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BÀI LÀM

1. Văn phạm CFG

a. Nam đang đọc sách ở thư viện.

S \rightarrow NP VP	PROPERN \rightarrow [Nam]
NP \rightarrow PROPERN	ADV \rightarrow [đang]
VP \rightarrow ADVP V NP PP	V \rightarrow [đọc]
ADVP \rightarrow ADV	N \rightarrow [sách]
NP \rightarrow DET NOM	P \rightarrow [ở]
NOM \rightarrow N	N \rightarrow [thư_viện]
PP \rightarrow P NP	
NP \rightarrow DET NOM	
NOM \rightarrow N	

b. Nam thích đọc sách.

S \rightarrow NP VP	PROPERN \rightarrow [Nam]
NP \rightarrow PROPERN	V \rightarrow [thích]
VP \rightarrow V VP	V \rightarrow [đọc]
VP \rightarrow V NP	N \rightarrow [sách]
NP \rightarrow DET NOM	
NOM \rightarrow N	

c. Nam có nhiều cuốn sách rất hay.

S → NP VP	PROPERN → [Nam]
NP → PROPERN	V → [có]
VP → V NP	Q → [nhiều]
NP → DET NOM	N → [cuốn]
DET → Q	N → [sách]
NOM → N N ADJP	ADV → [rất]
ADJP → ADVP ADJ	ADJ → [hay]
ADVP → ADV	

d. Nó mới mua hai cuốn sách mới.

SV NP VP	PRON → [Nó]
NP → PRON	ADV → [mới]
VP → ADVP V NP	V → [mua]
ADVP → ADV	CD → [hai]
NP → DET NOM	N → [cuốn]
DET → CD	N → [sách]
NOM → N N ADJP	ADJ → [mới]
ADJP → ADJ	

e. Nam tặng Lan một cuốn sách.

S → NP VP	PROPERN → [Nam]
NP → PORPERN	V → [tặng]
VP → V NP NP	PROPERN → [Lan]
NP → PROPERN	CD → [một]
NP → DET NOM	UN → [cuốn]
DET → CD	N → [sách]
NOM → UN N	

2. Rút gọn văn phạm CFG

S -> NP VP

NP -> PROPERN | DET NOM | PRON

VP -> ADVP V NP PP | V VP | V NP | ADVP V NP | V NP NP | V PP

ADVP -> ADV

PP -> P NP

DET -> Q | CD |

ADJP -> ADJ | ADVP ADJ | ADJ ADVP

NOM -> N | N N ADJP | UN N

PROPERN -> 'Nam' | 'Lan'

PRON -> 'Nó'

V -> 'đọc' | 'thích' | 'có' | 'mua' | 'tặng' | 'ở'

P -> 'ở'

N -> 'sách' | 'thư_viện' | 'cuốn'

UN -> 'cuốn'

Q -> 'nhiều'

ADV -> 'rất' | 'mới' | 'đang' | 'hay' | 'mua'

ADJ -> 'hay' | 'mới' | 'nhiều'

CD -> 'một' | 'hai'

3. Cài đặt thư viện NLTK trong Python để chạy chương trình

a. Code:

```
import nltk
grammer = nltk.CFG.fromstring("""
S -> NP VP
NP -> PROPERN | DET NOM | PRON
VP -> ADVP V NP PP | V VP | V NP | ADVP V NP | V NP NP | V PP
ADVP -> ADV
PP -> P NP
DET -> Q | CD |
ADJP -> ADJ | ADVP ADJ | ADJ ADVP
NOM -> N | N N ADJP | UN N
PROPERN -> 'Nam' | 'Lan'
PRON -> 'Nó'
V -> 'đọc' | 'thích' | 'có' | 'mua' | 'tặng' | 'ở'
P -> 'ở'
N -> 'sách' | 'thư_viện' | 'cuốn'
UN -> 'cuốn'
Q -> 'nhiều'
ADV -> 'rất' | 'mới' | 'đang' | 'hay' | 'mua'
ADJ -> 'hay' | 'mới' | 'nhiều'
CD -> 'một' | 'hai'
""")
nltk.app.rdparsers()
nltk.app.srparsers()
file1 = open('baitap.txt', 'r', encoding="utf8")
Lines = file1.readlines()
for line in Lines:
    sentence = line.split()
    print(sentence)
    def parse(sent):
        a = []
        parser = new_func()
        for tree in parser.parse(sent):
            a.append(tree)
        return(a[0])

    def new_func():
        parser = nltk.ChartParser(grammer)
        return parser
    parse(sentence).draw()
```

b. Các câu ban đầu

Recursive Descent Parser Application

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Available Expansions

- S → NP VP
- NP → PROPERN
- NP → DET NOM
- NP → PRON
- VP → ADVP V NP PP
- VP → V VP
- VP → V NP
- VP → ADVP V NP
- VP → V NP NP
- VP → V PP
- ADVP → ADV
- PP → P NP
- DET → Q
- DET → CD

