1. Let \( w = w_1 \ldots w_n \) be a length-\( n \) sentence. For now, assume no adjunction.

When is an initial tree \( \alpha \) be the root of a derivation tree for \( w \)?

\[
S \quad \leftarrow \quad \text{leaf 1} \quad \text{leaf 4} \\
\text{leaf 2} \quad \text{leaf 3}
\]

... if \( w = w'_1 \ldots w'_i \) for some substrings \( w'_i \), and each \( \text{leaf}_i \Rightarrow* w'_i \).

(Either \( \text{leaf}_i \) is a sequence of terminals or substitution of some tree \( \hat{\alpha} \) into \( \text{leaf}_i \) eventually yields a fringe that is \( w'_i \).)

This suggests a "left-to-right" search of the leaves of a possible start tree:

for \( i = 1 \ldots \# \) of leaves:

given what \( \text{leaf}_1 \ldots \text{leaf}_{i-1} \) cover, figure out what tree could substitute \( \hat{\alpha} \) into \( \text{leaf}_i \) and what \( w'_i \) — a section of \( w \) — is.

2. Dot notation: for tracking search in an elementary tree.

\[
\begin{array}{c}
A \\
\text{}``\text{everything to the left has been checked}``
\end{array}
\]

\[
\begin{array}{c}
X \cdot Y \\
\text{}``\text{everything to the right must be verified}``
\end{array}
\]

state:

\[
[ \alpha, \text{address of } X \text{ in } \alpha, \text{right}, \quad ]
\]

\[
[ \alpha, \text{address of } Y \text{ in } \alpha, \text{left}, \quad ]
\]

3. Dynamic programming idea:

\[
\begin{array}{c}
\text{state:} \\
[ \alpha, \quad ]
\end{array}
\]

\[
\begin{array}{c}
A \quad \text{leaf 1} \\
\text{leaf 2} \quad \text{leaf 3}
\end{array}
\]

\[
\begin{array}{c}
A \quad \text{leaf 1} \\
\text{leaf 2} \quad \text{leaf 3}
\end{array}
\]

\[
\begin{array}{c}
A \quad \text{leaf 1} \\
\text{leaf 2} \quad \text{leaf 3}
\end{array}
\]

\[
\begin{array}{c}
A \quad \text{leaf 1} \\
\text{leaf 2} \quad \text{leaf 3}
\end{array}
\]

\[
\begin{array}{c}
A \quad \text{leaf 1} \\
\text{leaf 2} \quad \text{leaf 3}
\end{array}
\]

\[
\begin{array}{c}
A \quad \text{leaf 1} \\
\text{leaf 2} \quad \text{leaf 3}
\end{array}
\]

\[
\begin{array}{c}
A \quad \text{leaf 1} \\
\text{leaf 2} \quad \text{leaf 3}
\end{array}
\]

\[
\begin{array}{c}
A \quad \text{leaf 1} \\
\text{leaf 2} \quad \text{leaf 3}
\end{array}
\]

\[
\begin{array}{c}
A \quad \text{leaf 1} \\
\text{leaf 2} \quad \text{leaf 3}
\end{array}
\]

\[
\begin{array}{c}
A \quad \text{leaf 1} \\
\text{leaf 2} \quad \text{leaf 3}
\end{array}
\]

\[
\begin{array}{c}
A \quad \text{leaf 1} \\
\text{leaf 2} \quad \text{leaf 3}
\end{array}
\]

\[
\begin{array}{c}
A \quad \text{leaf 1} \\
\text{leaf 2} \quad \text{leaf 3}
\end{array}
\]