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NLP HOMEWORK 3:

Context Free Grammars

**Part 1: Writing grammar rules**

# The start symbol is START.

START -> S1

# This is a very, very, very simple grammar to get you started.

# Sentences

S1 -> NP VP Eos | # The start symbol is START.

START -> S1

# This is a very, very, very simple grammar to get you started.

# Sentences

S1 -> NP VP Eos | VP VP Eos | VP NP Eos | VP Eos

# Verb phrases

VP -> VerbT NP | VerbT NP PP | VerbT PP | VerbT NOT JJ | VBG NOT JJ | VB | VB NP | VB RB RB | VB RB PP | VBD PP | VBD VBD PP | VBD VBN VBG PP | VBP PP | VBG PP | VBZ TO VB NP | MD VB VBN | MD VB VBN VBG NP | VBZ NP | VBD VBN NP | VBP PP | MD VP | VBP VBN | VBD VBN VBG PP | VBP VBN VBG NP | VBP RB RB | VBP RB PP | VBZ TO VB NP | VerbT NOT JJ | VBP | VBP NP | VBZ NP | VBD NP | CC VP | VBD PP | VBP RB NP | DO NOT VP | VBP RB | VB VBN | VerbT Pas NP | VerbT | RB Pas | VBZ RB

# Noun phrases

NP -> Det NP | Proper | Noun PP | Noun Det NP | Det JJ NP | Det JJS NP | Proper PP | Noun | PNP | NNPS | CD NP | CD | NNS | Proper PP JJ NP | Proper CC Proper | PRP | DO NP | WPro VP | POS Noun | NNP | JJ NP | TO NP | JJS NNS | CC NP | NNS | Proper PP | NNPS | Proper CC Proper | PRP | VBG NP | DO NP | WRB NP | WDET NP | WPro NP | PRP VP | Proper VP | Proper WPro VP | Proper DO | PRP NP | Proper Pas NP| NNS Pas | NP VP | Noun WDet VP

# do not use Nominals in RD parser

# Nom -> Noun | Noun Nom

# Prepositional phrase

PP -> Prep NP | TO NP

# This is a hand-generated set of lexical rules.

# Miscellaneous items that don't fit into any of our simple tags are

# given to Misc. You will want to develop your own tags for these!

# Singular and mass nouns. Notice that only the

# ones that start with consonants get our Noun tag.

Noun -> 'castle' | 'king' | 'defeater' | 'sovereign' | 'servant' | 'corner' | 'land' | 'quest' | 'chalice' | 'master' | 'horse' | 'fruit' | 'swallow' | 'sun' | 'winter' | 'coconut' | 'pound' | 'husk' | 'home' | 'weight' | 'story'

# Determiners

Det -> 'a' | 'another' | 'any' | 'each' | 'every' | 'no' | 'that' | 'the' | 'this'

# Prepositions

Prep -> 'above' | 'across' | 'at' | 'below' | 'by' | 'for' | 'from' | 'into' | 'near' | 'of' | 'on' | 'over' | 'through' | 'with'

# Proper nouns, this tag is just for people

Proper -> 'Arthur' | 'Guinevere' | 'Sir\_Lancelot' | 'Sir\_Bedevere' | 'Zoot' | 'Dingo' | 'Patsy'

# Verbs (third person singular present).

# Note that only transitive verbs get our VerbT tag,

# and some of those could also function as intransitives!

VerbT -> 'has' | 'covers' | 'is' | 'drinks' | 'carries' | 'rides'

# End-of-sentence.

Eos -> '!' | '.' | '?'

# Pauses.

Pas -> ',' | '...' | '--' | ';' | ':'

# Coordinating conjunctions.

CC -> 'and' | 'but' | 'or' | 'either' | 'nor' | 'neither' | 'so'

# Numbers.

CD -> 'eight' | 'five' | 'one' | '5.5' | 'sixty' | '5,000'

# Expletive.

Exp -> 'there'

# Subordinating conjunctions.

SCON -> 'that' | 'so' | 'while' | 'because' | 'if'

# Modals.

MD -> 'can' | 'could' | 'may' | 'might' | 'must' | 'ought' | 'shall' | 'should' | 'will' | 'would'

# JJectives

JJ -> 'plodding' | 'bloody' | 'weary' | 'unable' | 'trusty' | 'further' | 'sacred' | 'hot' | 'lucky' | 'simple' | 'tiny' | 'hard' | 'sensational' | 'comparable' | 'yellow'

