Spatial Summarization of Image Collections

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Outline

Leftover question

- Does using a feature matrix $\mathbf{X}' = \mathbf{X} \mid \mathbb{I}$ improve the results?

		K			
		0	2	5	10
L	0	17.38 ± 1.81	18.75 ± 2.95	18.82 ± 2.58	18.91 ± 2.40
	2	22.66 ± 4.58	28.53 ± 4.36		
	5	25.40 ± 4.77		31.59 ± 2.38	
	10	31.13 ± 2.92			30.49 ± 3.51

- Not really, the best score so far is 34.35 ± 2.15 with $\mathbf{X} = \mathbb{I}$.
- Running time is significantly slower, because of the increased number of features $M = N + 4$.

Outline

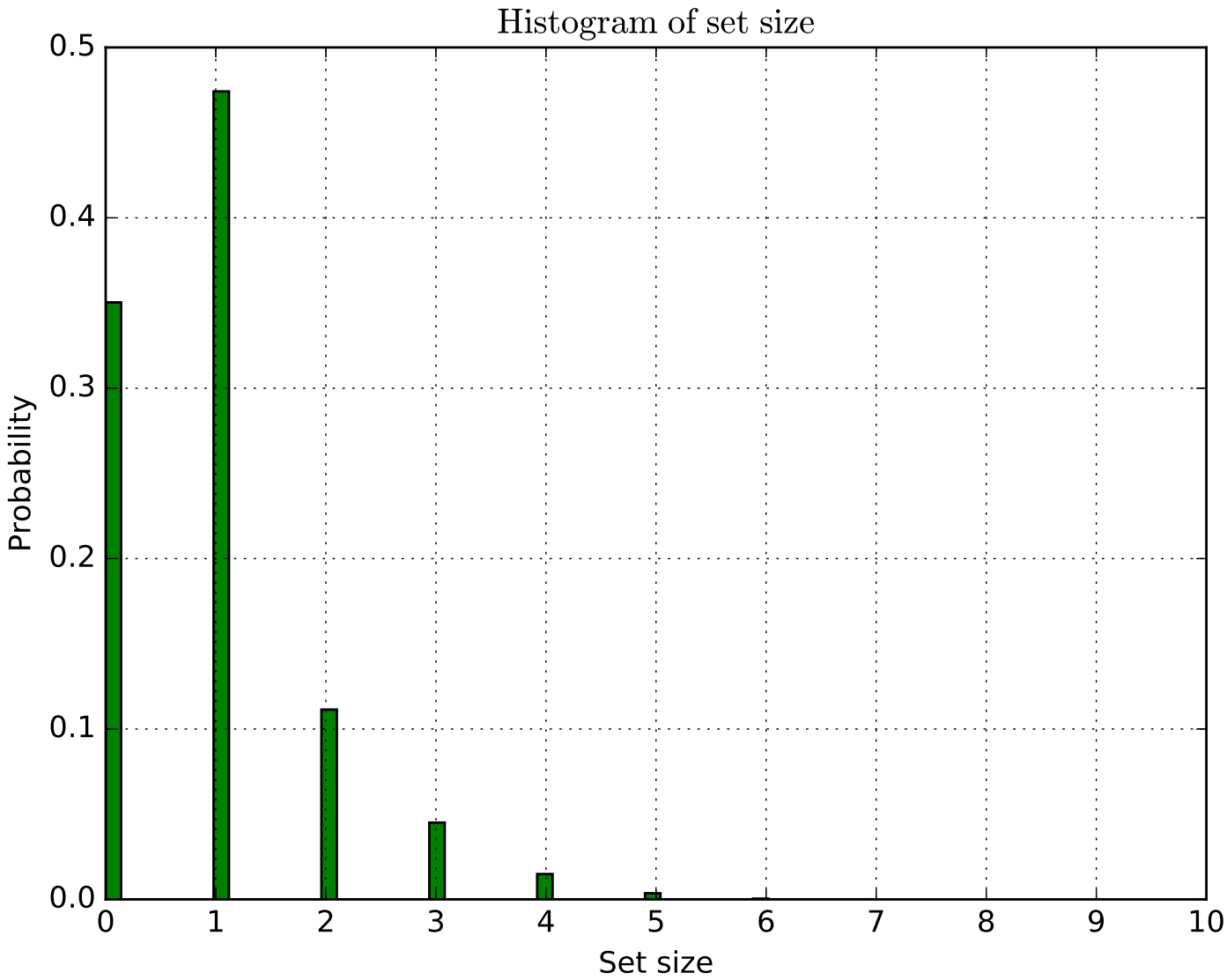
Sampling from the model

- Using the best model, i.e. without features and with $L = 5, K = 5$.
- How does the resulting distribution look?
- How to use the distribution to recommend sets?

