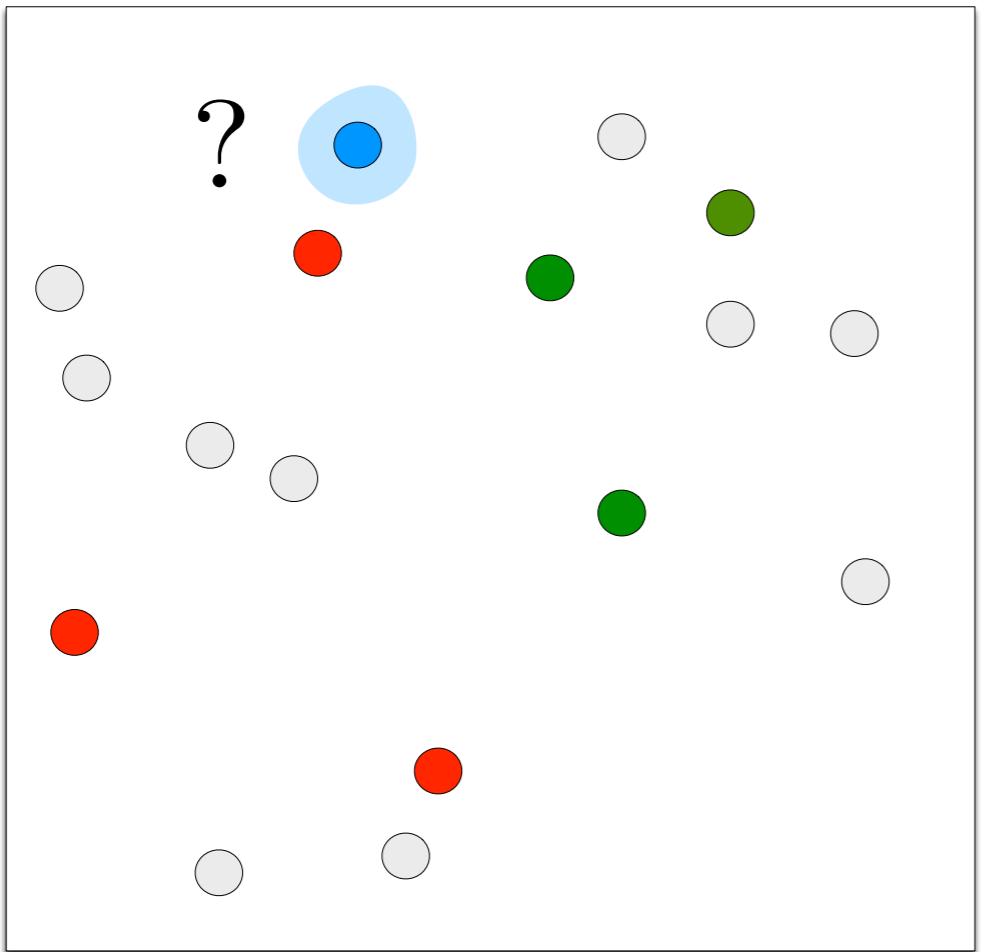








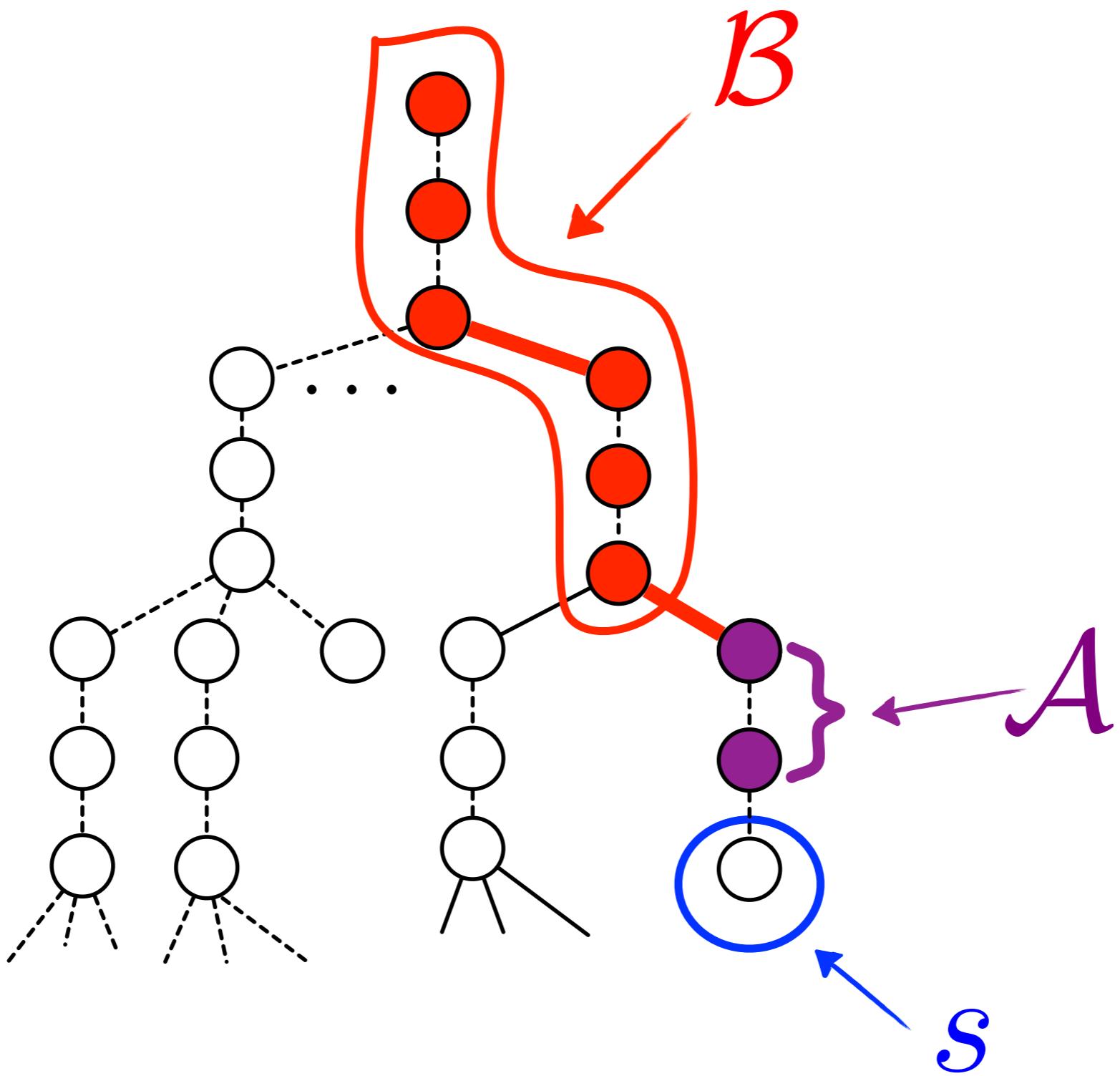




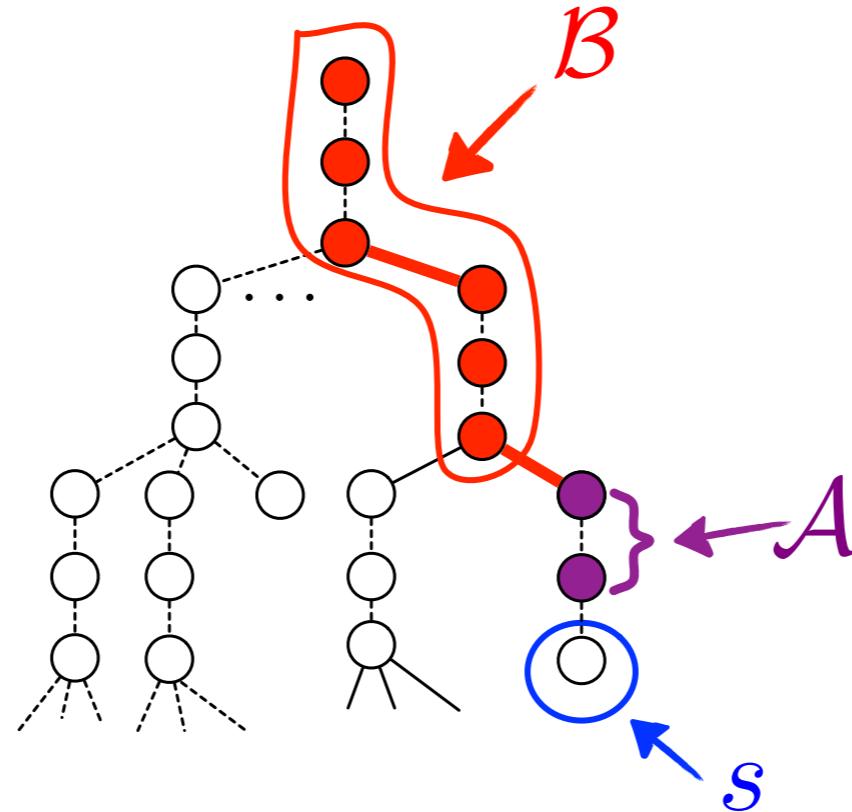


Multi-stage Influence Maximization in Social Networks

How should we construct the batches?