# Comparative Adjectives.

CJJ -> 'bloodier' | 'wearier' | 'trustier' | 'hotter' | 'simpler' | 'tinier' | 'harder'

# Superlative Adjectives.

JJS -> 'bloodiest' | 'weariest' | 'trustiest' | 'hottest' | 'simplest' | 'tiniest' | 'hardest'

# Plural nouns.

NNS -> 'coconuts' | 'halves' | 'snows' | 'mountains' | 'areas' | 'strangers' | 'inches' | 'ants' | 'nights'

# More proper nouns, not people.

PNP -> 'Camelot' | 'England' | 'Holy\_Grail' | 'Round\_Table'

# Plural proper nouns.

NNPS -> 'Britons' | 'Saxons'

# Personal pronouns.

PRP -> 'he' | 'her' | 'him' | 'it' | 'one' | 'she' | 'them' | 'they'

# Possessive personal pronouns

POS -> 'her' | 'his' | 'its' | 'their'

# Adverbs.

RB -> 'again' | 'already' | 'currently' | 'frequently' | 'precisely' | 'south' | 'successfully' | 'unfortunately'

# 'do'/'does'

DO -> 'do' | 'does'

# 'to'

TO -> 'to'

# 'not'

NOT -> 'not'

# Verbs (base form).

VB -> 'have' | 'speak' | 'cover' | 'be' | 'ride' | 'drink' | 'grow' | 'carry' | 'suggest' | 'migrate' | 'know'

# Verbs (past tense).

VBD -> 'had' | 'spoke' | 'covered' | 'was' | 'were' | 'rode' | 'drank' | 'grew' | 'carried' | 'suggested' | 'migrated' | 'knew'

# Verbs (present participles).

VBG -> 'having' | 'speaking' | 'covering' | 'being' | 'riding' | 'drinking' | 'growing' | 'carrying' | 'suggesting' | 'migrating' | 'knowing'

# Verbs (past participle).

VBN -> 'had' | 'spoken' | 'covered' | 'been' | 'ridden' | 'drunk' | 'grown' | 'carried' | 'suggested' | 'migrated' | 'known'

# More third person singular verbs.

VBZ -> 'speaks' | 'grows' | 'goes' | 'migrates' | 'suggests' | 'knows'

# Verbs (present, plural, third person).

VBP -> 'have' | 'speak' | 'cover' | 'are' | 'ride' | 'drink' | 'grow' | 'carry' | 'suggest' | 'migrate' | 'know'

# Wh-determiners.

WDet -> 'that' | 'what' | 'which'

# Wh-pronouns.

WPro -> 'what' | 'who'

# Wh possessive pronoun.

WPos -> 'whose'

# Wh-adverbs

WRB -> 'how' | 'when' | 'where' | 'why'

# Possessive marker.

POSS -> "'s" | VP NP Eos | VP Eos

**Phrase Labels:**

The following phrase labels were generated and modified to parse the Camelot text. Descriptions of each parser are listed below as they relate and manifest in the ensuing text found in Part 1.

**Sentences (S1)**

* **NP VP Eos:** noun phrase followed by a verb phrase that ends in an end of sentence marker such as a period, exclamation or question mark
* **VP VP Eos:** two verb phrases leading directly to the end of a sentence
* **VP NP Eos:** a verb phrase and noun phrase preceding the end of a sentence
* **VP Eos:** a singular verb phrase preceding the end of a sentence

