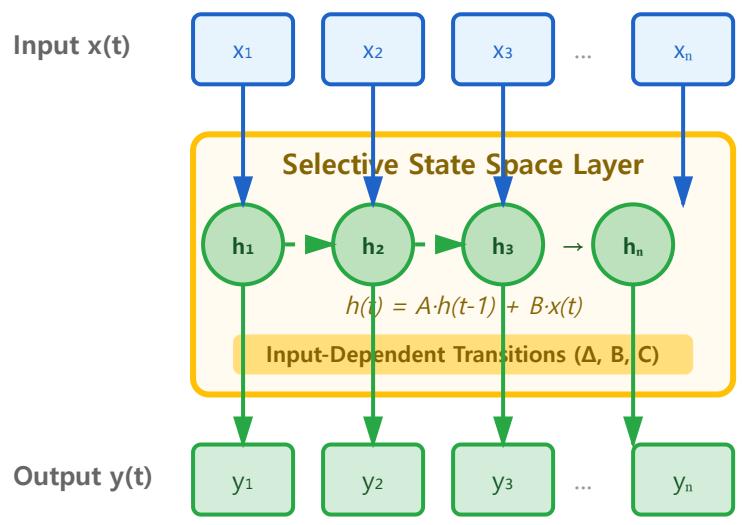


Mamba: State Space Models with Linear Complexity

Mamba Architecture: Selective State Space



Complexity: $O(n)$ Time & Memory

Transformer $O(n^2) \rightarrow$ Mamba $O(n)$

State Space Models

- Continuous-time dynamics
- Linear recurrence
- Efficient long sequences

Selective Mechanism

- Input-dependent A, B, C
- Context-aware filtering
- Mamba's key innovation

vs Transformers

- Linear scaling with length
- Better for 1M+ tokens
- Faster inference

Medical Applications

- ICU time-series monitoring
- Continuous glucose tracking
- Long-term EEG analysis

 **Next-Gen Efficiency**

Mamba achieves Transformer-level performance with **O(n) complexity instead of O(n²)**, enabling processing of million-token medical time-series in real-time with selective state updates.