THE BATCHGREEDY ALGORITHM



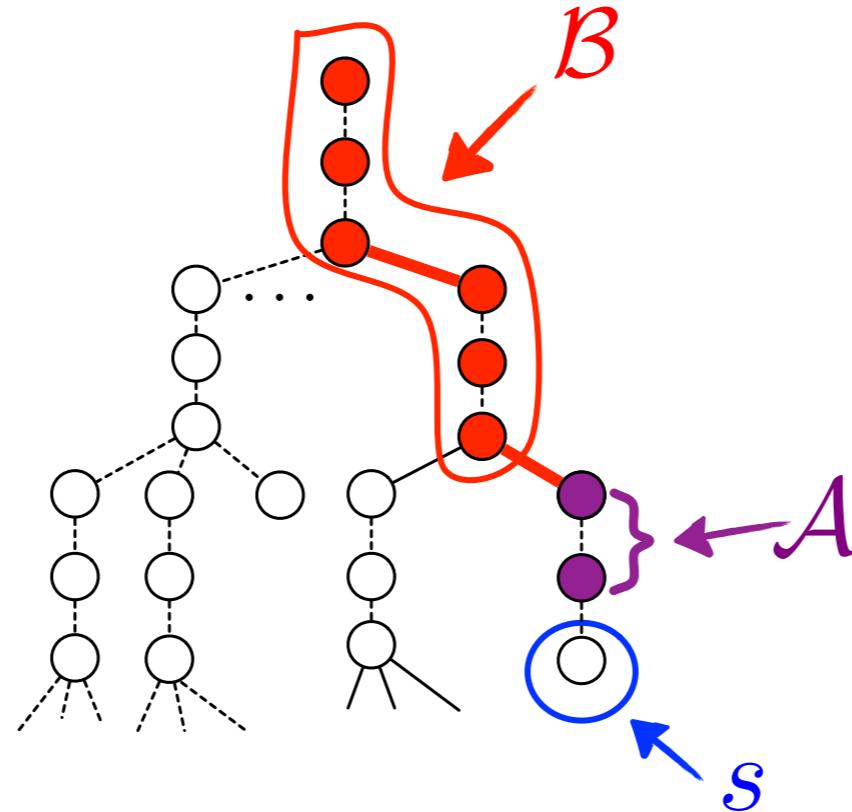
Conditional marginal benefit of an item s:

$$\Delta_f(s \mid \mathcal{A}, \mathbf{y}_{\mathcal{B}}) = \mathbb{E}_{\mathbf{y}_{\mathcal{V}}} [f(\mathbf{y}_{\{s\} \cup \mathcal{A} \cup \mathcal{B}}) - f(\mathbf{y}_{\mathcal{A} \cup \mathcal{B}}) \mid \mathbf{y}_{\mathcal{B}}].$$

↑
Expectation over
all realizations
within the batch

↑
Conditioning on
previous
observations

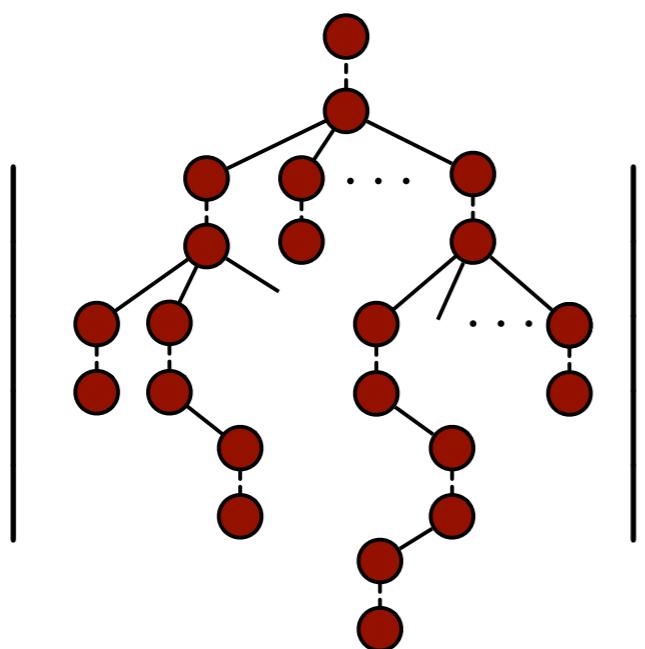
THE BATCHGREEDY ALGORITHM



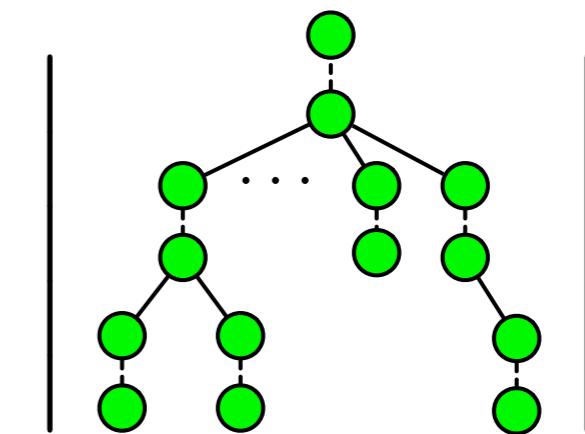
BatchGreedy will greedily select the i -th element in the j -th batch

$$s_{i,j} = \arg \max_{s \in \mathcal{V}} \Delta_f(s \mid \underbrace{\{s_{1,j}, \dots, s_{i-1,j}\}}_{\text{the } j^{th} \text{ batch } \mathcal{A}}, \mathbf{y}_B)$$

BATCHGREEDY VS. OPTIMAL BATCH

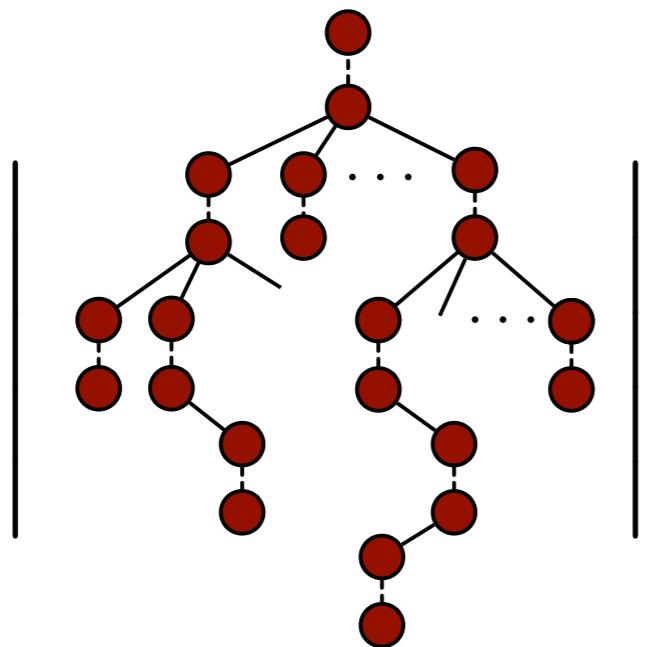


Cost of **BatchGreedy**



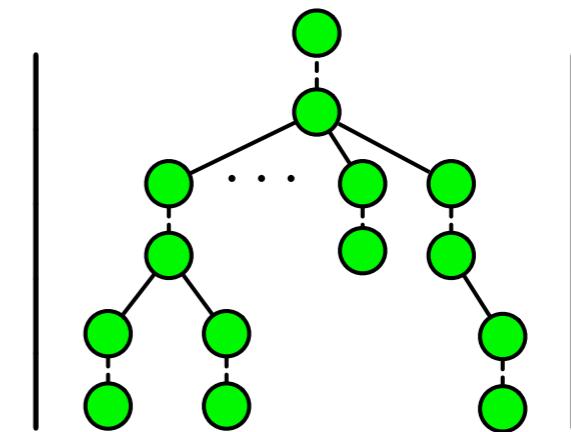
Cost of optimal **batch policy**

BATCHGREEDY VS. OPTIMAL BATCH



Cost of **BatchGreedy**

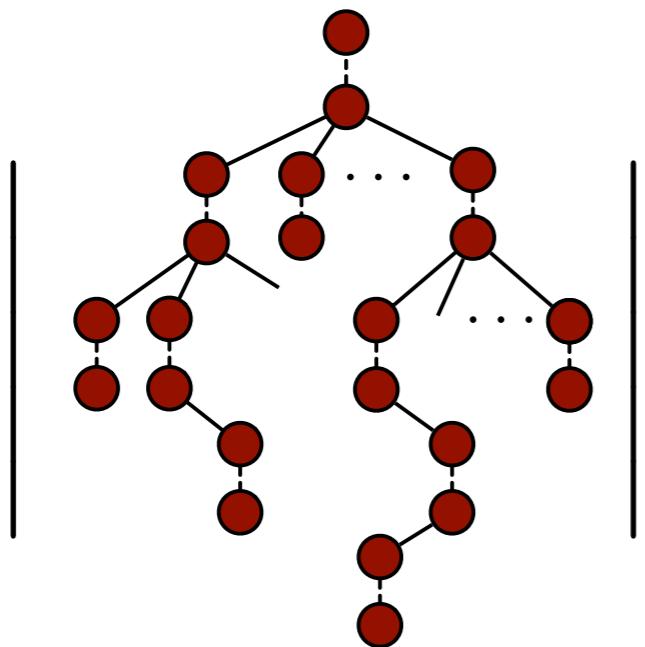
$$\leq O(\ln Q) .$$



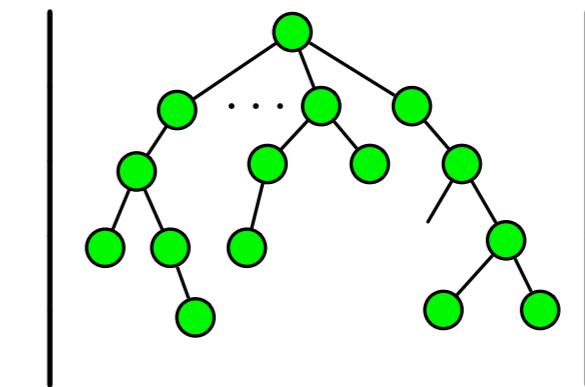
Cost of optimal **batch policy**

How many extra items will we select?