**Verb phrases (VP)**

* **VerbT NP:** transitive verb preceding a noun phrase
* **VerbT NP PP:** transitive verb preceding a noun phrase and a prepositional phrase
* **VerbT PP:** verb phrase preceding a prepositional phrase
* **VerbT NOT JJ:** verb phrase not before and adjective
* **VBG NOT JJ:** present participle not before an adjective
* **VB:** base form verb
* **VB NP:** base form verb preceding a noun phrase
* **VB RB RB:** base form verb preceding two adverbs
* **VB RB PP:** vbase form verb preceding an adverb and a propositional phrase
* **VBD PP:** past tense verb preceding a prepositional phrase
* **VBD VBD PP:** two past tense verbs preceding a prepositional phrase
* **VBD VBN VBG PP:** two past tense verbs preceding a present participle and a prepositional phrase
* **VBP PP:** verb present, plural, third person preceding a prepositional phrase
* **VBG PP:**  verb present participle preceding a prepositional phrase
* **VBZ TO VB NP:** third person singular verb followed by a verb and then a noun phrase
* **MD VB VBN:**  modal followed by a verb and a past participle
* **MD VB VBN VBG NP:** modal followed by a verb and a past participle, present participle verb and a noun phrase
* **VBZ NP:** third person singular verb followed by a noun phrase
* **VBD VBN NP:** verb past tense followed by a past participle verb and a noun phrase
* **VBP PP:** verb present, plural, third person followed by a prepositional phrase
* **MD VP:** modal followed by a verb
* **VBP VBN:** verb present, plural, third person followed by a past participle
* **VBD VBN VBG PP:** verb past tense followed by a past participle verb, present participle verb and a prepositional phrase
* **VBP VBN VBG NP:** verb present, plural, third person followed by a past participle verb, present participle verb and a noun phrase
* **VBP RB RB:** verb present, plural, third person followed by two adverbs
* **VBP RB PP:** verb present, plural, third person followed by an adverb and a prepositional phrase
* **VBZ TO VB NP:** third person singular verb followed by a verb and a noun phrase
* **VerbT NOT JJ:** a transitive verb not followed by and adjective
* **VBP:** verb present
* **VBP NP:** verb present followed by a noun phrase
* **VBZ NP:** third person singular verb followed by a noun phrase
* **VBD NP:** past tense verb followed by a noun phrase
* **CC VP:** a coordinating conjunction followed by a verb phrase
* **VBD PP:** past tense verb followed by a prepositional phrase
* **VBP RB NP:** verb present followed by an adverb and a noun phrase
* **DO NOT VP:** do/does not followed by a verb phrase
* **VBP RB:** verb past, plural or third person followed by an adverb
* **VB VBN:** verb phrases followed by a past participle
* **VerbT Pas NP:** transitive verb followed by a pause and a noun phrase
* **VerbT:** transitive verb
* **RB Pas:** adverb followed by a pause
* **VBZ RB:** third person singular verb followed by an adverb

**Noun Phrases (NP)**

* **Det NP:** determiner followed by a noun phrase
* **Proper:** prop noun
* **Noun PP:** noun followed by a prepositional phrase
* **Noun Det NP:** noun preceding a determiner and a noun phrase
* **Det JJ NP:**  determiner preceding and adjective and a noun phrase
* **Det JJS NP:** determiner preceding a superlative adjective and a noun phrase
* **Proper PP:** proper noun preceding a prepositional phrase
* **Noun PP:** noun preceding a prepositional phrase
* **Noun:** noun
* **PNP:** more proper nouns not people
* **NNPS:** plural proper nouns
* **CD NP:** number preceding a noun phrase
* **CD:** number
* **NNS:** plural nouns
* **Proper PP JJ NP:** proper noun preceding a prepositional phrase, adjective and noun phrase
* **Proper CC Proper:** proper noun preceding a coordinating conjunction and another proper noun
* **PRP:**  personal pronoun
* **DO NP:** do/does preceding a noun phrase
* **WPro VP:** wh-pronoun preceding a verb
* **POS Noun:** possessive plural noun followed by a noun
* **NNPS:** proper plural nouns
* **JJ NP:** adjective to noun phrase
* **TO NP:** to followed by a noun phrase
* **JJS NNS:** superlative adjective followed by a plural noun
* **CC NP:** coordinating conjunction followed by a noun phrase
* **Proper PP:** proper noun preceding a prepositional phrase
* **WDET NP:** wh-determiner followed by a noun phrase
* **NN NP:** noun followed by a noun phrase
* **WPro NP:** wh-pronoun followed by a noun phrase
* **PRP VP:** personal pronoun followed by a verb phrase
* **Proper VP:** proper noun followed by a verb phrase
* **Proper WPro VP:** proper noun followed by a wh-pronoun and a verb phrase
* **Proper DO:** proper noun followed by do/does
* **PRP NP:** prepositional phrase followed by a noun phrase
* **Proper Pas NP:** proper noun followed by a pause and a noun phrase
* **NNS Pas:** plural noun followed by a pause
* **NP VP:** noun phrase followed by a verb phrase
* **Noun WDet VP:** noun followed by a wh-determiner and a verb phrase

**Part 1**

**['Arthur', 'is', 'the', 'king', '.']**

(START

(S1

(NP (Proper Arthur))

(VP (VerbT is) (NP (Det the) (NP (Noun king))))

(Eos .)))