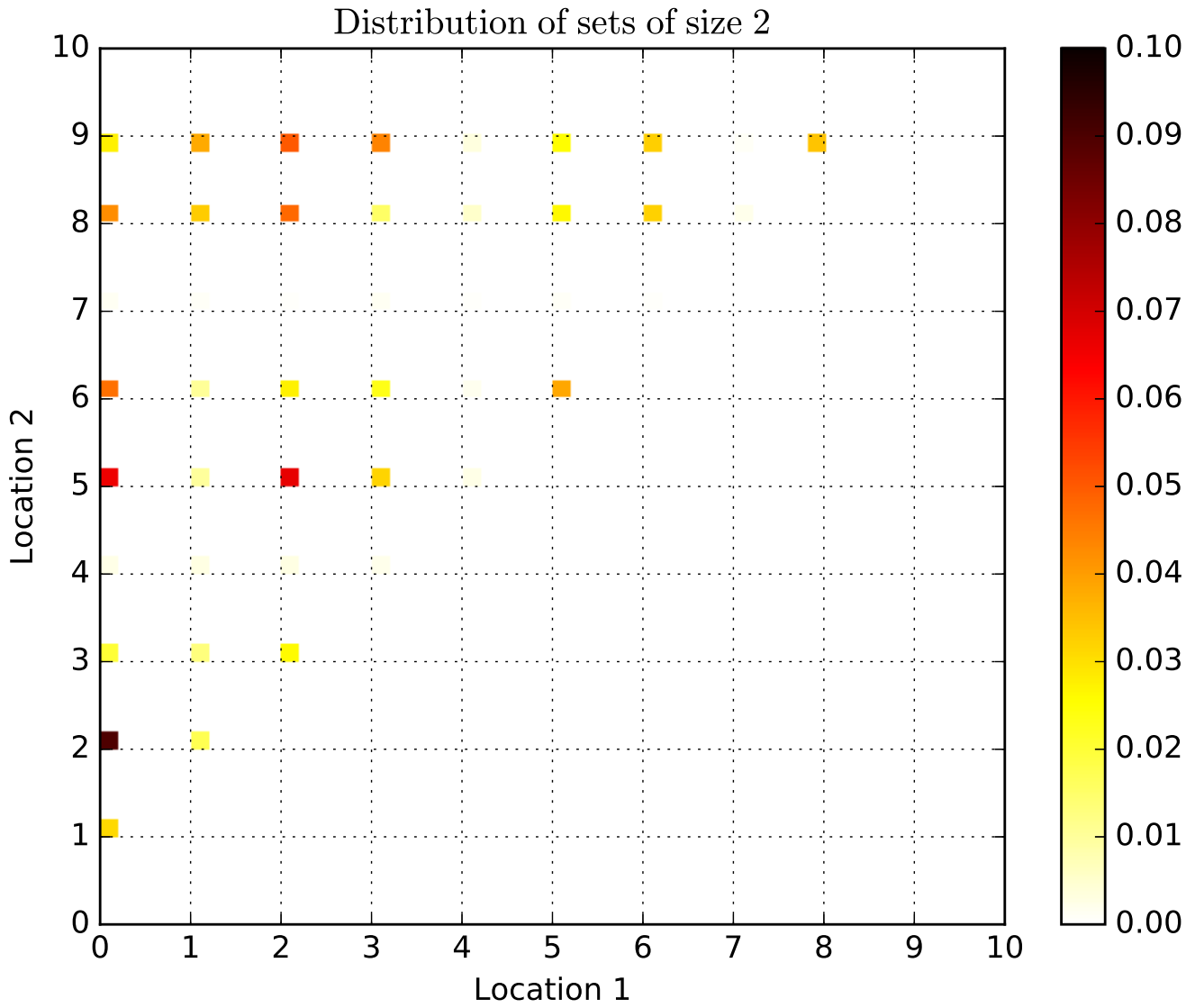
Exact sampling

- With $N = 10$, it is possible to calculate the probabilities from the model for all $2^{10} = 1024$ possible sets.
- Evaluating the model on all sets $S \subseteq V$ and then normalizing the probability distribution.
- Takes only seconds to evaluate.