BATCHGREEDY VS. SEQUENTIAL

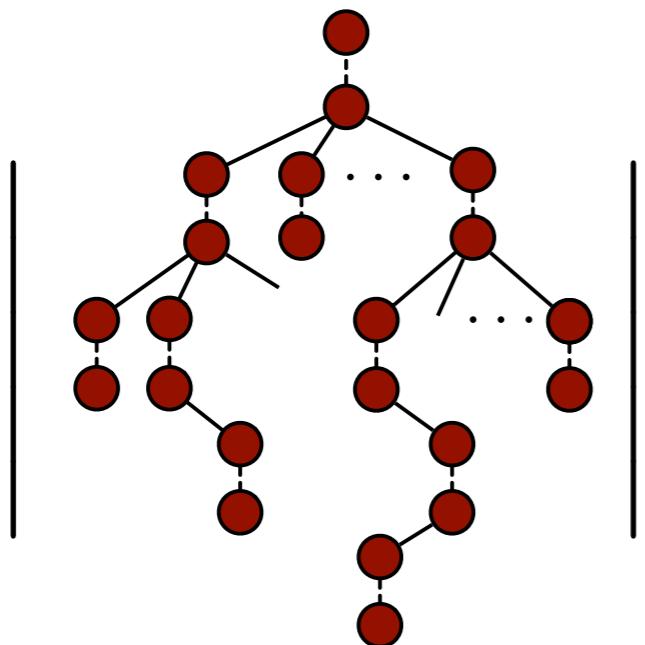


Cost of **BatchGreedy**



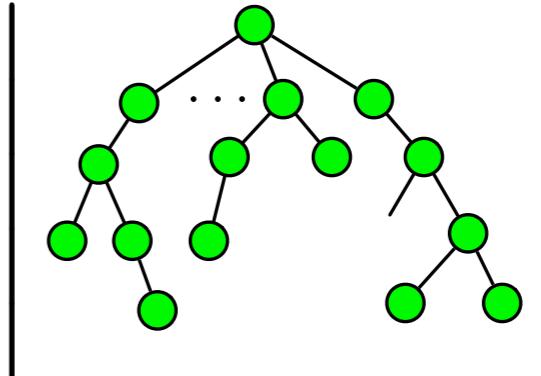
Cost of optimal **sequential policy**

BATCHGREEDY VS. SEQUENTIAL

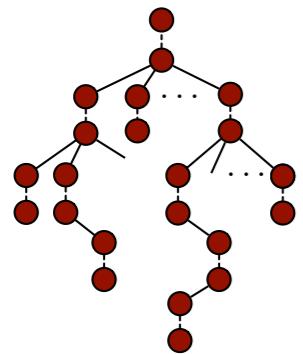


Cost of **BatchGreedy**

COMPETITIVE

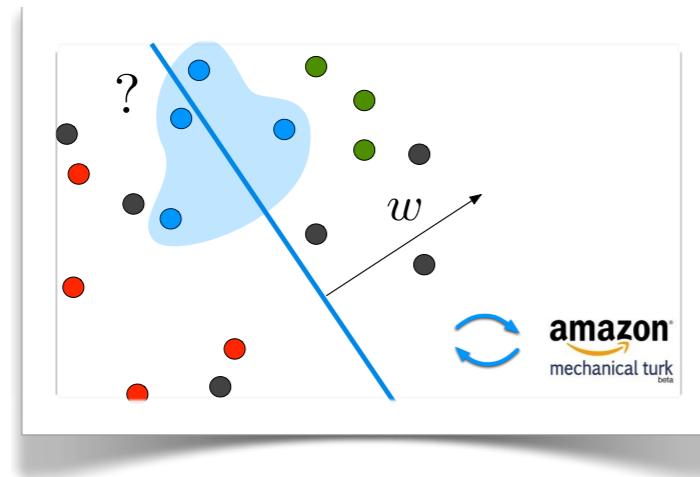


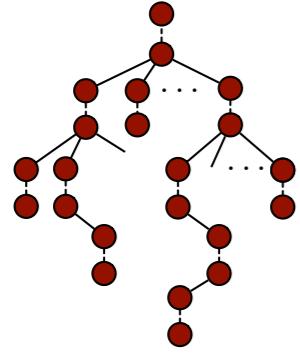
Cost of optimal **sequential policy**



EXPERIMENTAL RESULTS

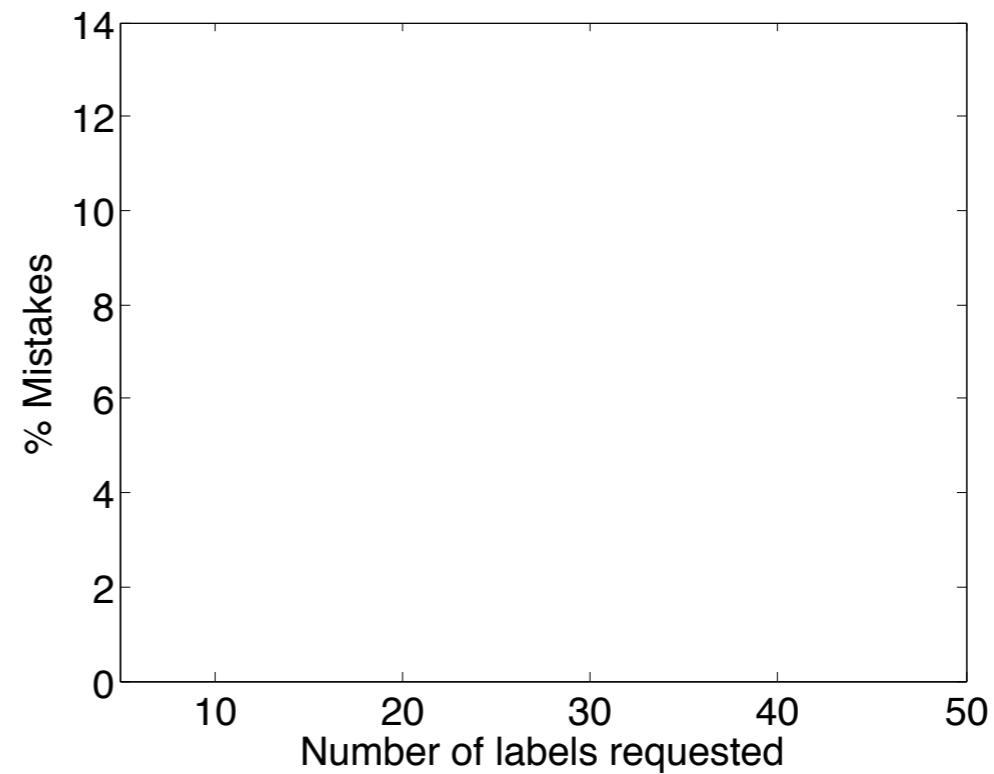
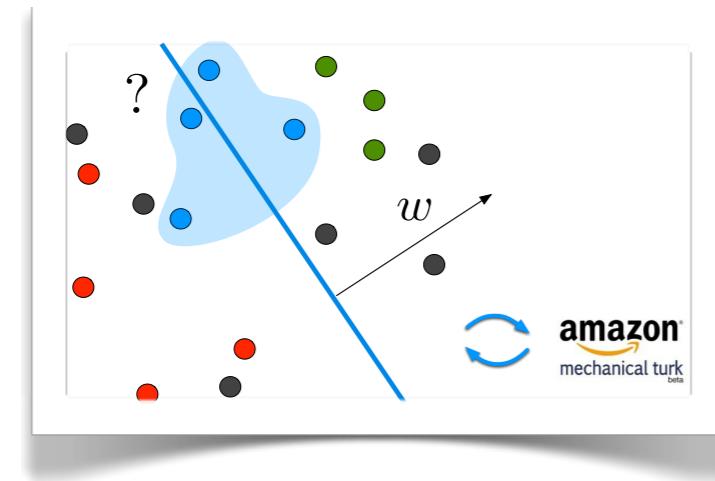
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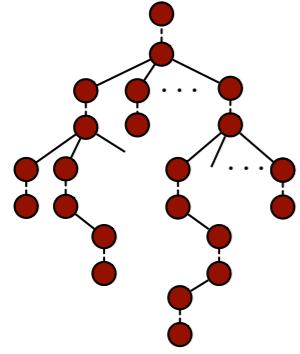




EXPERIMENTAL RESULTS

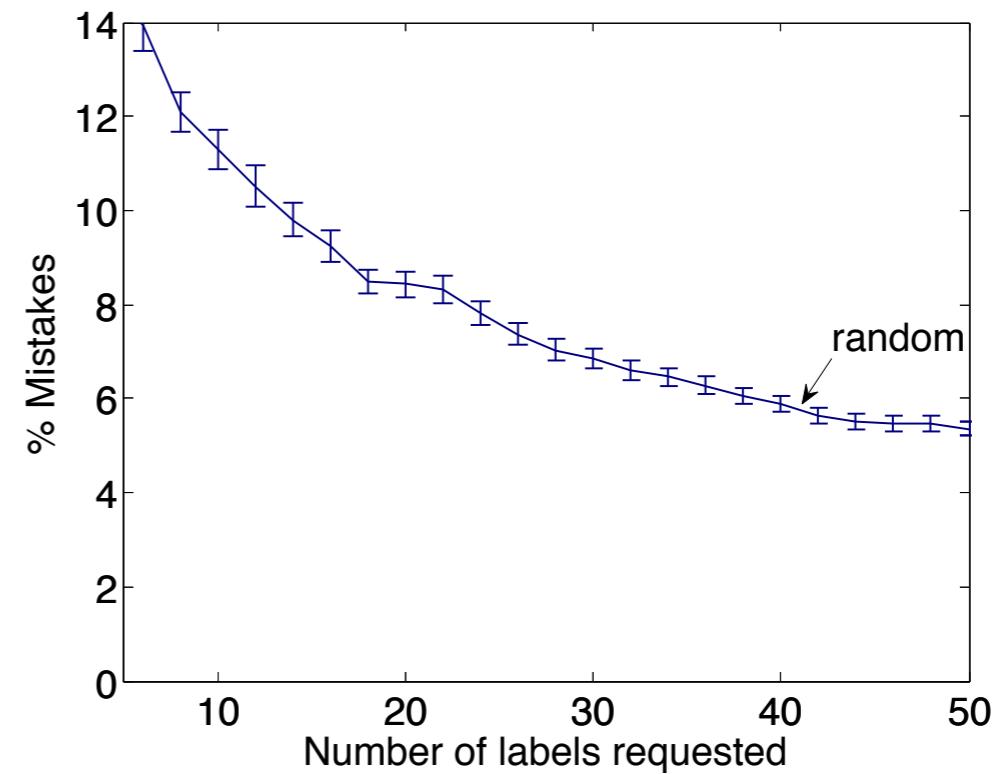
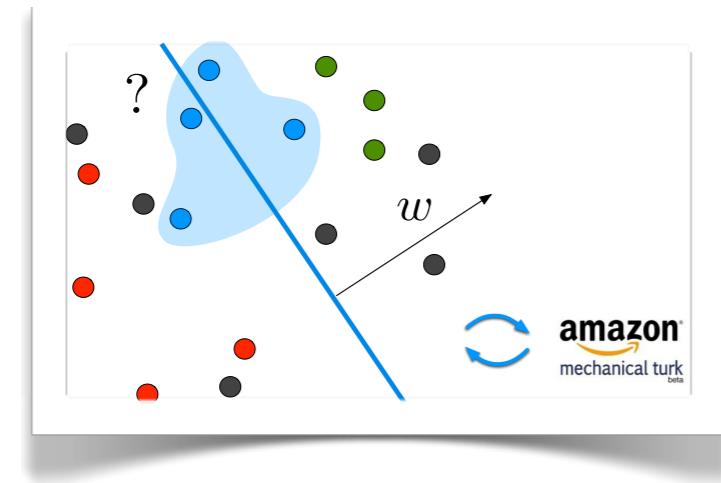
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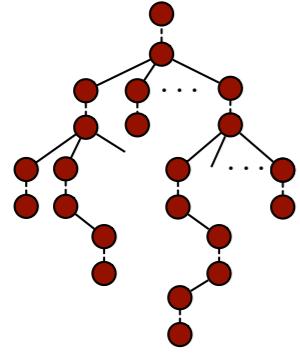




