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Energy Efficient Stochastic Computing with Sobol Sequences

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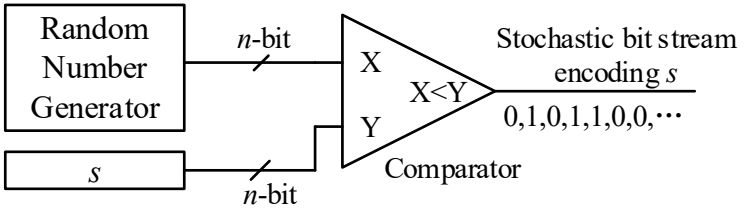
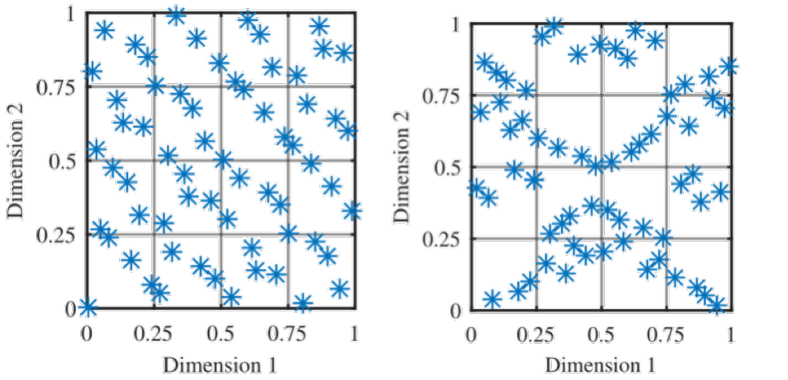
The use of Sobol sequences can lead to high-accuracy and energy-efficient stochastic computing.



A stochastic number generator (SNG)

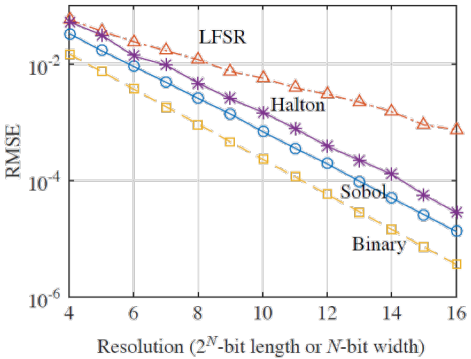


(a) Sobol sequences (b) Pseudorandom sequences

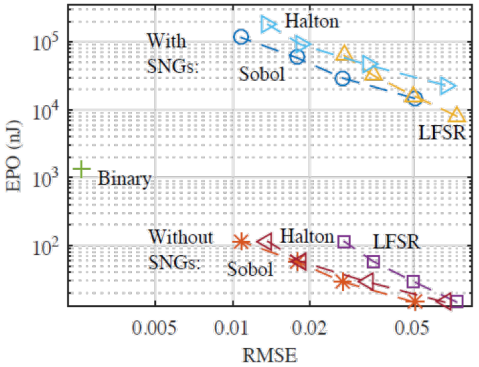
- Sobol sequences are more evenly distributed than pseudorandom sequences.

- "Discrepancy" is used to describe how evenly a random sequence is distributed in the sample space.
- A lower discrepancy leads to a smaller error in stochastic circuits as in a Monte Carlo integration.

	Sobol	Halton	LFSR
Discrepancy	Low	Medium	High
Base	2	{2,3,5,7,…}	2



Accuracy comparison of the stochastic multipliers.



Energy efficiency comparison of the Bernstein polynomial circuits.