Distribution of set size ($100k$ samples)



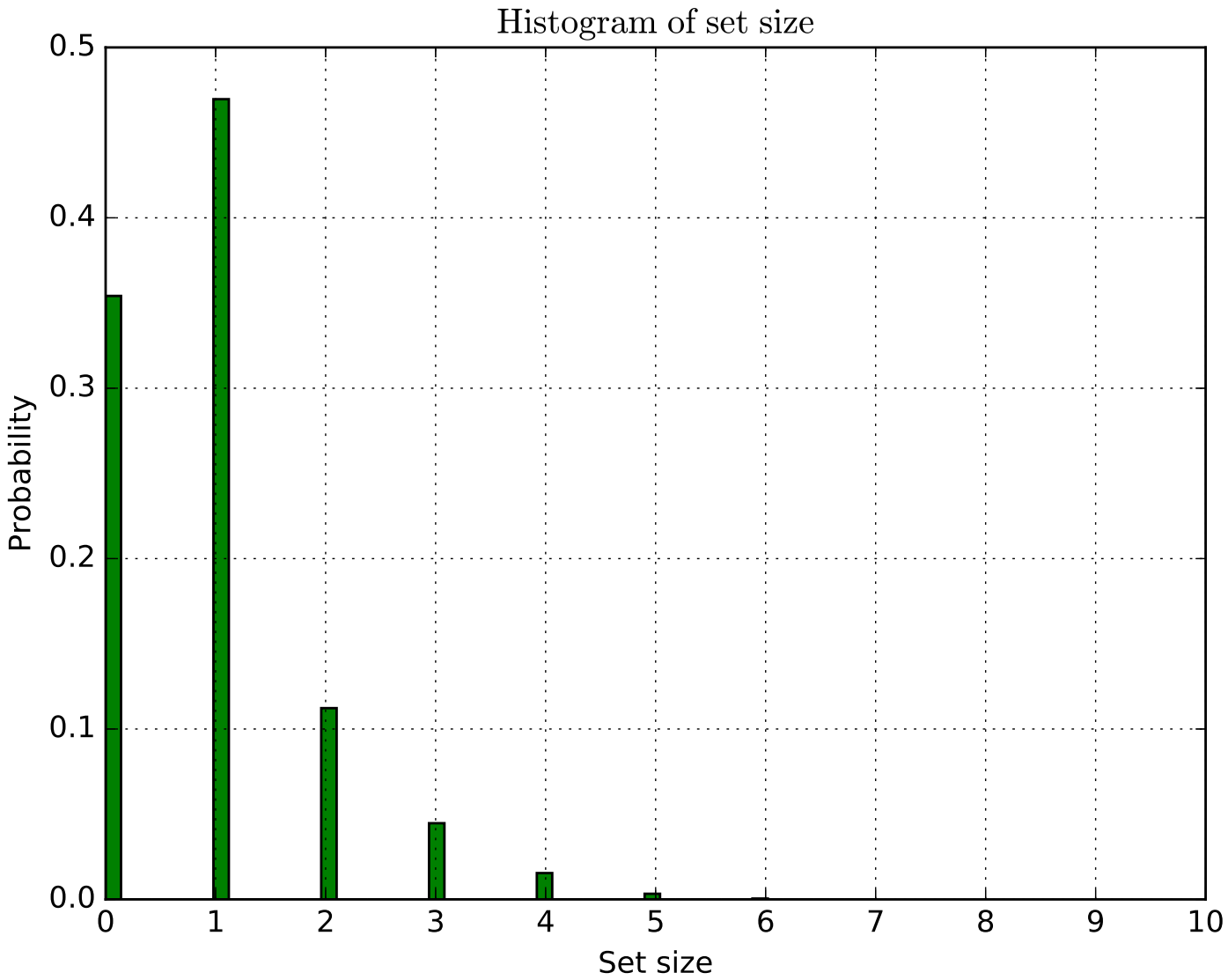
Distribution of sets with $|S| = 2$ ($100k$ samples)



