

This is CS50

CS50 EXPO

FRIDAY, NOVEMBER 20TH

3PM - 4:30PM

STERLING MEMORIAL LIBRARY

Research projects, student groups,
and startups from Yale and Harvard all
related to engineering and science.
Learn about how you can get involved!

Natural Language Processing

ELIZA

Joseph Weizenbaum, 1966

Pattern Matching Systems

I want to impress my boss.

I want to impress my boss.

I want to impress my boss.

WHY DO YOU WANT*

I want to impress my boss.

WHY DO YOU WANT*TO IMPRESS MY BOSS.

I want to impress my boss.

WHY DO YOU WANT*

I want **to** impress my boss.

WHY DO YOU WANT **TO**

I want to **impress** my boss.

WHY DO YOU WANT TO **IMPRESS**

I want to impress **my** boss.

WHY DO YOU WANT TO IMPRESS **YOUR**

I want to impress my boss.

WHY DO YOU WANT TO IMPRESS YOUR BOSS

I want to impress my boss.

WHY DO YOU WANT TO IMPRESS YOUR BOSS?

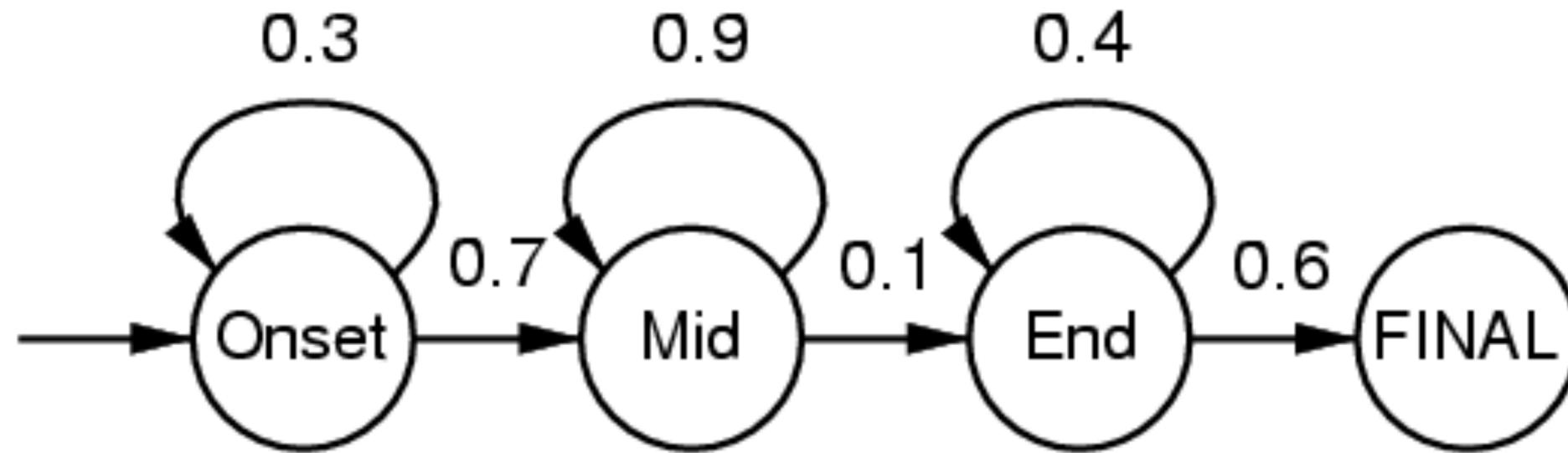
Speech Recognition

Phonetic model

Word pronunciation model

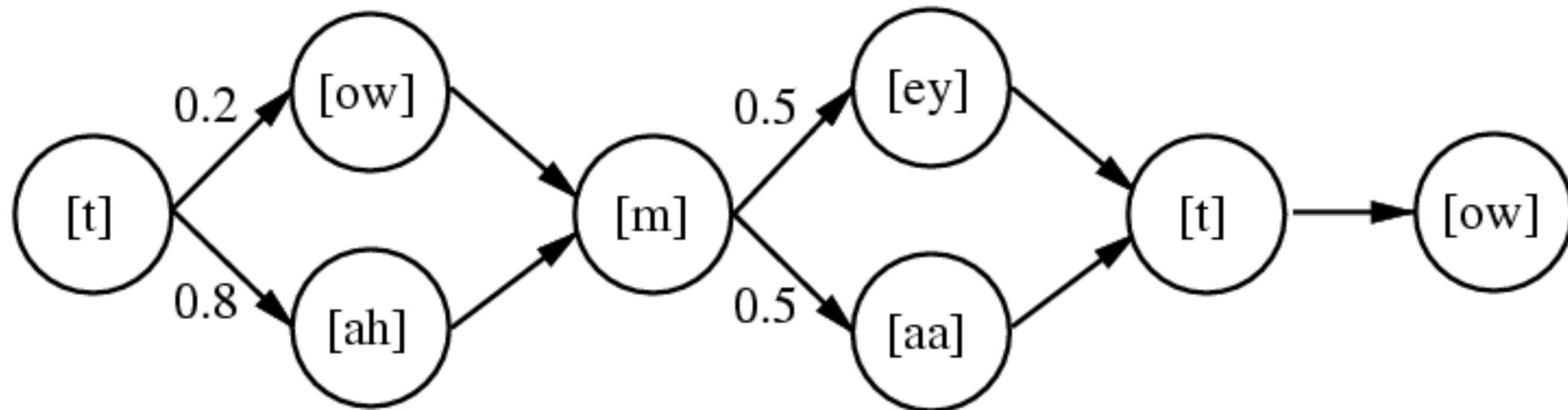
Language model

Phonetic Model



Hidden Markov Model

Word Pronunciation Model



Hidden Markov Model

Language Model

$$\begin{aligned} P(w_1 \dots w_n) &= P(w_1)P(w_2 | w_1)P(w_3 | w_2) \dots P(w_n | w_{n-1}) \\ &= \prod_{i=1}^n P(w_i | w_{i-1}) \end{aligned}$$

$$P(\text{the rat ate cheese}) = P(\text{the}) * P(\text{rat}|\text{the}) * P(\text{ate}|\text{rat}) * P(\text{cheese}|\text{ate})$$