**Summary:**

For this sentence, holistically, the rules are NP 🡪 VP 🡪 Eos. The sentence begins with the additional NP (Proper) because Arthur is a proper noun and continues with a verb phrase ‘is the king’. First, a rule was added VerbT NP to account for the transitive verb ‘is’ following by the noun phrase ‘the king’. Within the NP, ‘the’ is the Det and ‘king’ is a regular noun. To account for future Det NPs, a parsing rule was written for that as well as a general one for nouns so that NP 🡪 Proper | Det NP | NN

**['Arthur', 'rides', 'the', 'horse', 'near', 'the', 'castle', '.']**

(START

(S1

(NP (Proper Arthur))

(VP

(VerbT rides)

(NP

(Det the)

(NP

(Noun horse)

(PP (Prep near) (NP (Det the) (NP (Noun castle)))))))

**Summary:**

This sentence required minimal additional parsing with the inclusion of one noun phrase Noun PP (a common noun followed by a prepositional phrase). This was necessary to parse ‘horse’ the noun followed by ‘near’ the beginning of a prepositional phrase. The remainder of the sentence was covered by rules written for the previous sequential sentence.

**['Arthur', 'rides', 'the', 'plodding', 'horse', 'near', 'the', 'castle', '.']**

(START

(S1

(NP (Proper Arthur))

(VP

(VerbT rides)

(NP

(Det the)

(NP

(JJ plodding)

(NP

(Noun horse)

(PP (Prep near) (NP (Det the) (NP (Noun castle))))))))

(Eos .)))

(Eos .)))

**Summary:**

This sentence includes the color of an adjective in ‘plodding’. This required just one modification from the prior sentence by including an adjective common noun prepositional phrase parser.

**['the', 'Holy\_Grail', 'is', 'a', 'chalice', '.']**

(START

(S1

(NP (Det the) (NP (PNP Holy\_Grail)))

(VP (VerbT is) (NP (Det a) (NP (Noun chalice))))

(Eos .)))

**Summary:**

This sentence added the nuance (‘fun’) of adding a proper noun into the mix. This required a simple Proper noun phrase parsing rule.

**['the', 'sensational', 'Holy\_Grail', 'is', 'a', 'sacred', 'chalice', '.']**

(START

(S1

(NP (Det the) (NP (JJ sensational) (NP (PNP Holy\_Grail))))

(VP (VerbT is) (NP (Det a) (NP (JJ sacred) (NP (Noun chalice)))))

(Eos .)))

**Summary:**

This sentence lead to the addition of one rule ‘JJ NP’ capitalizing on the previous NP rule Noun PP for parsing.

**['Sir\_Lancelot', 'might', 'have', 'spoken', '.']**

(START

(S1

(NP (Proper Sir\_Lancelot))

(VP (MD might) (VB have) (VBN spoken))

(Eos .)))

**Summary:**

This sentence required the additional support of two verb phrases. MD🡪VP was used to cover ‘might have’.

**['every', 'coconut', 'was', 'carried', 'to', 'the', 'hottest', 'mountains', '.']**

(START

(S1

(NP (Det every) (NP (Noun coconut)))

(VP

(VBD was)

(VBD carried)

(PP (TO to) (NP (Det the) (NP (JJS hottest) (NNS mountains)))))

(Eos .)))

**Summary:**

For this sentence, no additional support was required for the noun phrase ‘every coconut’. However, new parsers were need for the remainder of the sentence. ‘Was’ is clearly past tense (VBD) and needed additional support for the verb phrase by having an additional VBD for the past tense verb carried followed by the preposition ‘to’ (TO🡪NP). Finally, this ends with the noun phrase JJS 🡪 NNS to accommodate the superlative adjective to plural noun at the end of the sentence.

**['sixty', 'strangers', 'are', 'at', 'the', 'Round\_Table', '.']**

(START

(S1

(NP (CD sixty) (NP (NNS strangers)))

(VP

(VBP are)

(PP (Prep at) (NP (Det the) (NP (PNP Round\_Table)))))

(Eos .)))

**Summary:**

This sentence begins alright with the NP followed by a number and plural noun. The prior rules begin to break down and need modification when the verb phrase transitions from present, plural, third person verb ‘are’ to prepositional phrase ‘at’. A rule was added to include that scenario.

