

How is Sketching Useful?

Turnstile Streaming

- **Implicitly initialize a sketching matrix S**

- Maintain $S \cdot x$ in the stream

- Initialize $sk(x) \leftarrow 0$

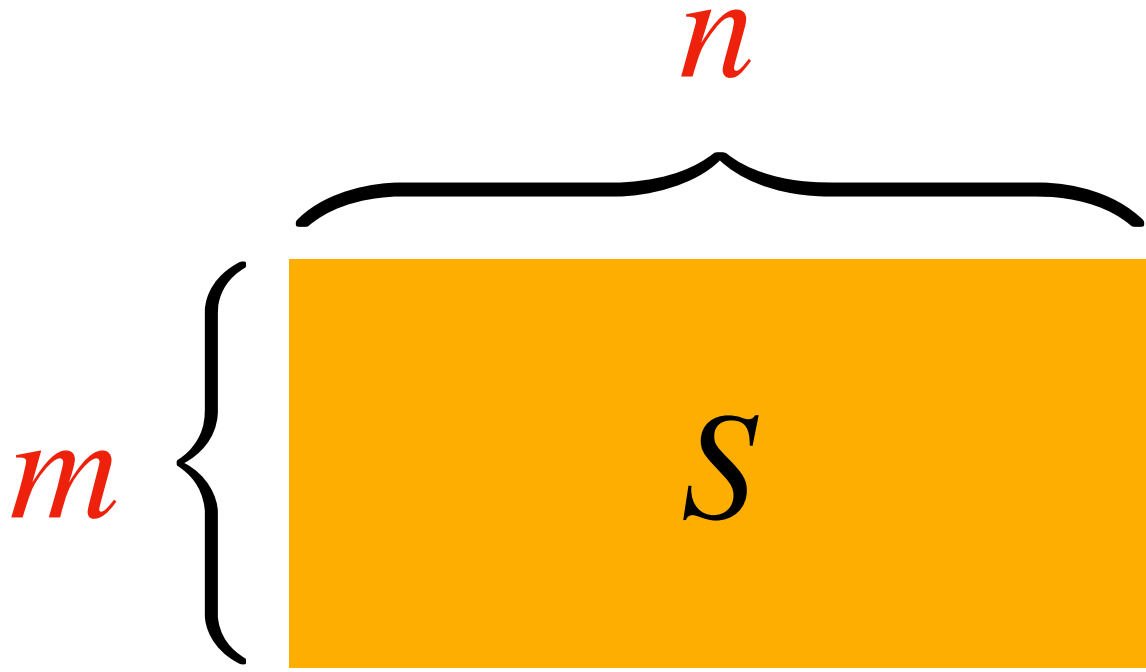
• When $x[i] \leftarrow x[i] + \Delta$

- Retrieve the i -th column S_{*i}

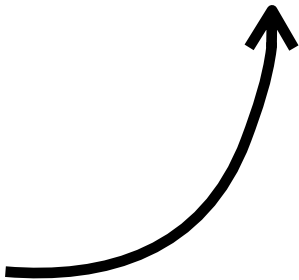
- Update $sk(x) \leftarrow sk(x) + (S_{*i}) \cdot \Delta$

- At all times: $sk(x) \equiv S \cdot x$

- Extract "information" about x from $sk(x)$ at the end



S_{*i}



$$x[1] S_{*1} + \cdots + x[n] S_{*n}$$

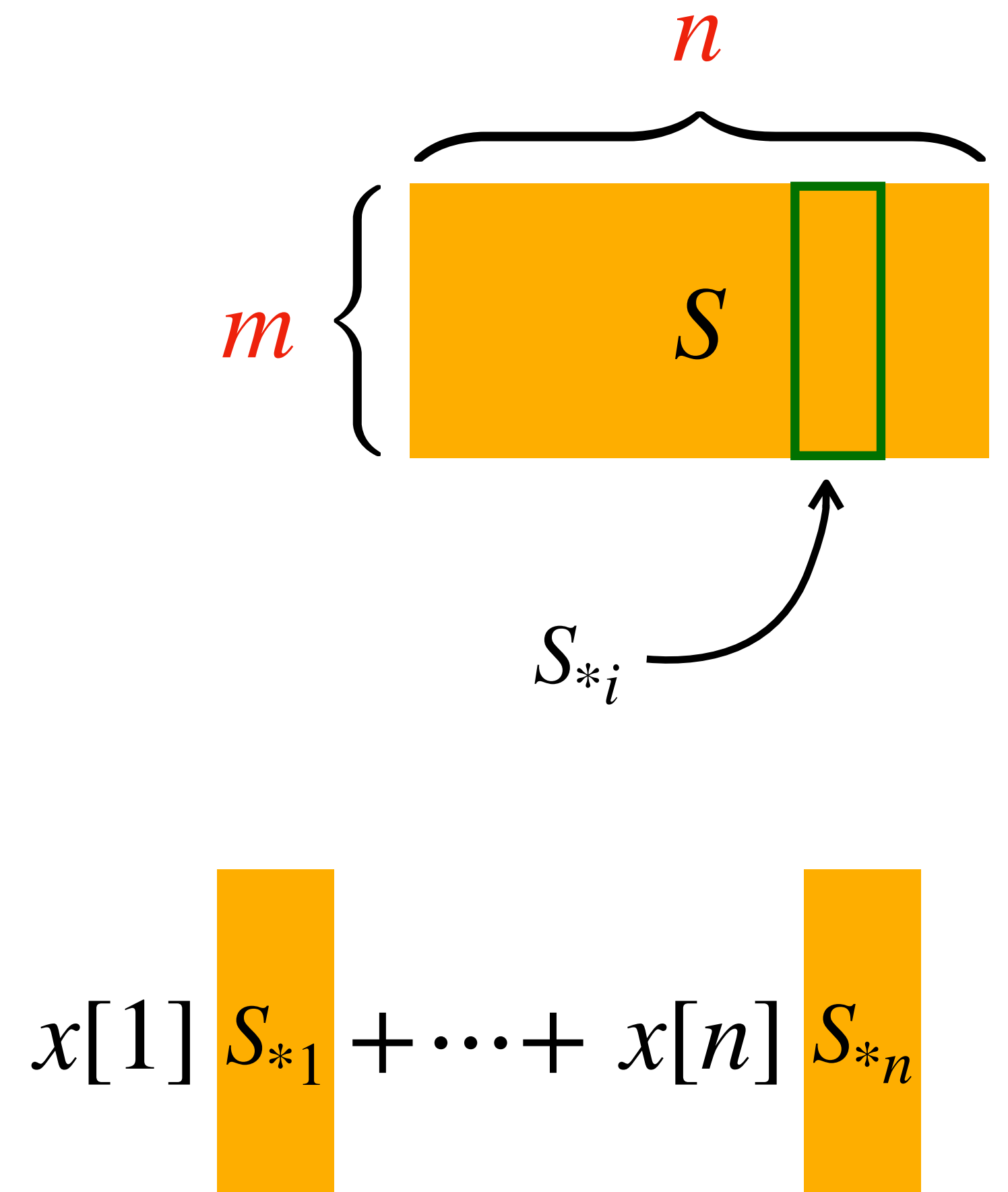
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- When $x[i] \leftarrow x[i] + \Delta$
 - Retrieve the i -th column S_{*i}
 - Update $\text{sk}(x) \leftarrow \text{sk}(x) + (S_{*i}) \cdot \Delta$
- At all times: $\text{sk}(x) = S \cdot x$
- Extract "information" about x from $\text{sk}(x)$ at the end



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