1. **Implement probabilistic context-free grammar parsing for a sentence using python**

**Aim:**

To implement probabilistic context-free grammar parsing for a sentence using python.

**Code:**

import nltk

from nltk import PCFG

from nltk.parse import ViterbiParser

# Define a Probabilistic Context-Free Grammar

grammar = PCFG.fromstring("""

S -> NP VP [1.0]

NP -> Det N [0.5] | NP PP [0.25] | 'John' [0.25]

VP -> V NP [0.5] | VP PP [0.5]

PP -> P NP [1.0]

Det -> 'the' [0.6] | 'a' [0.4]

N -> 'dog' [0.5] | 'cat' [0.5]

V -> 'chased' [1.0]

P -> 'with' [1.0]

""")

# Create a parser using Viterbi algorithm

parser = ViterbiParser(grammar)

# Take user input for a sentence

sentence = input("Enter a sentence (e.g., 'the dog chased the cat'): ")

tokens = sentence.split()

# Parse the sentence

print("\nParsing Results:")

for tree in parser.parse(tokens):

print(tree)

tree.pretty\_print()

**Input:**

Enter a sentence (e.g., 'the dog chased the cat'): the dog chased the cat

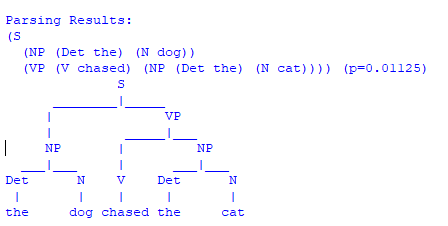
**Output:**

Parsing Results:

(S

(NP (Det the) (N dog))

(VP (V chased) (NP (Det the) (N cat)))) (p=0.01125)

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