

# Particle Gibbs for Infinite HMMs

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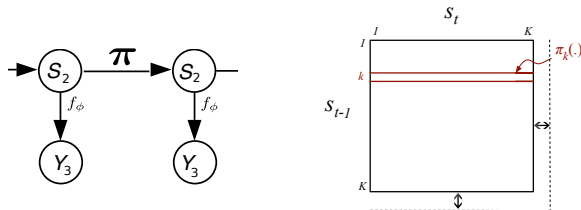
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# BACKGROUND

BEAL ET AL. (2001)

**Problem:** select the number of states in HMMs.

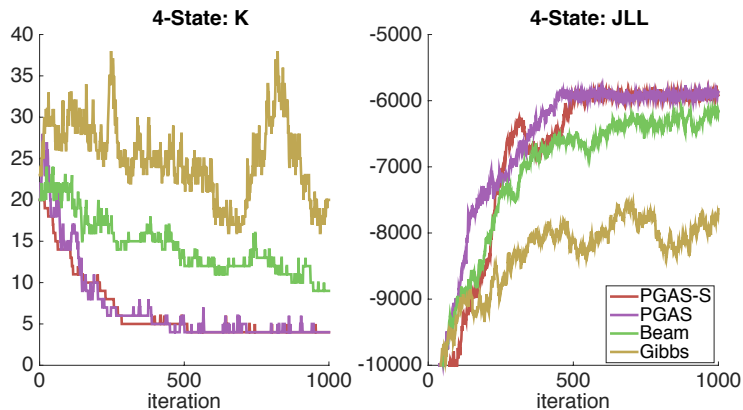


An infinite HMM is a standard HMM that

- uses a **nonparametric prior** over its parameters  
 $\theta \equiv (\pi_{1:\infty}, \phi_{1:\infty})$
- can automatically **adapt** the number of “effective” states to data

# BEAM V.S. PARTICLE GIBBS

EMPIRICAL RESULTS ON TWO SYNTHETIC DATASET WITH 4 STATES

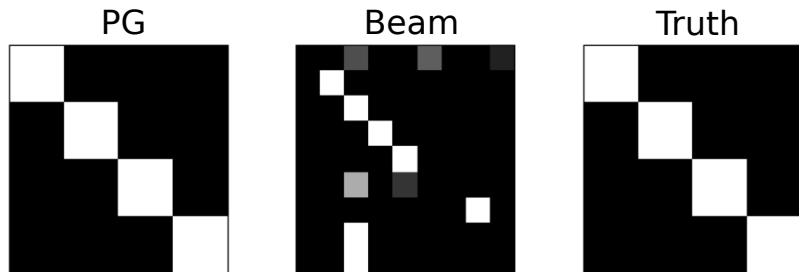


On this **synthetic dataset**, the Particle Gibbs sampler quickly converges to the "correct"  $K = 4$ .

# FORWARD-BACKWARD V.S. PARTICLE GIBBS





EMPIRICAL RESULTS ON TWO SYNTHETIC DATASET WITH 4 STATES

Illustration for a sampled transition matrix:





On this **synthetic dataset**, the Particle Gibbs sampler **correctly recovered** the ground truth transition matrix.

# REFERENCES I

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