bigram model



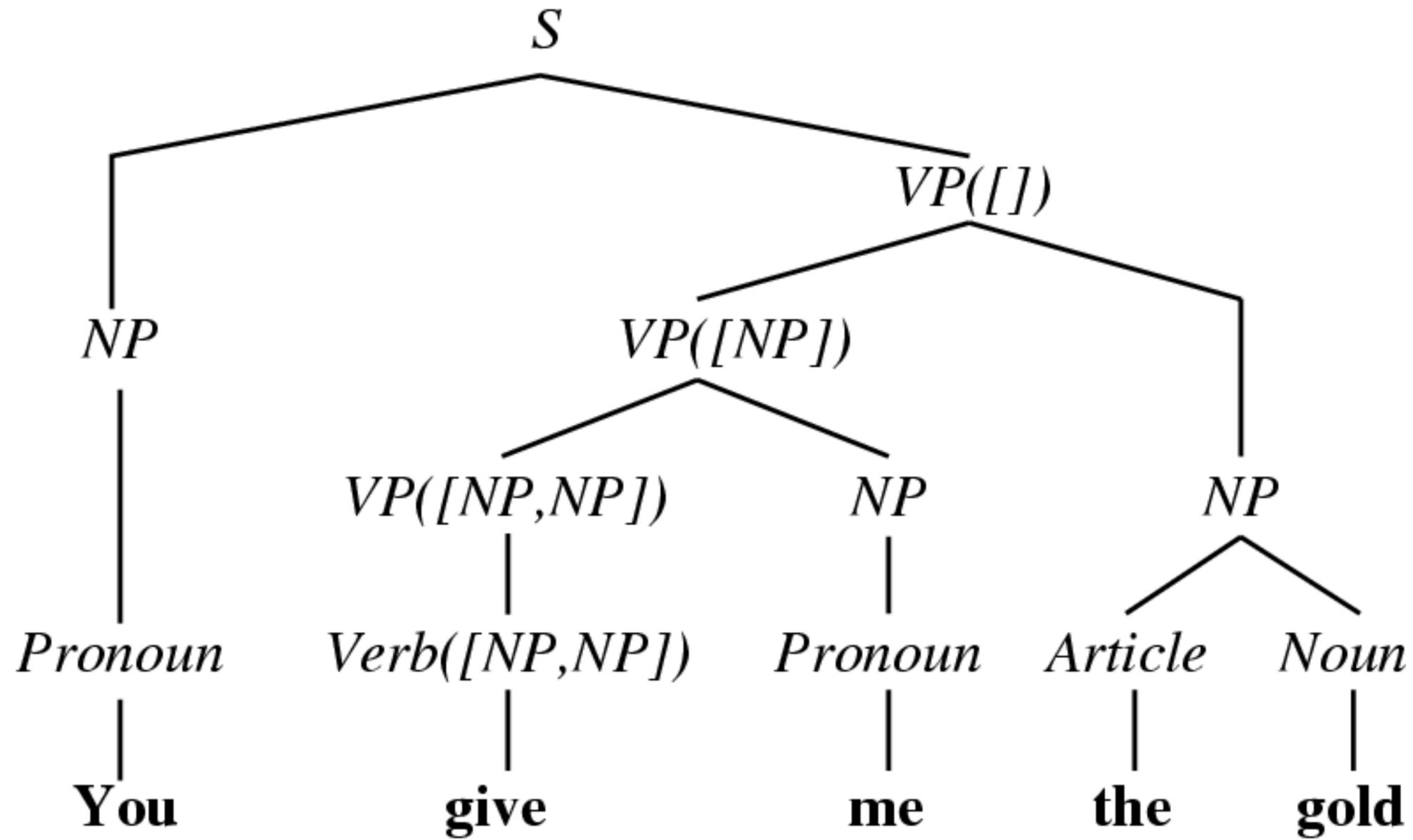
Question Answering

Syntactic Processing

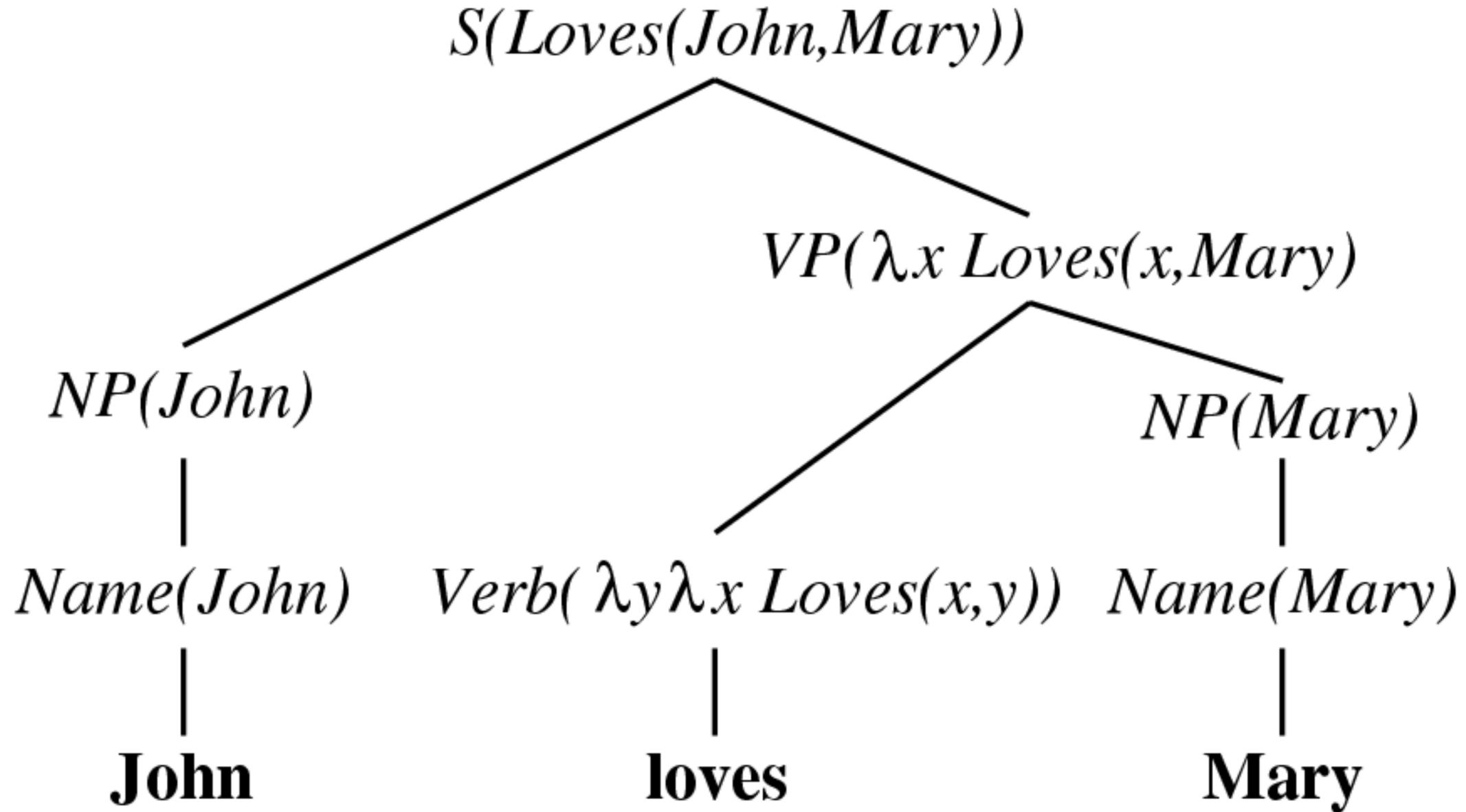
Semantic Processing

Pragmatic Processing

Syntax



Semantics



Pragmatics

Red-hot star to wed astronomer.

Squad helps dog bite victim.

Helicopter powered by human flies.

Non-verbal Communication