

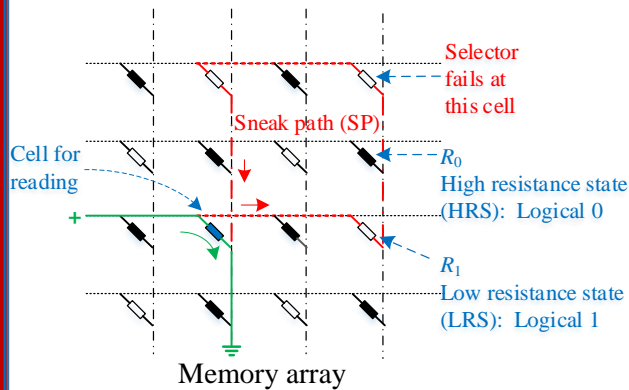
# Coding for Resistive Random-Access Memory Channels

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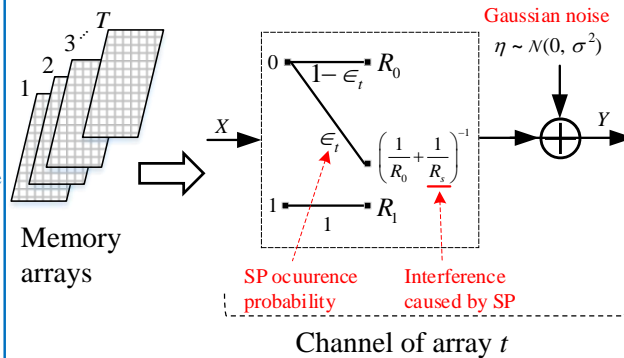
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## 1. Sneak Path Model (1DIR) & Challenges



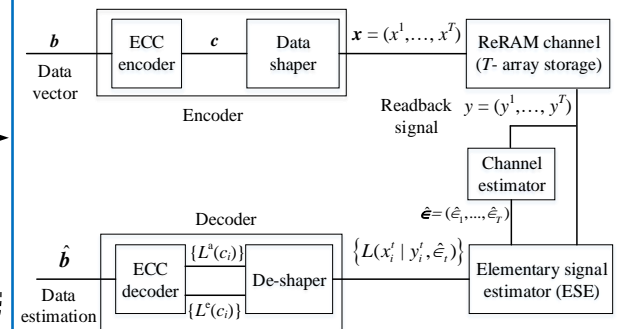
- ✓ SP interference & noise  $\rightarrow$  unreliable reading
- ✓ SP occurrence relies on stored data pattern
- ✓ SP induces harmful effect for HRS

## 2. Array-Varying Channel Equivalence



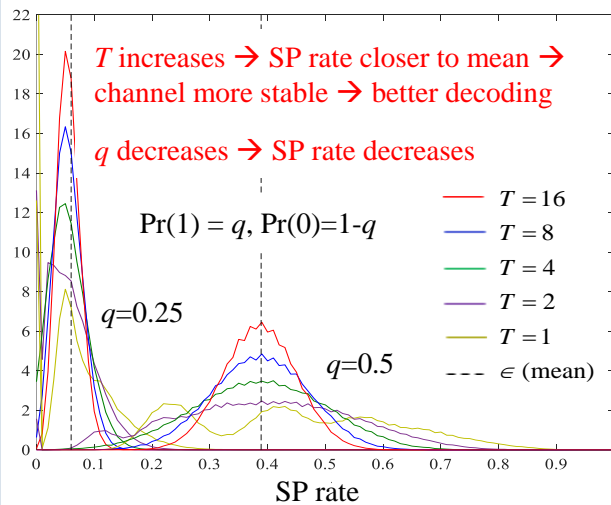
- ✓ Channel within each array is assumed i.i.d.
- ✓ Channel parameter  $\epsilon_t$  varies from array to array
- ✓ Channel is asymmetrical for 0/1 inputs

## 3. Across-Array Coding Scheme

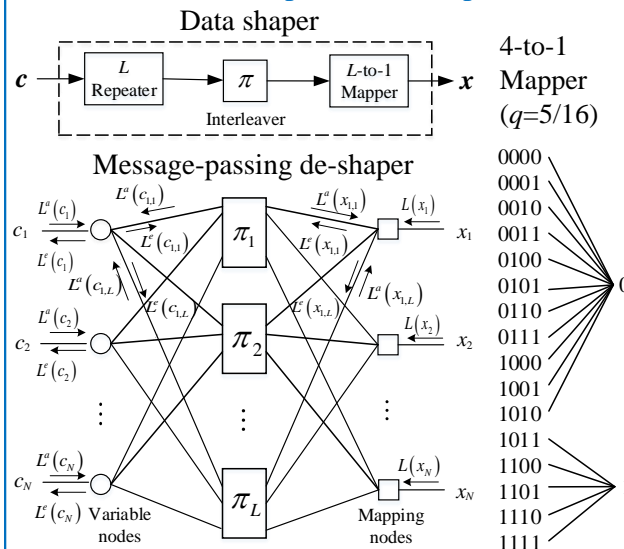


- ✓ Across-array coding  $\rightarrow$  mitigate SP correlation
- ✓ Data shaper  $\rightarrow$  form desired 0/1 distribution
- ✓ Channel estimator  $\rightarrow$  estimate  $\epsilon_t$  for  $t = 1 \dots T$ .
- ✓ ESE  $\rightarrow$  calculates initial LLR for each bit

## 4. PDF of SP Rate Within One Codeword (Across $T$ -array coding)



## 5. Data Shaper & De-Shaper



## 6. BER Simulations of $64 \times 64$ ReRAM (Irregular RA Code, across $T$ -Array)