EXPERIMENTAL RESULTS

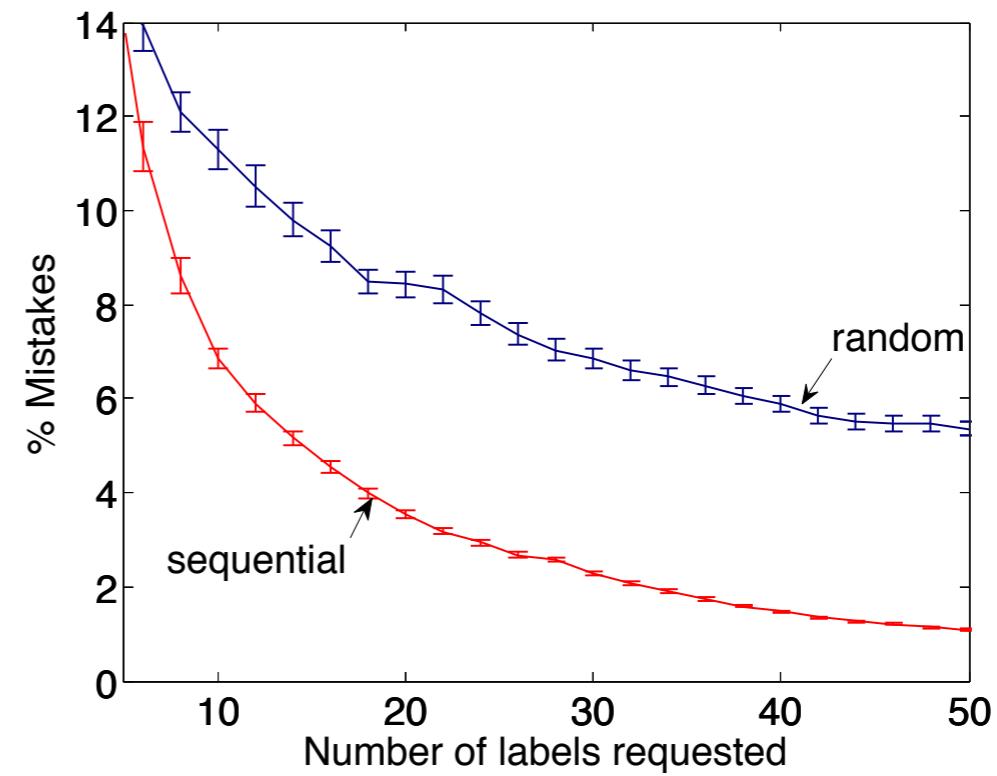
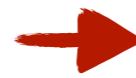
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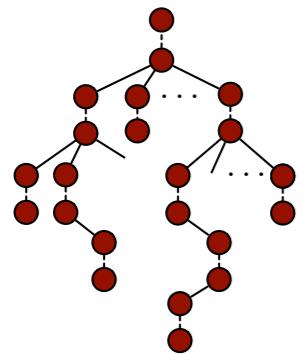




EXPERIMENTAL RESULTS

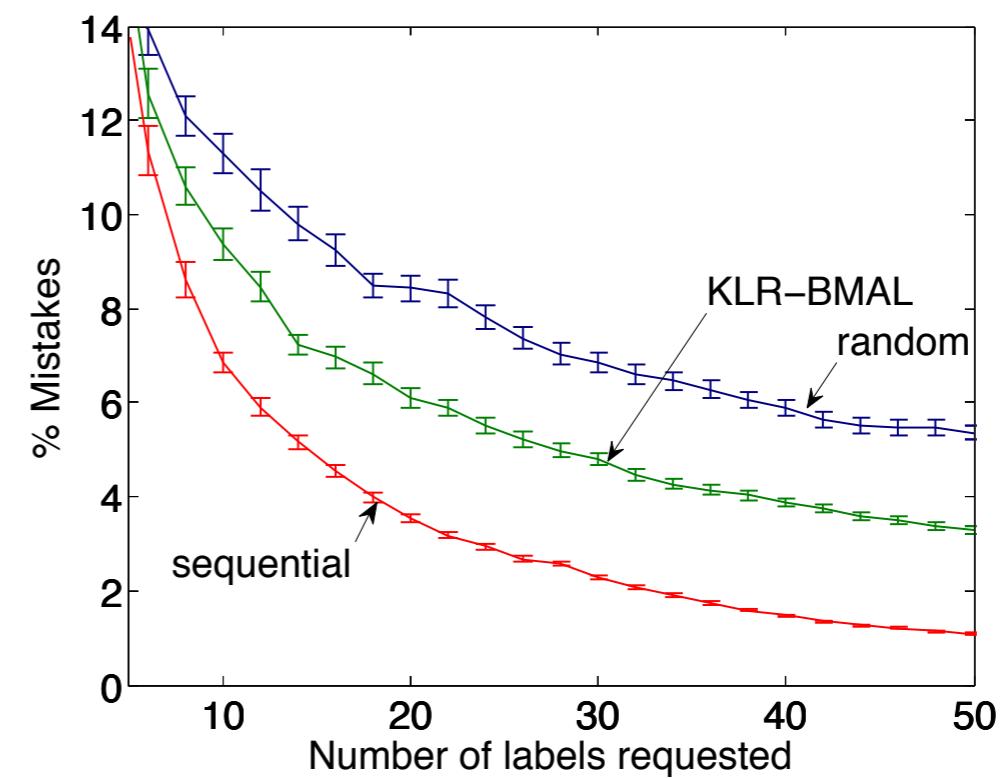
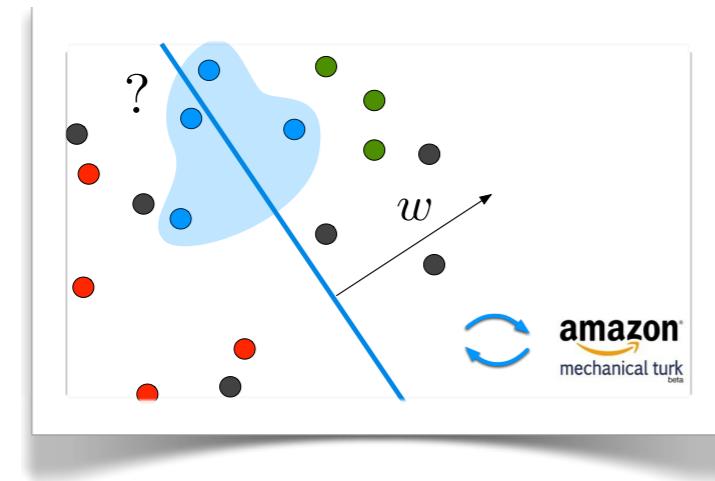
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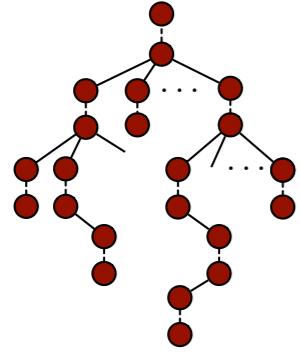




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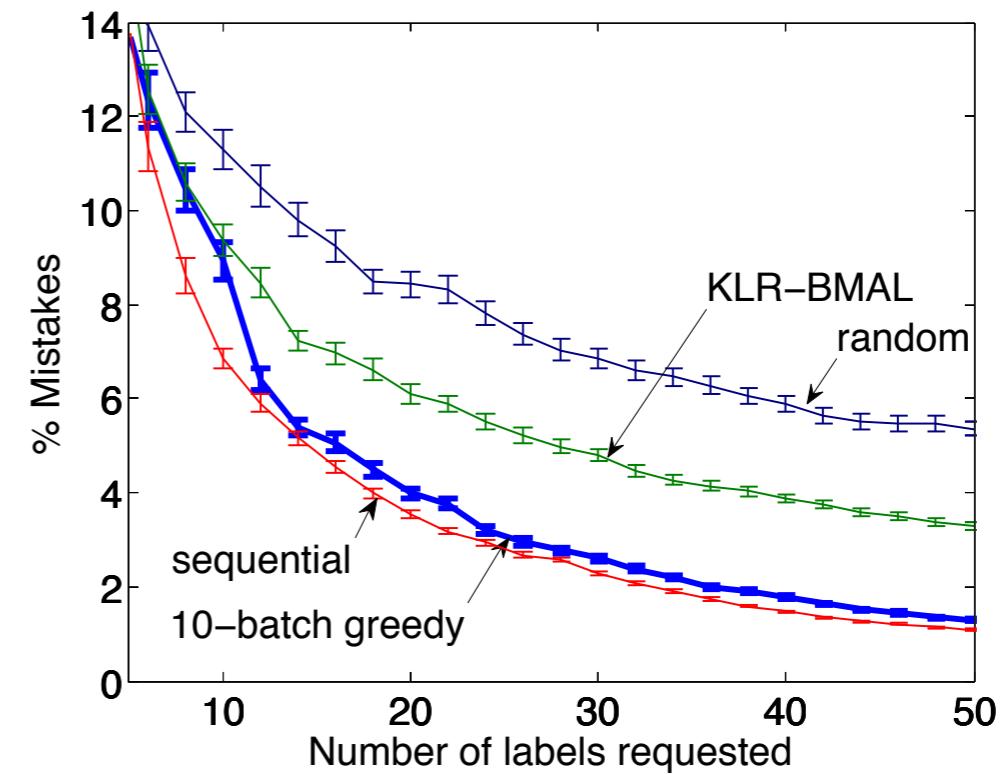
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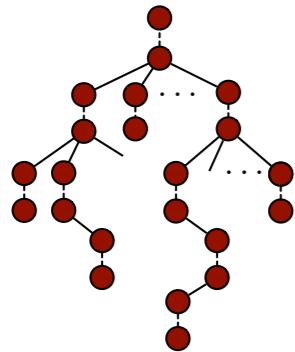




