The Annotation Guideline of LST20 Corpus

Prachya Boonkwan   Vorapon Luantangsrisuk   Sitthaa Phaholphinyo
Kanyanat Kriengket   Dhanon Leenoi   Charun Phrombut
Monthika Boriboon   Krit Kosawat   Thepchai Supnithi

Language and Semantic Technology Lab (LST)
National Electronics and Computer Technology Center
112 Phahonyothin Road
Khlong Nueng, Khlong Luang District
Pathumthani 12120, Thailand

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Abstract

This report presents the annotation guideline for LST20, a large-scale corpus with multiple layers of linguistic annotation for Thai language processing. Our guideline consists of five layers of linguistic annotation: word segmentation, POS tagging, named entities, clause boundaries, and sentence boundaries. The dataset complies to the CoNLL-2003-style format for ease of use. LST20 Corpus offers five layers of linguistic annotation as aforementioned. At a large scale, it consists of 3,164,002 words, 288,020 named entities, 248,242 clauses, and 74,180 sentences, while it is annotated with 16 distinct POS tags. Regarding its sheer size, this dataset is considered large enough for developing joint neural models for NLP. With the existence of this publicly available corpus, Thai has become a linguistically rich language for the first time.

Contents

Chapter 1

Word Segmentation Guideline

In the LST20 Guideline, word segmentation generally abides by the formation of compound words described in the Inter-BEST 2009 Guideline. The rule of thumb is quite simple:

> A compound word is formed only if free morphemes are combined to form a new semantic concept that discards their original meanings.

However, a few exceptions allow the formation of compound words that merely retain the original meaning of free morphemes, which we shall explain along the way.

The annotation format for word segmentation is as follows. We assume that the data is in a raw format that preserves white spaces as shown below.

(1) อย่างไรก็ตามบริษัท เอบีซี จำกัดจะรีบแจ้งเตือนลูกค้าถึงปัญหาที่เกิดขึ้นทันที
‘However, ABC Corporation will notify all customers about the current issues immediately.’

We annotate all word boundaries with a vertical bar ‘|’ and preserve all white spaces as is. In this paper, we denote any white space with the square-cup symbol ‘⊔’.

(2) อย่างไรก็ตาม | บริษัท | ⊔ | เอบีซี | ⊔ | จำกัด | จะ | รีบ | แจ้ง | เตือน | ลูกค้า | ถึง | ปัญหา | ที่ | เกิด | ขึ้น | ทันที |
‘However, ABC Corporation will notify all customers about the current issues immediately.’

The underlying assumption of word segmentation is that as many free morphemes should be delimited as possible, except that compound words must be formed so that the sentence conveys the right meaning. The following subsections describe the criteria of compound word formation and some exceptions.

1.1 Compound Word Formation

Any compound word is comprised of free morphemes, where their combination does not retain their original meanings. Some compound words are obvious and context-independent. For instance:

- แมวน้ำ [mæːʊ.náːm] *sea lion* consists of two free morphemes: แมว [mæːʊ] *cat* and น้ำ [náːm] *water*.
- กินใจ [kin.tɕaɪ] *be touching* consists of two free morphemes: กิน [kin] *eat* and ใจ [tɕaɪ] *heart*.

The other compound words are less clear and their formation depends on context interpretation, such as มีอายุ [miː.ʔaːjú] *elderly* vs. มี [miː] *have* + อายุ [ʔaːjú] *age*.

(3) a. p^{h}ûː.tɕ^{h}aːɪ k^{h}on níː duː miː.ʔaːjú
man CL this look elderly
‘This man looks elderly.’

b. dèk nák-rian miː ʔaːjú sìp.sɔ̌ːŋ piː
child NOMZ-study have age twelve CL.YEAR
‘The young student is 12 years old.’

1.2 Plant and Animal Names

Any specific plant and animal name is treated as a compound word. For example, these plant and animal names are treated as compound words.

- มะม่วงน้ำดอกไม้ [mámuâŋ.náːm.dɔ̀ːkmáːɪ] *barracuda mango* consists of three free morphemes: มะม่วง [mámuâŋ] *mango*, น้ำ [náːm] *water*, and ดอกไม้ [dɔ̀ːkmáːɪ] *flower*.

- เพลี้ยกระโดดสีน้ำตาล [p^{h}liá.kràdòːt.sǐː.námtaːn] *brown planthopper* consists of four free morphemes: เพลี้ย [p^{h}liá] *spittle bug*, กระโดด [kràdòːt] *jump*, สี [sǐː] *color*, and น้ำตาล [námtaːn] *brown*.

However, any part of plants and animals will be treated separately; for example, ขา | หลัง | เพลี้ยกระโดดสีน้ำตาล *hind leg of brown planthopper*.

