

## ATIS English Grammar Conversion

### Original Grammar

$S \rightarrow NP VP$   
 $S \rightarrow Aux NP VP$   
  
 $S \rightarrow VP$   
  
 $NP \rightarrow Pronoun$   
 $NP \rightarrow Proper-Noun$   
 $NP \rightarrow Det Nominal$   
 $Nominal \rightarrow Noun$   
 $Nominal \rightarrow Nominal Noun$   
 $Nominal \rightarrow Nominal PP$   
 $VP \rightarrow Verb$   
 $VP \rightarrow Verb NP$   
 $VP \rightarrow VP PP$   
 $PP \rightarrow Prep NP$

### Chomsky Normal Form

$S \rightarrow NP VP$   
 $S \rightarrow X1 VP$   
 $X1 \rightarrow Aux NP$   
 $S \rightarrow book \mid include \mid prefer$   
 $S \rightarrow Verb NP$   
 $S \rightarrow VP PP$   
 $NP \rightarrow I \mid he \mid she \mid me$   
 $NP \rightarrow Houston \mid NWA$   
 $NP \rightarrow Det Nominal$   
 $Nominal \rightarrow book \mid flight \mid meal \mid money$   
 $Nominal \rightarrow Nominal Noun$   
 $Nominal \rightarrow Nominal PP$   
 $VP \rightarrow book \mid include \mid prefer$   
 $VP \rightarrow Verb NP$   
 $VP \rightarrow VP PP$   
 $PP \rightarrow Prep NP$

## The lexicon

- $Det \rightarrow the \mid a \mid that \mid this$
- $Noun \rightarrow book \mid flight \mid meal \mid money$
- $Verb \rightarrow book \mid include \mid prefer$
- $Pronoun \rightarrow I \mid he \mid she \mid me$
- $Proper-Noun \rightarrow Houston \mid NWA$
- $Aux \rightarrow does$
- $Prep \rightarrow from \mid to \mid on \mid near \mid through$