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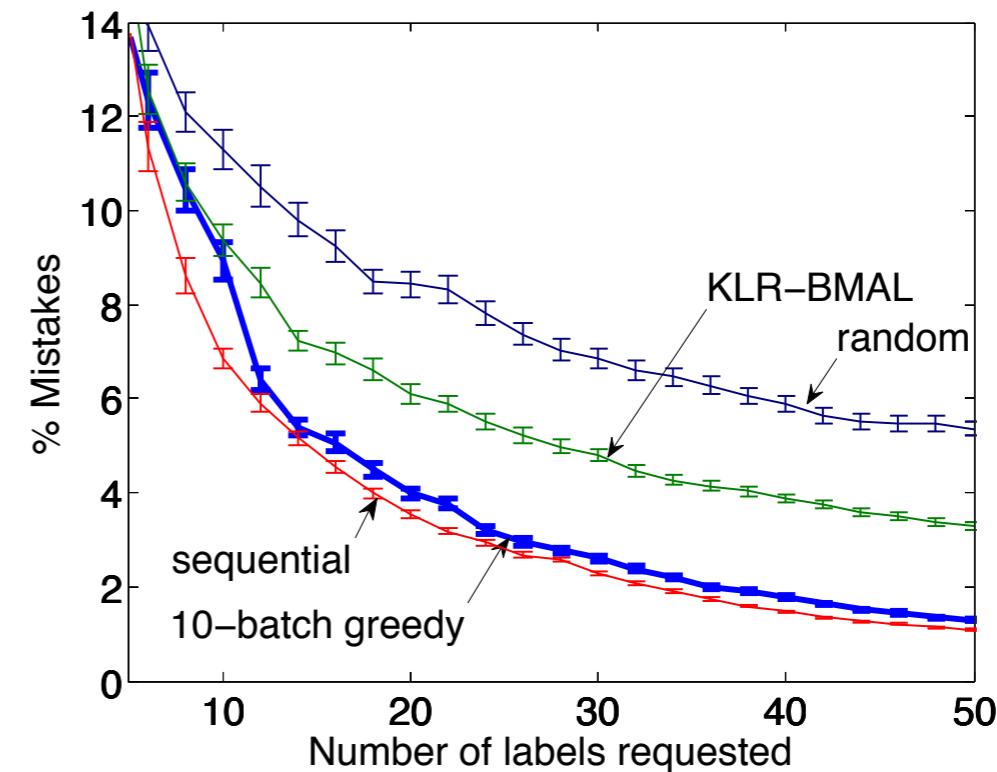
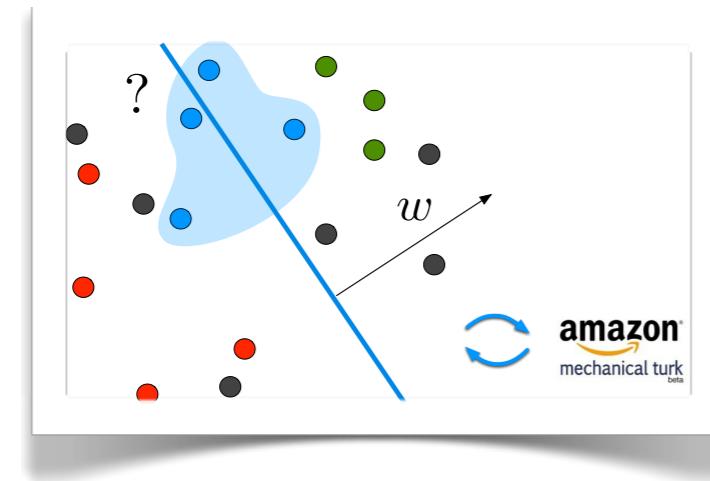
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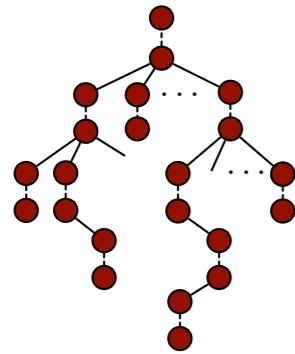




EXPERIMENTAL RESULTS

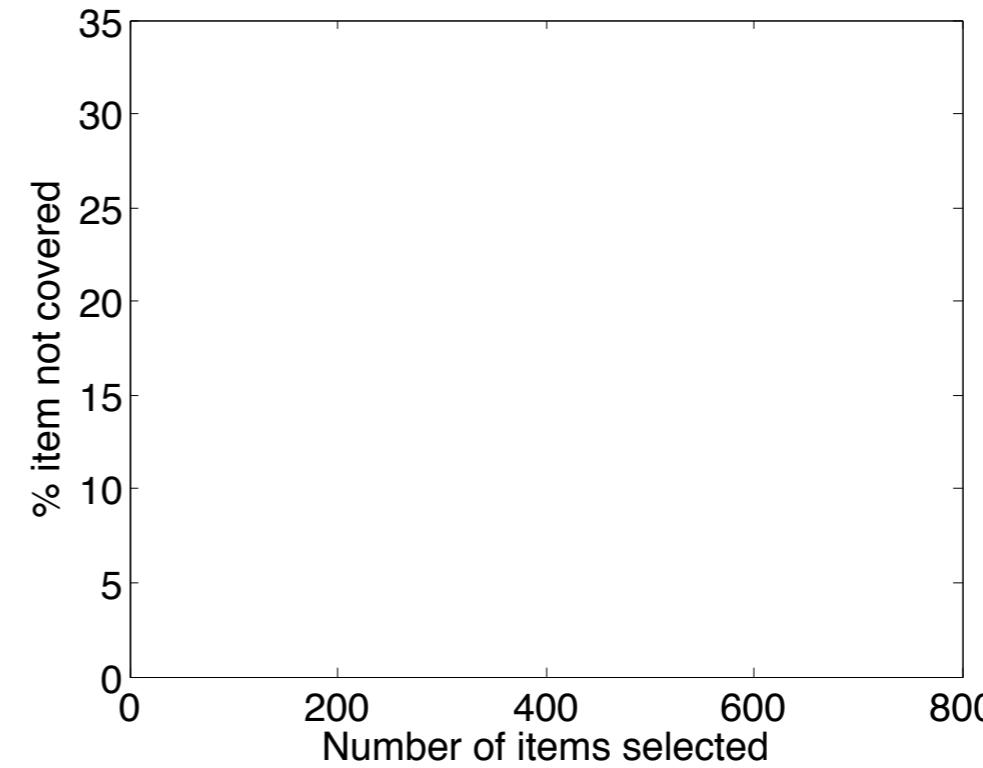
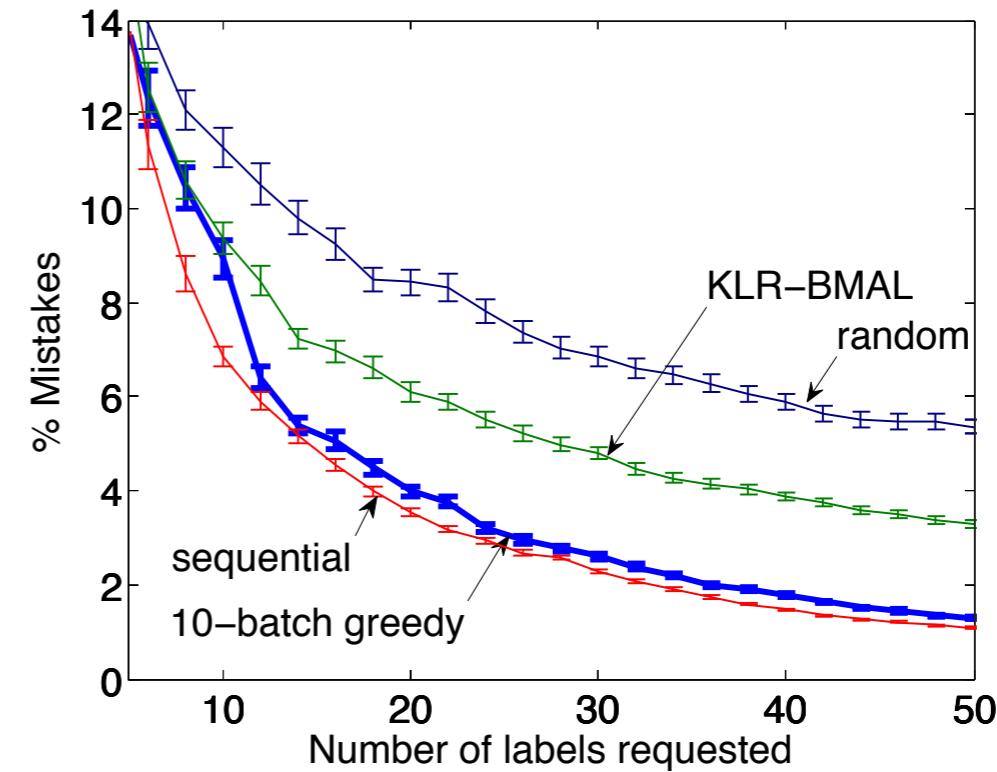
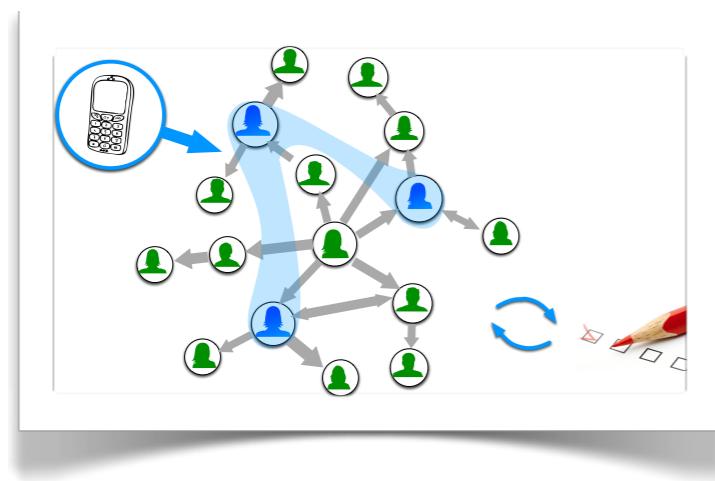
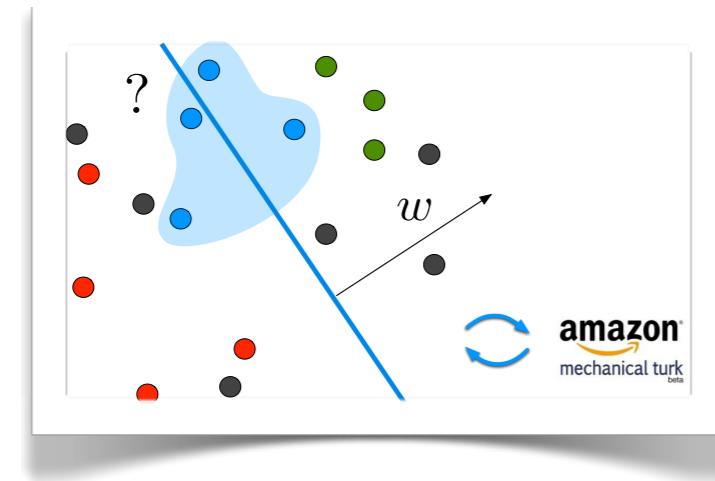
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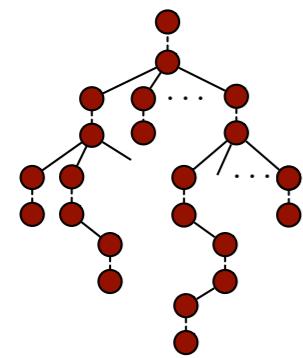




