

Alexandria, October 7-11

X UNL School

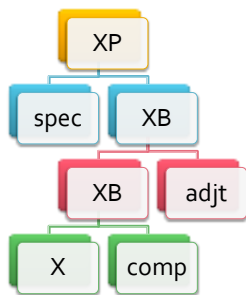
Day #2



Theory

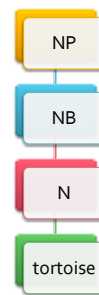
X-bar theory

X-bar structure

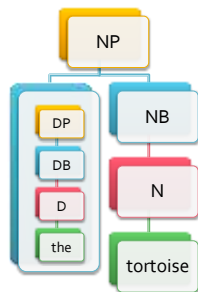


- Where:
- XP = maximal projection
- XB = intermediate projections
- spec = specifier
- adjt = adjunct
- comp = complement
- X = head
 - N (noun)
 - V (verb)
 - J (adjective)
 - A (adverb)
 - D (determiner)
 - P (preposition)
 - C (conjunction)

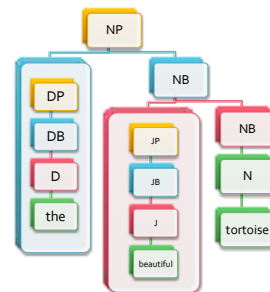
Tortoise



The tortoise



The beautiful tortoise



```

graph TD
    VP[VP] --> NP1[NP]
    VP --> VB1[VB]
    NP1 --> DP1[DP]
    NP1 --> NB1[NB]
    DP1 --> DB1[DB]
    DP1 --> D1[D]
    DB1 --> the1[the]
    NB1 --> N1[N]
    N1 --> tortoise[tortoise]
    VB1 --> V[V]
    V --> won[won]
    VB1 --> NP2[NP]
    NP2 --> DP2[DP]
    NP2 --> NB2[NB]
    DP2 --> DB2[DB]
    DP2 --> D2[D]
    DB2 --> the2[the]
    NB2 --> N2[N]
    N2 --> race[race]
  
```

```

graph TD
    NP[NP] --- NP1[NP#1]
    NP --- and["and"]
    NP --- NP2[NP#2]
    NP1 --- DP1_1[DP#1]
    NP1 --- NB1[NB]
    DP1_1 --- N1[N]
    N1 --- hare[hare]
    NP2 --- DP1_2[DP#1]
    NP2 --- NB2[NB]
    DP1_2 --- N2[N]
    N2 --- tortoise[tortoise]
    NB2 --- DP1_3[DP#1]
    DP1_3 --- DB[DB]
    DP1_3 --- D[D]
    DP1_3 --- the[the]
  
```

The figure shows two parse trees for the sentence "The tortoise replied." The left tree is a flat structure where the IP node branches into NP#2 and IB, and IB branches into I and VP#1. The right tree is a hierarchical structure where NP#2 branches into DP#1 and NB, DP#1 branches into N (tortoise), NB branches into D (the) and V (replied), and VP#1 branches into DB and VB.

```

graph TD
    IP[IP] --> NP2[NP#2]
    IP --> IB1[IB]
    NP2 --> DP1[DP#1]
    NP2 --> NB[NB]
    DP1 --> D[D]
    DP1 --> the[the]
    NB --> N[N]
    NB --> tortoise[tortoise]
    IB1 --> IB2[IB]
    IB1 --> VP1[VP#1]
    IB2 --> I[I]
    IB2 --> did[did]
    VP1 --> AP1[AP#1]
    VP1 --> VB1[VB]
    AP1 --> A[A]
    AP1 --> not[not]
    VB1 --> V[V]
    VB1 --> stop[stop]
  
```

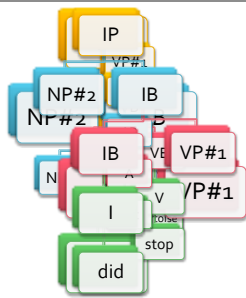
Exercise #1 (60 min)

Build the x-bar tree modified for the sentences of the corpus

Exercise #2

Building a grammar (I)

extracting the rules from the trees



```
(NP):=(NP)("and")(NP);
(NP):=(DP)(NB);
(NB):=(N);
(DP):=(DB);
(DB):=(D);
(IP):=(NP)(IB);
(IB):=(VP);
(VP):=(VB);
(VB):=(V);
(IB):=(IB)(VP);
(IB):=(I);
(VB):=(AP)(VB);
(AP):=(AB);
(AB):=(A);
```

Building a grammar (II)

inverting the rules

```
(NP):=(NP)("and")(NP);
(NP):=(DP)(NB);
(NB):=(N);
(DP):=(DB);
(DB):=(D);
(IP):=(NP)(IB);
(IB):=(VP);
(VP):=(VB);
(VB):=(V);
(IB):=(IB)(VP);
(IB):=(I);
(VB):=(AP)(VB);
(AP):=(AB);
(AB):=(A);

(NP)("and")(NP):=(NP);
(DP)(NB):=(NP);
(N):=(NB);
(DB):=(DP);
(D):=(DB);
(NP)(IB):=(IP);
(VP):=(IB);
(VB):=(VP);
(V):=(VB);
(IB)(VP):=(IB);
(I):=(IB);
(AP)(VB):=(VB);
(AB):=(AP);
(A):=(AB);
```

Building a grammar (II)

ordering the rules (longest first)

```
(NP)("and")(NP):=(NP);
(DP)(NB):=(NP);
(N):=(NB);
(DB):=(DP);
(D):=(DB);
(NP)(IB):=(IP);
(VP):=(IB);
(VB):=(VP);
(V):=(VB);
(IB)(VP):=(IB);
(I):=(IB);
(AP)(VB):=(VB);
(AB):=(AP);
(A):=(AB);

(NP)("and")(NP):=(NP);
(AP)(VB):=(VB);
(DP)(NB):=(NP);
(IB)(VP):=(IB);
(NP)(IB):=(IP);

(AB):=(AP);
(DB):=(DP);
(VB):=(VP);
(VP):=(IB);

(A):=(AB);
(D):=(DB);
(I):=(IB);
(V):=(VB);
(N):=(NB);
```

Building the grammar (III)

Creating the arborisation module

SOURCE	RULE
(NP)("and")(NP):=(NP);	(NP,%n1)("and")(NP,%n2):=(XP(%np2,%np3),+XP=NP,+LEX=N);
(AP)(VB):=(VB);	(AP,%a)(VB,%v):=(XB(%v,%a),+XB=VB,+LEX=V);
(DP)(NB):=(NP);	(DP,%d)(NB,%n):=(XP(%n,%d),+XP=NP,+LEX=N);
(IB)(VP):=(IB);	(IB,%i)(VP,%v):=(XB(%v,%i),+XB=IB,+LEX=I);
(NP)(IB):=(IP);	(NP,%n)(IB,%i):=(XP(%i,%n),+XP=IP,+LEX=I);
(AB):=(AP);	(AB,^AP):=(+XP=AP);
(DB):=(DP);	(DB,^DP):=(+XP=DP);
(VB):=(VP);	(VB,^VP):=(+XP=VP);
(VP):=(IB);	(VP,^IB):=(+XB=IB);
(A):=(AB);	(A,^AB):=(+XB=AB);
(D):=(DB);	(D,^DB):=(+XB=DB);
(I):=(IB);	(I,^IB):=(+XB=IB);
(V):=(VB);	(V,^VB):=(+XB=VB);
(N):=(NB);	(N,^NB):=(+XB=NB);

Exercise #2 (60 min)

- Build the arborisation grammar for the trees generated out of the English sentences