**['Sir\_Lancelot', 'might', 'have', 'spoken', '.']**

(START

(S1

(NP (Proper Sir\_Lancelot))

(VP (MD might) (VB have) (VBN spoken))

(Eos .)))

**Summary:**

Slight adjustments were also needed for this sentence to capture the modal verb ‘might’ followed by a verb phrase and a verb phrase followed by a past participle.

**['Guinevere', 'had', 'been', 'riding', 'with', 'Patsy', 'for', 'five', 'weary', 'nights', '.']**

(START

(S1

(NP (Proper Guinevere))

(VP

(VBD had)

(VBN been)

(VBG riding)

(PP

(Prep with)

(NP

(Proper Patsy)

(PP

(Prep for)

(NP (CD five) (NP (JJ weary) (NP (NNS nights))))))))

(Eos .)))

**Summary:**

Two modifications were needed for this sentence. A rather long rule was written to parse the first noun phrase by including VBD🡪VBN🡪VBG🡪PP. A second rule was written for the last noun phrase to include a sequence of proper noun ‘Patsy’ followed by a preposition ‘for’. The remainder successfully parsed from prior rules.

**['Sir\_Bedevere', 'might', 'have', 'been', 'suggesting', 'this', 'quest', '.']**

(START

(S1

(NP (Proper Sir\_Bedevere))

(VP

(MD might)

(VB have)

(VBN been)

(VBG suggesting)

(NP (Det this) (NP (Noun quest))))

(Eos .)))

**Summary:**

This sentence required one alphabet soup parser. The string of ‘might haver been suggesting this request’ needed a rule to accommodate the verb phrase MD🡪VB🡪VBN🡪VBG.

**['the', 'Britons', 'migrate', 'south', 'frequently', '.']**

(START

(S1

(NP (Det the) (NP (NNPS Britons)))

(VP (VB migrate) (RB south) (RB frequently))

(Eos .)))

**Summary:**

Two rules were needed here. First, it was needed to capture the noun phrase NNPS for the plural proper noun Britons. Next, it was necessary to add the verb phrase VB🡪RB🡪RB for the phrase ‘migrate south frequently’.

**['Arthur', 'and', 'Guinevere', 'ride', 'frequently', 'near', 'the', 'castle', '.']**

(START

(S1

(NP (Proper Arthur) (CC and) (Proper Guinevere))

(VP

(VB ride)

(RB frequently)

(PP (Prep near) (NP (Det the) (NP (Noun castle)))))

(Eos .)))

**Summary:**

The first additional phrase added here was for the noun phrase ‘Arthur and Guinevere’ by adding Proper🡪CC🡪Proper. Then, a verb phrase VBP🡪RB🡪PP was added for ‘ride frequently near’.

**['he', 'suggests', 'to', 'grow', 'fruit', 'at', 'home', '.']**

(START

(S1

(NP (PRP he))

(VP

(VBZ suggests)

(TO to)

(VB grow)

(NP (Noun fruit) (PP (Prep at) (NP (Noun home)))))

(Eos .)))

**Summary:**

This phrase introduces the personal pronoun ‘he’ which was added to the noun phrase list. Also, a verb phrases was added to cover ‘suggests to grow fruit’ written as VBZ🡪TO🡪VB🡪NP.

**['riding', 'to', 'Camelot', 'is', 'not', 'hard', '.']**

(START

(S1

(NP (VBG riding) (NP (TO to) (NP (PNP Camelot))))

(VP (VerbT is) (NOT not) (JJ hard))

(Eos .)))

**Summary:**

Two rules were added here. The first rule parses ‘riding to Camelot’ with the simple addition of VGB🡪NP. Next, a rule was written to cover ‘is not hard’ as VBT—NOT🡪JJ.

**['do', 'coconuts', 'speak', '?']**

(START (S1 (NP (DO do) (NP (NNS coconuts))) (VP (VBP speak)) (Eos ?)))

**Summary:**

In the most anticipated question of the year, an answer was unfortunately not provided. Rules were provided, however, to parse the ‘do coconuts’ with DO🡪NP. A rule was also written for ‘speak’ VBP.

**['why', 'does', 'England', 'have', 'a', 'king', '?']**

(START

(S1

(NP (WRB why) (NP (DO does) (NP (PNP England))))

(VP (VB have) (NP (Det a) (NP (Noun king))))

(Eos ?)))