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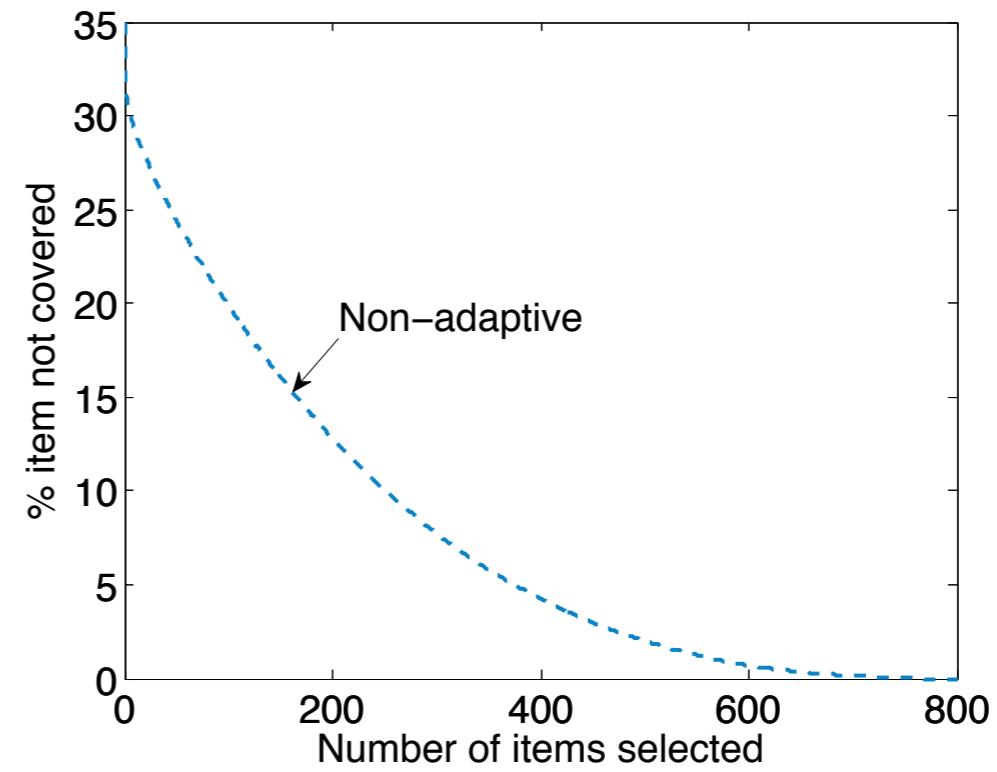
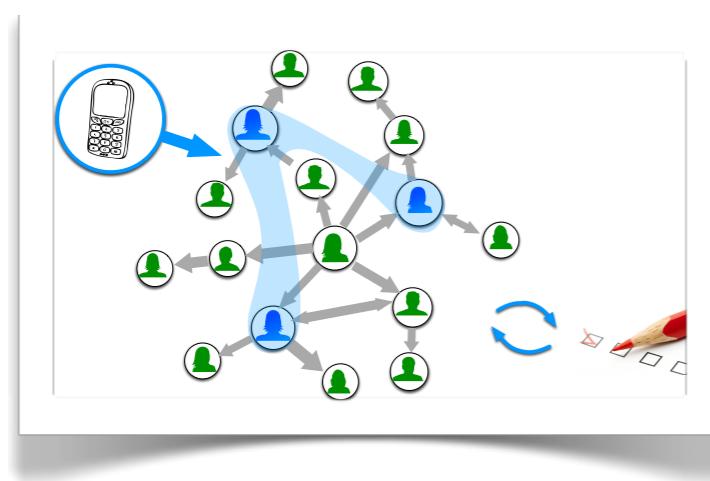
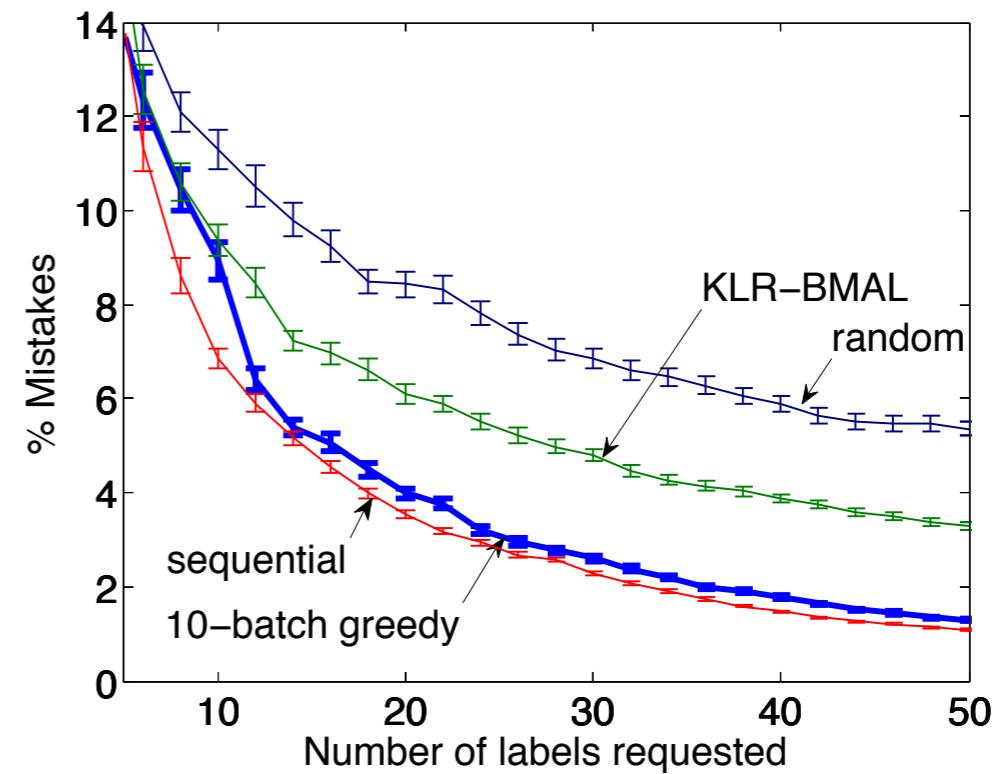
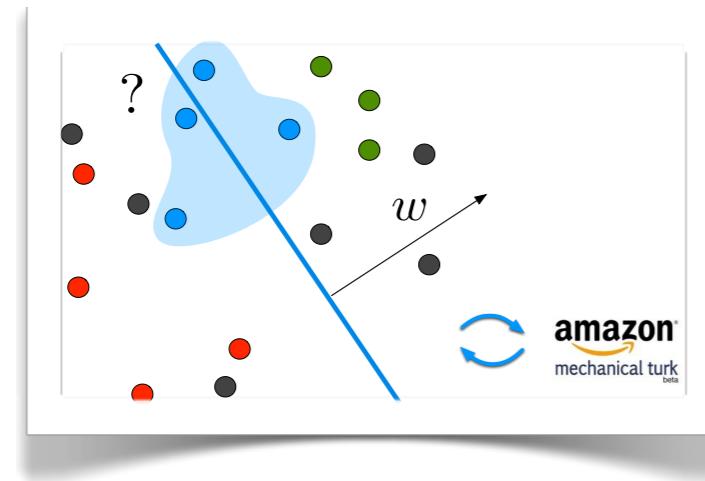
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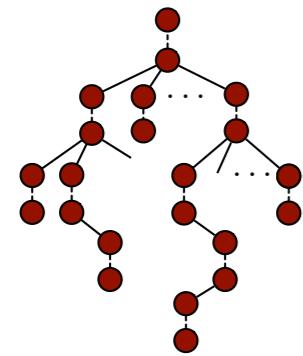