Parse tree structure for the sentence "Nam đang đọc sách ở thư viện":

- S
 - NP (PROPERN) → Nam
 - VP
 - ADVP (ADV) → đang
 - V → đọc
 - NP (DET, NOM) → sách
 - PP (P, NP) → ở thư_viện

Last Operation: Match: thư_viện [COMPLETE PARSE]

Step Autostep Expand Match Backtrack

Nam đang đọc sách ở thư viện

Recursive Descent Parser Application

File Edit Apply View Animate Help

Available Expansions

- S → NP VP
- NP → PROPERN
- NP → DET NOM
- NP → PRON
- VP → ADVP V NP PP
- VP → V VP
- VP → V NP
- VP → ADVP V NP
- VP → V NP NP
- VP → V PP
- ADVP → ADV
- PP → P NP
- DET → Q
- DET → CD

Parse tree structure for the sentence "Nam thích đọc sách":

- S
 - NP (PROPERN) → Nam
 - VP
 - V → thích
 - VP
 - V → đọc
 - NP (DET, NOM) → sách

Last Operation: Match: sách [COMPLETE PARSE]

Step Autostep Expand Match Backtrack

Nam thích đọc sách

Recursive Descent Parser Application

File Edit Apply View Animate Help

Available Expansions

- S → NP VP
- NP → PROPERN
- NP → DET NOM
- NP → PRON
- VP → ADVP V NP PP
- VP → V VP
- VP → V NP
- VP → ADVP V NP
- VP → V NP NP
- VP → V PP
- ADVP → ADV
- PP → P NP
- DET → Q
- DET → CD
- DET →

Last Operation: Match: hay [COMPLETE PARSE]

Step Autostep Expand Match Backtrack

Nam có nhiều cuốn sách rất hay

Recursive Descent Parser Application

File Edit Apply View Animate Help

Available Expansions

- S → NP VP
- NP → PROPERN
- NP → DET NOM
- NP → PRON
- VP → ADVP V NP PP
- VP → V VP
- VP → V NP
- VP → ADVP V NP
- VP → V NP NP
- VP → V PP
- ADVP → ADV
- PP → P NP
- DET → Q
- DET → CD
- DET →

Last Operation: Match: mới [COMPLETE PARSE]

Step Autostep Expand Match Backtrack

Nó mới mua hai cuốn sách mới

Recursive Descent Parser Application

File Edit Apply View Animate Help

Available Expansions

S -> NP VP
NP -> PROPERN
NP -> DET NOM
NP -> PRON
VP -> ADVP V NP PP
VP -> V VP
VP -> V NP
VP -> ADVP V NP
VP -> V NP NP
VP -> V PP
ADVP -> ADV
PP -> P NP
DET -> Q
DET -> CD

S

NP

VP

PROPERN

V

NP

NP

Nam

tặng

Lan

một

UN

N

cuốn sách

Nam

tặng

Lan

một

cuốn

sách

Last Operation: Match: sách [COMPLETE PARSE]

Step

Autostep

Expand

Match

Backtrack

Nam tặng Lan một cuốn sách

c. Các câu phát sinh

Recursive Descent Parser Application

File Edit Apply View Animate Help

Available Expansions

- S → NP VP
- NP → PROPERN
- NP → DET NOM
- NP → PRON
- VP → ADVP V NP PP
- VP → V VP
- VP → V NP
- VP → ADVP V NP
- VP → V NP NP
- VP → V PP
- ADVP → ADV
- PP → P NP
- DET → Q
- DET → CD

Last Operation: Match: thư_viện [COMPLETE PARSE]

Step Autostep **Expand** Match Backtrack

```
graph TD
    S --> NP1[NP]
    S --> VP1[VP]
    NP1 --> PROPERN[PROPERN]
    PROPERN --> Nam[Nam]
    VP1 --> ADVP[ADVP]
    ADVP --> ADV[ADV]
    ADV --> đang[đang]
    VP1 --> V[V]
    V --> o[ở]
    VP1 --> NP2[NP]
    NP2 --> DET[DET]
    DET --> thuvien[thư_viện]
    NP2 --> NOM[NOM]
    NOM --> N[N]
    N --> thuvien
```

