Viterbi's expectation maximization

Given an edge labelled directed graph $G = (V, E)$ with weights, and a starting vertex $V_0$ and a string $\sigma_1, \sigma_2, \ldots, \sigma_n$ over the labels, we want to find the most profitable path starting from $V_0$.

For length 1 paths, it is easy.

For length > 1, we can write an inductive defn.

--- end of DP ---
Searching

Binary search: static (set of elements is fixed)

Balanced search: dynamic dictionary

$n$ elements, $O(\log n)$ search, update (insert, delete)

Comparison search requires total ordering $O(n)$ space

$U$: set of all possible elements

Hashing $x \in U$

Hash table

hash function $h(x)$

$h: x \rightarrow \{1, 2, \ldots, n\}$

We want to store a set of $n$ elements in $T$, $n \ll N$
Conflict resolution techniques:

1. Open addressing: find the "next" available location.

2. Chaining: maintain a linked list with the location.

![Diagram with arrows and boxes indicating different elements mapped to the same location.]

Both the conflict resolution schemes could degenerate to linear search.

Some locator of the table will be the range of at least $N/n$ elements.
Most popular hash function including modulo n equipartitions,

\[ |h^{-1}(1)| = |h^{-1}(2)| = \ldots |h^{-1}(n)| \]

Suppose \( S \) is chosen randomly (uniformly) from \( U \).

What is the expected length of a chain in location \( 1 = \frac{1}{n} \times n = 1 \) (for equipartition)?

We show that all chains are \( \leq O(\log n) \) with prob \( 1 - \frac{1}{n} \).