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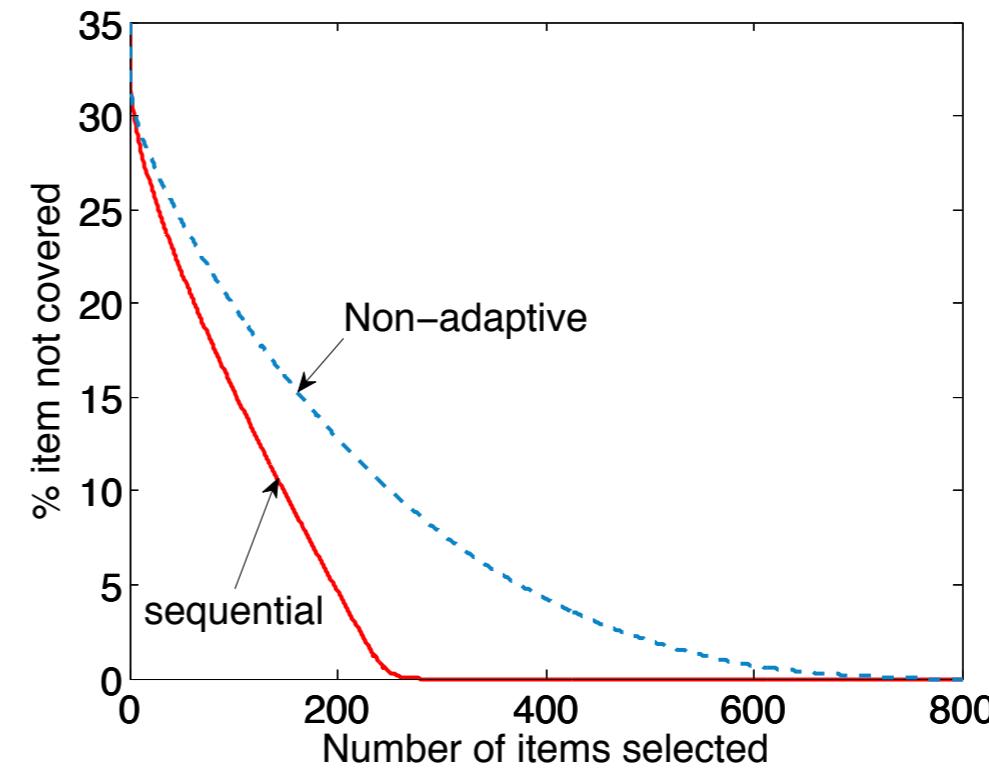
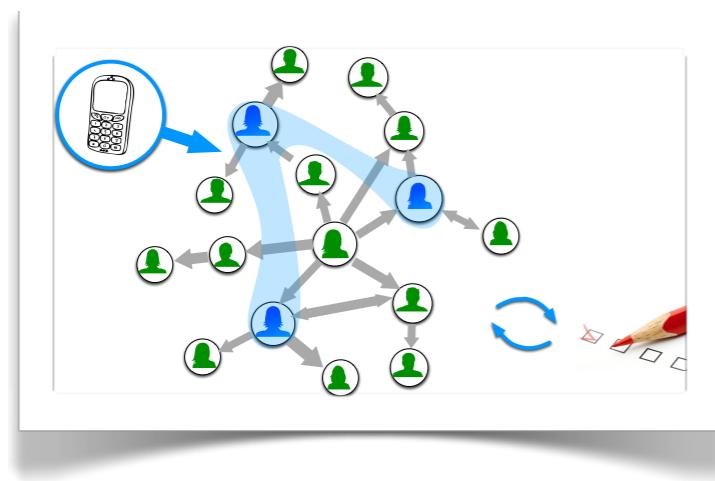
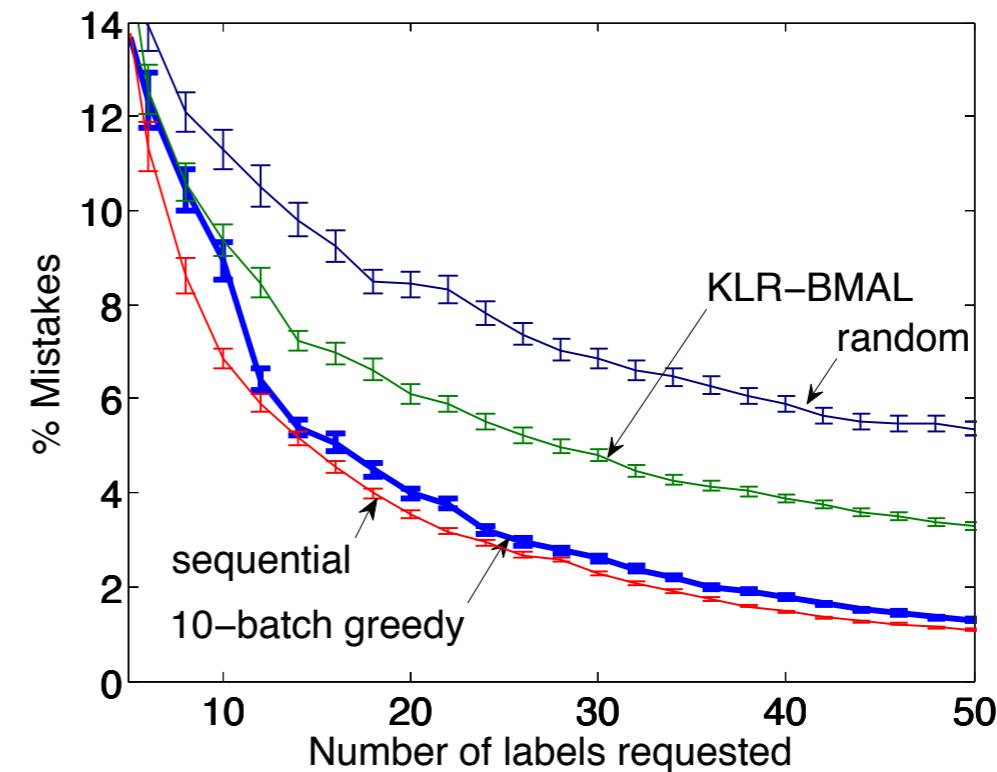
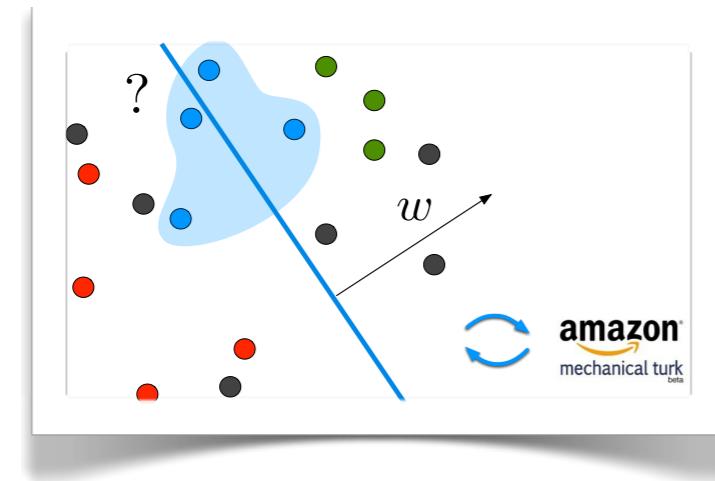
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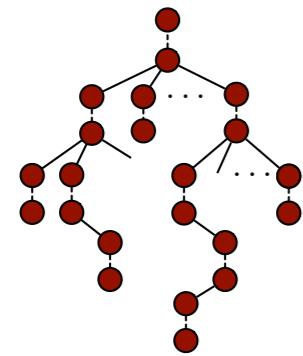