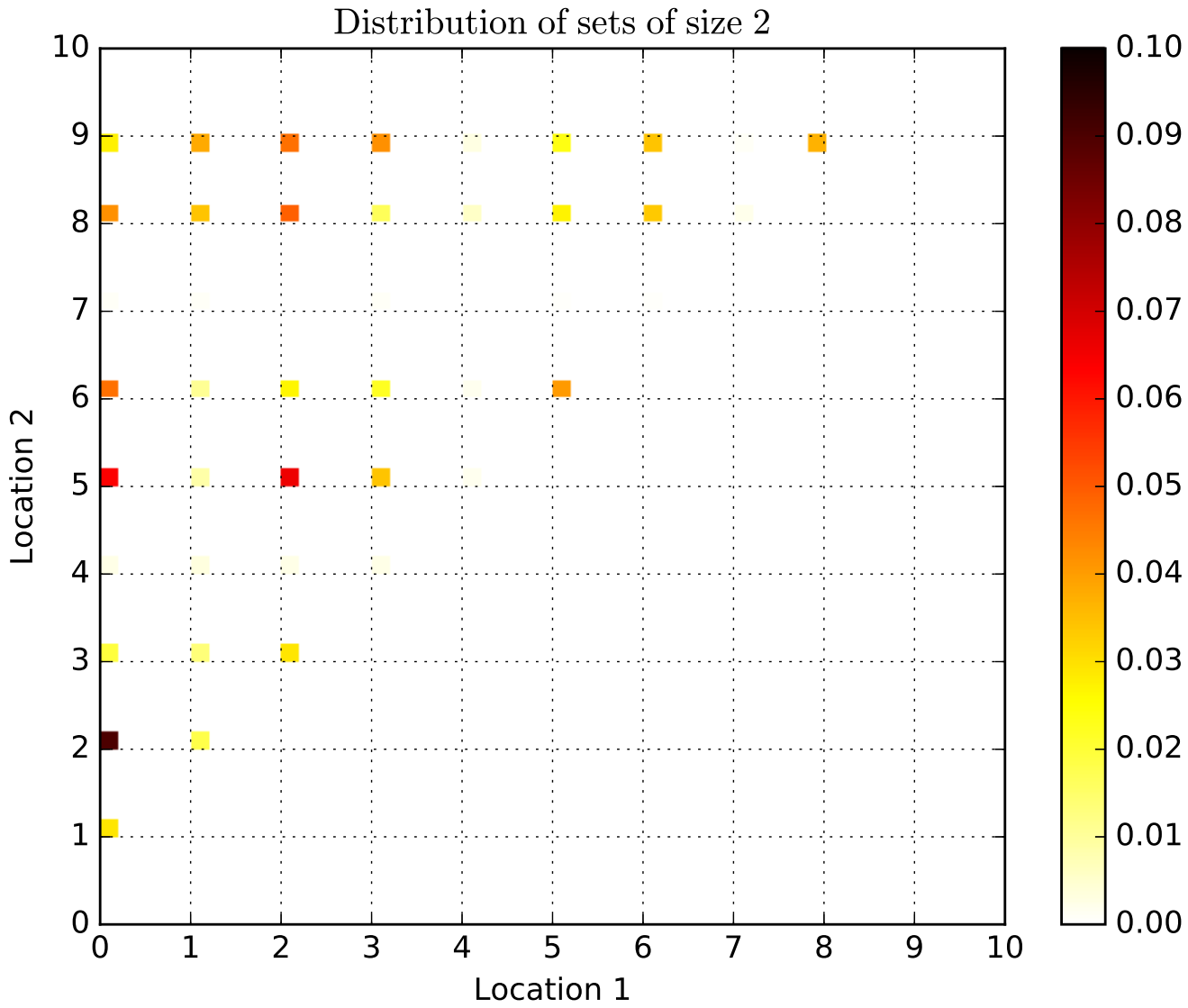
Gibbs sampling

- What about a method that scales? For example if $N = 30$, then there are $2^{30} = 1073741824$ sets.
- Gibbs sampling as presented in [1].
- Run for $1M$ iterations, remove the first half of iterations are burn-in.
- Running time is a couple of minutes.