Nam đang ở thư_viện

Recursive Descent Parser Application

File Edit Apply View Animate Help

Available Expansions

- S → NP VP
- NP → PROPERN
- NP → DET NOM
- NP → PRON
- VP → ADVP V NP PP
- VP → V VP
- VP → V NP
- VP → ADVP V NP
- VP → V NP NP
- VP → V PP
- ADVP → ADV
- PP → P NP

Last Operation: Match: thư_viện [COMPLETE PARSE]

Step Autostep **Expand** Match Backtrack

```
graph TD
    S --> NP1[NP]
    S --> VP1[VP]
    NP1 --> PROPERN[PROPERN]
    PROPERN --> Nam[Nam]
    VP1 --> V[V]
    V --> o[ở]
    VP1 --> NP2[NP]
    NP2 --> DET[DET]
    DET --> thuvien[thư_viện]
    NP2 --> NOM[NOM]
    NOM --> N[N]
    N --> thuvien
```

Nam ở thư_viện

Recursive Descent Parser Application

File Edit Apply View Animate Help

Available Expansions

- S -> NP VP
- NP -> PROPERN
- NP -> DET NOM
- NP -> PRON
- VP -> ADVP V NP PP
- VP -> V VP
- VP -> V NP
- VP -> ADVP V NP
- VP -> V NP NP
- VP -> V PP
- ADVP -> ADV
- PP -> P NP

Last Operation: Match: sách [COMPLETE PARSE]

Step Autostep **Expand** **Match** Backtrack

```

graph TD
    S --> NP1[NP]
    S --> VP1[VP]
    NP1 --> PROPERN[PROPERN]
    PROPERN --> Nam[Nam]
    VP1 --> ADVP[ADVP]
    ADVP --> đang[đang]
    VP1 --> V[V]
    V --> đọc[đọc]
    VP1 --> NP2[NP]
    NP2 --> DET[DET]
    DET --> sách[sách]
  
```

Nam đang đọc sách

Recursive Descent Parser Application

File Edit Apply View Animate Help

Available Expansions

- S -> NP VP
- NP -> PROPERN
- NP -> DET NOM
- NP -> PRON
- VP -> ADVP V NP PP
- VP -> V VP
- VP -> V NP
- VP -> ADVP V NP
- VP -> V NP NP
- VP -> V PP
- ADVP -> ADV
- PP -> P NP

Last Operation: Match: sách [COMPLETE PARSE]

Step Autostep **Expand** **Match** Backtrack

```

graph TD
    S --> NP1[NP]
    S --> VP1[VP]
    NP1 --> PROPERN[PROPERN]
    PROPERN --> Nam[Nam]
    VP1 --> V[V]
    V --> đọc[đọc]
    VP1 --> NP2[NP]
    NP2 --> DET[DET]
    DET --> sách[sách]
  
```

Nam đọc sách

Recursive Descent Parser Application

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Available Expansions

- S → NP VP
- NP → PROPERN
- NP → DET NOM
- NP → PRON
- VP → ADVP V NP PP
- VP → V VP
- VP → V NP
- VP → ADVP V NP
- VP → V NP NP
- VP → V PP
- ADVP → ADV
- PP → P NP
- DET → Q

```

graph TD
    S --> NP1[NP]
    S --> VP1[VP]
    NP1 --> PROPERN[PROPERN]
    PROPERN --> Nam[Nam]
    VP1 --> V1[V]
    V1 --> thích[thích]
    VP1 --> VP2[VP]
    VP2 --> V2[V]
    V2 --> đọc[đọc]
    VP2 --> NP2[NP]
    NP2 --> DET[DET]
    DET --> sách[sách]
  
```

Last Operation: Match: sách [COMPLETE PARSE]

Step Autostep Expand Match Backtrack

Nam thích đọc sách

Recursive Descent Parser Application

File Edit Apply View Animate Help

Available Expansions

- S → NP VP
- NP → PROPERN
- NP → DET NOM
- NP → PRON
- VP → ADVP V NP PP
- VP → V VP
- VP → V NP
- VP → ADVP V NP
- VP → V NP NP
- VP → V PP
- ADVP → ADV
- PP → P NP
- DET → Q

```

graph TD
    S --> NP1[NP]
    S --> VP1[VP]
    NP1 --> PROPERN[PROPERN]
    PROPERN --> Nam[Nam]
    VP1 --> V1[V]
    V1 --> thích[thích]
    VP1 --> VP2[VP]
    VP2 --> V2[V]
    V2 --> ở[ở]
    VP2 --> NP2[NP]
    NP2 --> DET[DET]
    DET --> thư_viện[thư_viện]
  
```

Last Operation: Match: thư_viện [COMPLETE PARSE]

Step Autostep Expand Match Backtrack

Nam thích ở thư viện