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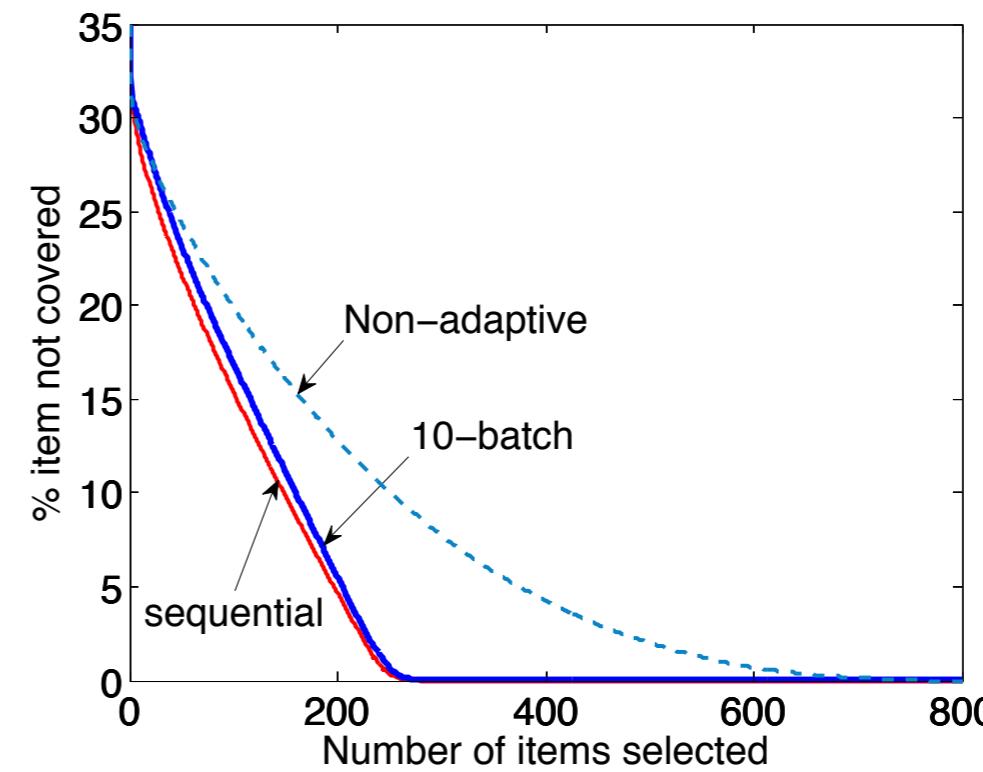
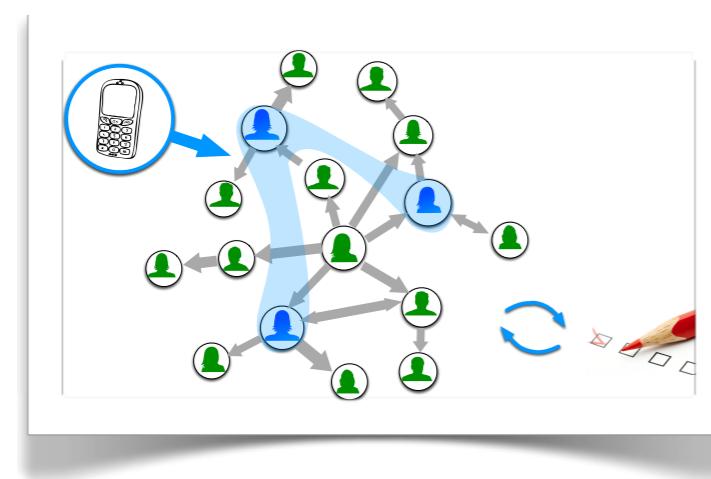
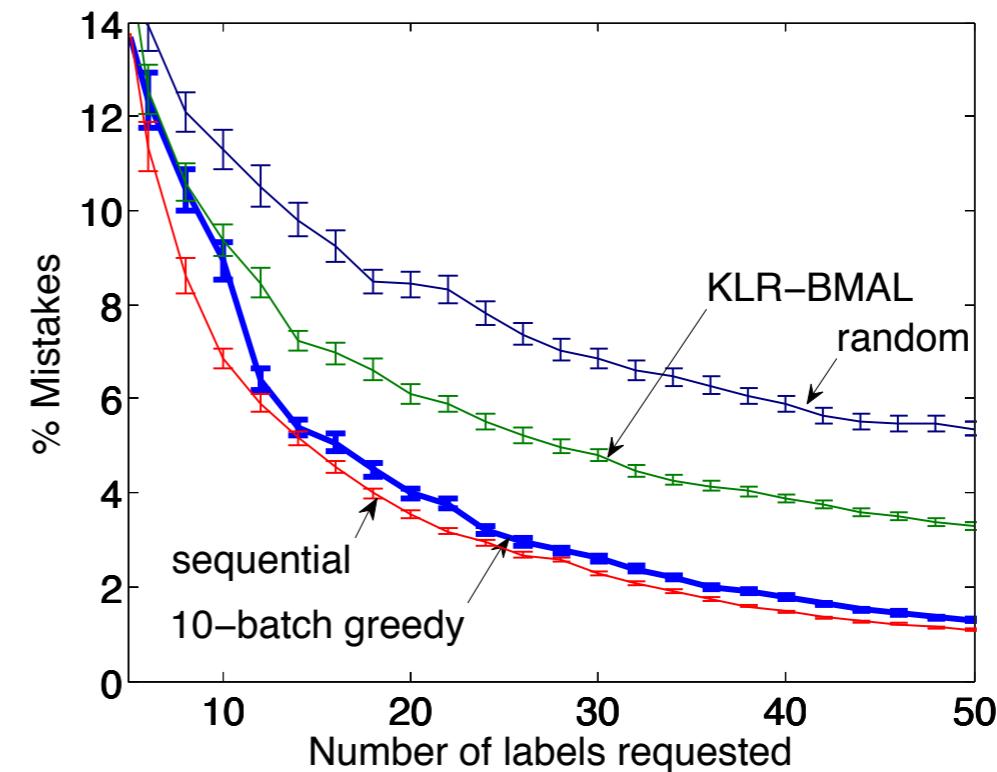
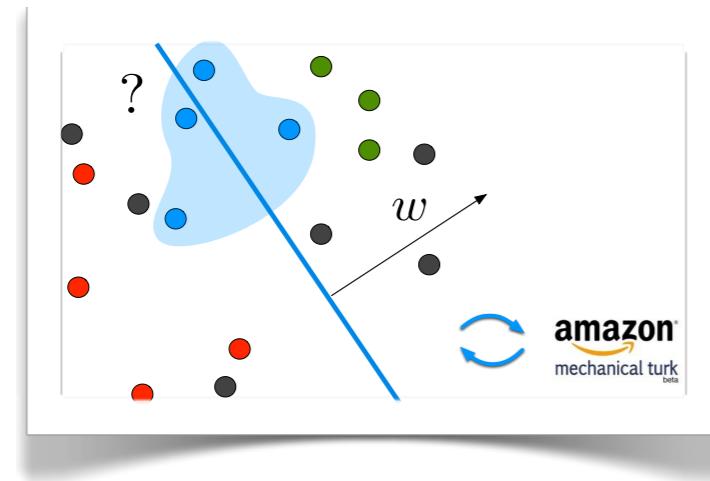
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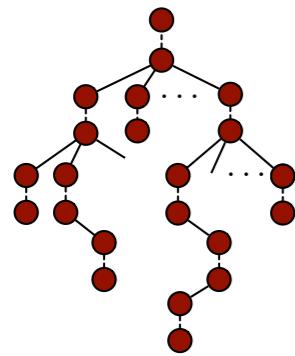




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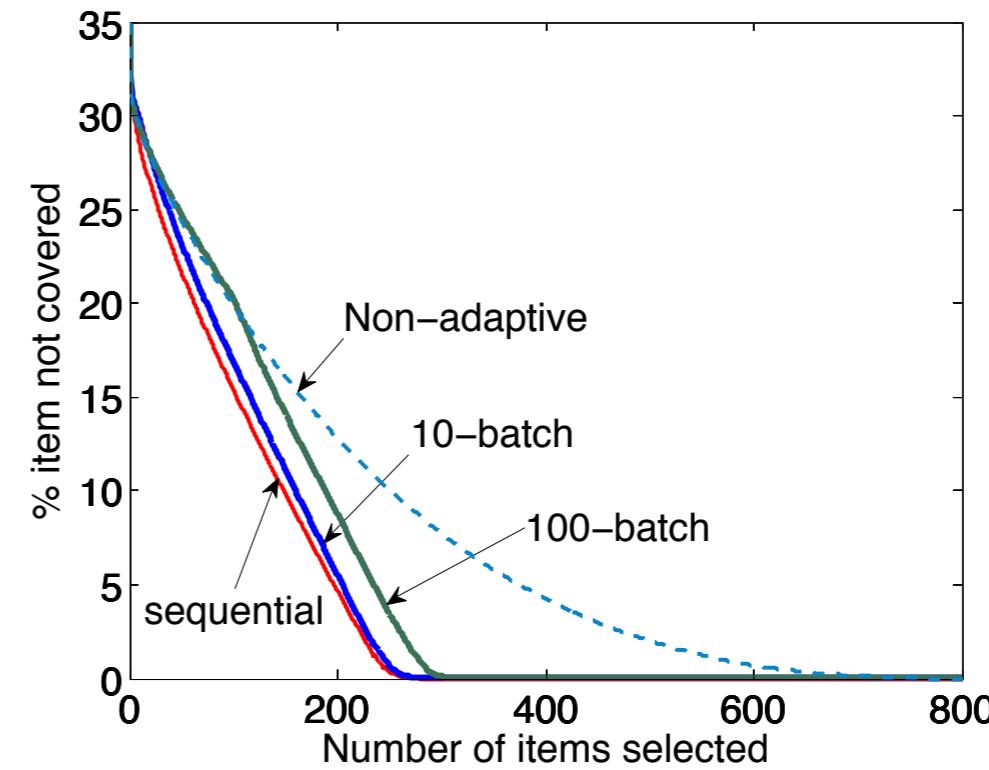
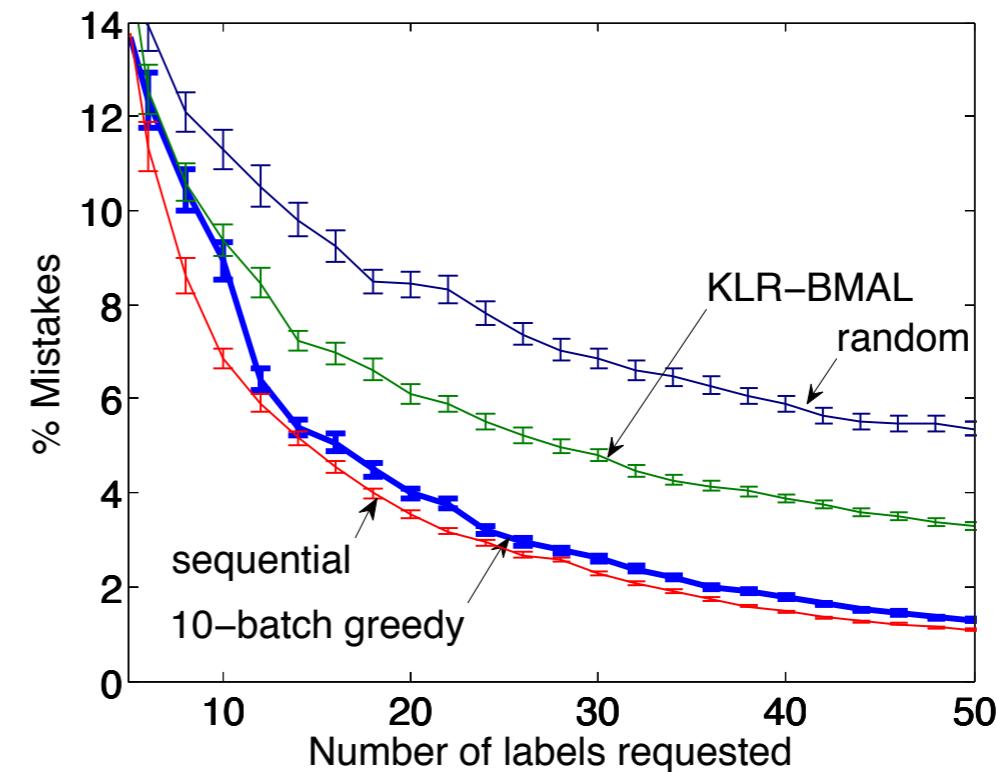
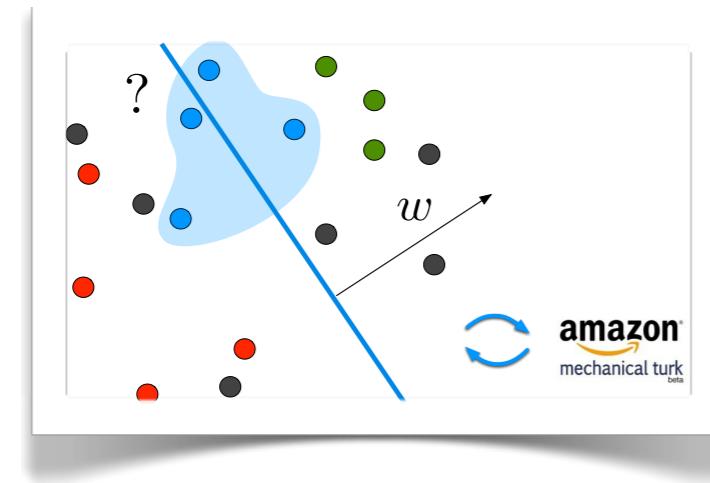
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EXPERIMENTAL RESULTS

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Code Available

www.inf.ethz.ch/~chenyux/icml13/bmal-src.zip

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