**Summary:**

Oddly enough, a recent conversation with friends focused on why England still has a pseudo-monarchy figurehead type government. Incoherence aside (and perhaps getting a little punchy after much parsing), this last sentence needed the addition of WRB🡪NP for ‘why does…’.

**Challenge Sentences**

**['neither', 'Sir\_Lancelot', 'nor', 'Guinevere', 'will', 'speak', 'of', 'it', '.']**

(START

(S1

(NP

(CC neither)

(NP (Proper Sir\_Lancelot) (CC nor) (Proper Guinevere)))

(VP (MD will) (VP (VBP speak) (PP (Prep of) (NP (PRP it)))))

(Eos .)))

**['Arthur', 'rode', 'to', 'Camelot', 'and', 'drank', 'from', 'his', 'chalice', '.']**

(START

(S1

(NP

(Proper Arthur)

(VP (VBD rode) (PP (TO to) (NP (PNP Camelot)))))

(VP

(CC and)

(VP (VBD drank) (PP (Prep from) (NP (POS his) (Noun chalice)))))

(Eos .)))

**['Arthur', 'suggested', 'that', 'the', 'castle', 'be', 'carried', '.']**

(START

(S1

(NP

(Proper Arthur)

(VP

(VBD suggested)

(NP (Det that) (NP (Det the) (NP (Noun castle))))))

(VP (VB be) (VBN carried))

(Eos .)))

**Summary:**

The parser met the challenges with outward success in completely tagging the three sentences.

The first sentence was truly a challenge for the part of speech tagging rules that were written to date and required several modifications. The NP needed to accommodate for CC ‘neither’ followed by a second NP with PNP ‘Sir\_Lancelot’🡪 CC ‘nor’ and PNP ‘Guinevere’. Next the VP began with MD ‘will’ before continuing with the last VP of VBP ‘speak’ 🡪 PP ‘of’ and NP ‘it’ before ending the sentence.

The second sentence relied heavily on similar structure with a noun phrase and verb phrase containing the sequence of past tense verbs followed by a prepositional phrase. Modifications were made to add a proper noun (PNP) to the NP and a possessive personal pronoun ‘his’ to the VP.

Finally, the third sentence did not require anything additional for the first noun phrase consisting of a proper noun or first verb phrase consisting just of a past tense verb. It did require modifications to the second noun phrase with two sequential determiners and a noun phrase with a common noun. Finally, the last verb phrase was previously addressed and did not require additional modification.

**Part 2: Exemplar Sentences**

unfortunately , coconuts may not speak at the Round\_Table .

speak at the do coconuts grow inches !

**['unfortunately', ',', 'coconuts', 'may', 'not', 'speak', 'at', 'the', 'Round\_Table', '.']**

**Summary:**

This sentence, although linguistically correct, is unable to be parsed by the current rules. This sentence breaks the rules I defined in the first section as it begins with an adverb and is followed by a comma and a noun phrase. A rule would need to be written to include RB 🡪 Pas 🡪 NP. Starting with a verb phrase (VP), it would be wise to include the instance VP: RB 🡪 Pas and then add the noun phrase (NP). It would also be prudent to add parsing for the prepositional phrase at the round table which is not positioned to parse a proper noun. The verb phrase should read something like:

(VP

(VBP speak)

(PP (Prep at) (NP (Det the) (Not (not) (NP (PNP Round\_Table))))))

**['speak', 'at', 'the', 'do', 'coconuts', 'grow', 'inches', '!']**

(START

(S1

(VP

(VBP speak)

(PP (Prep at) (NP (Det the) (NP (DO do) (NP (NNS coconuts))))))

(VP (VB grow) (NP (NNS inches)))

(Eos !)))

**Summary:**

This sentence, although successfully parsed, does not make any linguistic sense. The first verb phrase begins with the present plural VBP ‘speak’ and is followed by the prepositional phrase ‘at’ determiner ‘the’ noun phrase ‘do’ and ends with the noun phrase containing plural noun ‘coconuts’. This clearly shows an over generalization of the rules that were developed as this is a nonsensical sequence. The pseudo sentence then transitions into a second verb phrase beginning with the verb ‘grow’ and is followed by a noun phrase containing plural noun ‘inches’. Similar to what was described in the prior portion of this summary, the phrasing makes sense based upon the parsers that were established that generally provide the information we would expect to extract, but this once again demonstrates an over generalization through the VB 🡪 NP (containing a plural noun) cadence.