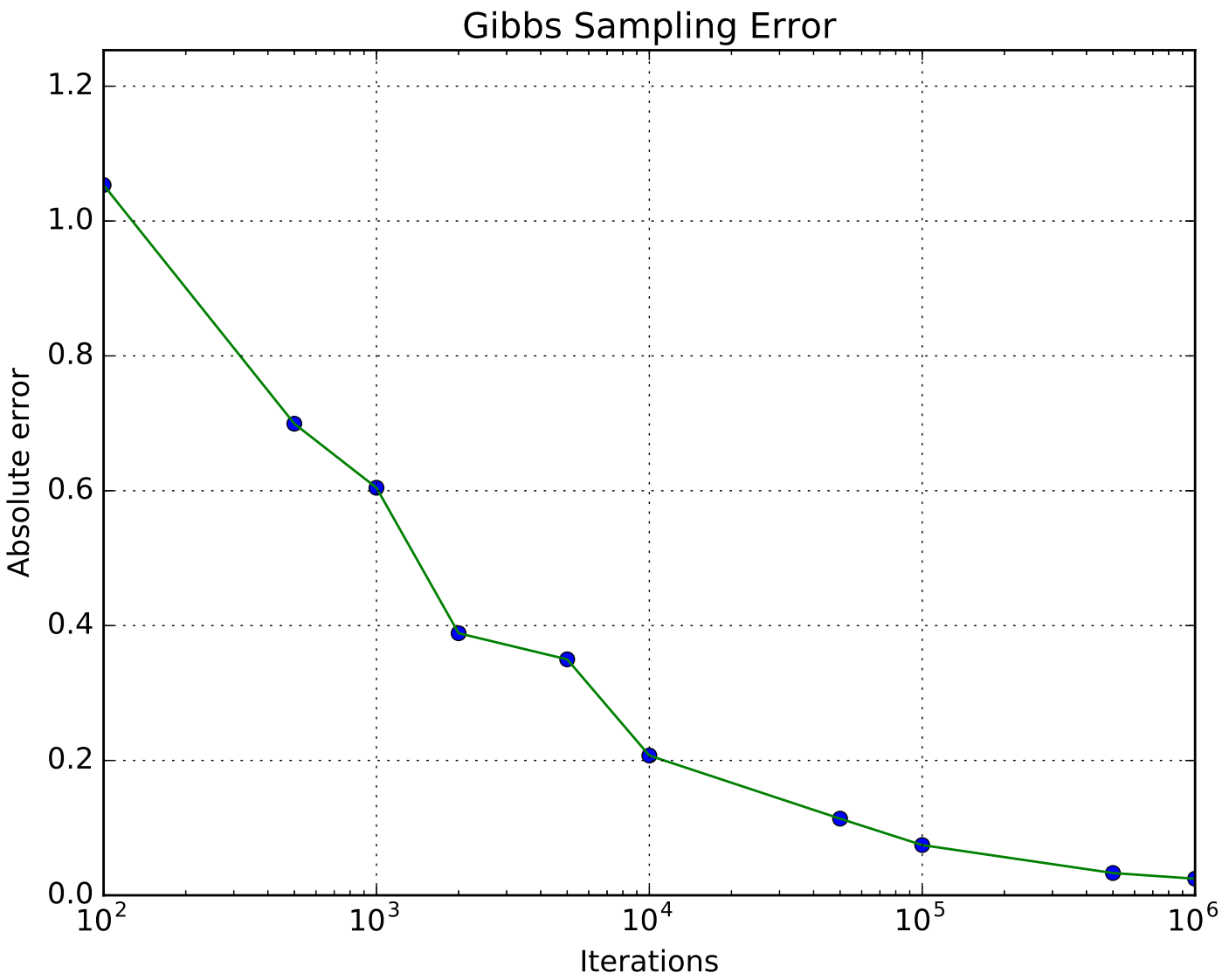
Distribution of set size ($100k$ samples)



Distribution of sets with $|S| = 2$ ($100k$ samples)



Gibbs Sampling Performance



Outline

Use more mean-shift clusters

References


Gotovos, A., Hassani, S. H., and Krause, A.
Sampling from probabilistic submodular models.
In *Neural Information Processing Systems (NIPS)* (December 2015).