(4) k^{h}ǎː lǎŋ p^{h}liá.kràdòːt.sǐː.námtaːn
leg hind brown planthopper
'a hind leg of a brown planthopper'

1.3 Rhyming

Free morphemes with semantic or phonetic rhyming are also licensed to form a compound word. Semantically rhyming morphemes are combined to form a compound word. For example:

- ทรัพย์สิน [sáp.sǐn] *possession* is composed of two free morphemes: ทรัพย์ [sáp] *asset* and สิน [sǐn] *money*.

- เสาะแสวงหา [sɔ̀.s^{w}æ̌ːŋ.hǎː] *seek* consists of three free morphemes: เสาะ [sɔ̀], แสวง [s^{w}æ̌ːŋ], หา [hǎː], all of which meaning '*seek*'.

A morpheme can also be combined with another phonetic rhyming one to form a compound word. For example:

- โครมคราม [k^{h}roːm.k^{h}raːm] *smack! smack!* consists of two phonetically rhyming parts: โครม [k^{h}roːm] *smack!* and คราม [k^{h}raːm] *indigo*. The second part, whose meaning is discarded, is added to rhyme with the first morpheme.

- สะบักสะบอม [sàbàk.sàbɔm] *be badly bruised* consists of two phonetically rhyming parts: สะบัก [sàbàk] *shoulder blade* and สะบอม [sàbɔm] (meaningless). The second part is added to rhyme with the first morpheme.

- กระป๋งกระเป๋า [kràpǒŋ.kràpǎʊ] *bag* (intensified) consists of two phonetically rhyming parts: กระป๋ง [kràpǒŋ] (meaningless) and กระเป๋า [kràpǎʊ] *bag*. The first part is added to rhyme with the second morpheme.

Note that the meaning of the rhyming part is entirely discarded.

1.4 Reduplicatives

Words formed with reduplication are treated either morphologically or orthographically. In the case of morphological reduplication, words are explicitly repeated, perhaps with minor tonal and stress change; e.g. เด็กเด็ก [dèk.dèk] *children* (pluralized), แด๊งแดง [ˈdǽːŋ.dæːŋ] *red* (intensified), and แดงแดง [dæŋ.ˈdæːŋ] *reddish* (moderated). These morphological reduplicatives are treated as compound words.

On the other hand, orthographical reduplicatives, where punctuation mark 'ๆ' *mai yamok* is used, are treated separately. If *mai yamok* is used to modify the core morpheme, it is treated as a separate word, such as เด็ก | ๆ [dèk.dèk] *children* (pluralized), and เล็ก | ๆ *very small* (intensified). Otherwise, if *mai yamok* becomes a part of the word, e.g. ต่างๆ นานา [tàːŋ.tàːŋ.naːnaː] *various* (intensified), and ทั่วๆ ไป [t^{h}uâ.t^{h}uâ.paɪ] *general* (moderated), it will be treated as a compound word.

1.5 Proverbs

Aphorisms, proverbs, and sayings are treated as compound words and annotated with respect to their syntactic functions. For example: ตาเป็นมัน [taː.pen.man] (*staring*) *attentively*.

(5) nɔ̂ːŋ mɔːŋ k^{h}ànŏm taː.pen.man ləːɪ
younger brother look snack attentively EMPHASIS
‘My younger brother stares at the snack very attentively.’

In the above example, the aphorism ตา เป็น มัน [taː.pen.man] can be literally translated as *the eyes are shimmering*.

1.6 Loanwords, Pseudo-Loanwords, and Courteous Terms

Loanwords from languages other than Thai are always treated as compound words. Most loanwords in Thai are from Pali and Sanskrit. For example, ชีววิทยา [tɕ^{h}iːʋáʋítt^{h}ájaː] *Biology* is derived from Sanskrit words *jīva* + *vidyā* > *jīvavidyā*. Pseudo-loanwords are a combination of Thai and foreign words. For example, ราชวัง [râːttɕ^{h}áʋaŋ] *royal palace* is a combination of Sanskrit word ราช [râːt] *king* < *rāja* and Thai word วัง [ʋaŋ] *palace*.

Courteous terms are a special vocabulary used when addressing the King, the Queen, royal family members, and Buddhist monks. These terms are also treated as compound words. For example, ฉลองพระเนตร [tɕ^{h}àlɔ̌ːŋ.p^{h}rá.nêːt] *eyeglasses* is used in the court instead of แว่นตา [ʋɛ̂ntaː] *eyeglasses*. However, when a non-courteous term is combined with a courteous one, they are treated as separate words. For example, ถ้วย | พระสุธารส [t^{h}uâɪ.p^{h}rásùt^{h}aːrót] *tea cup* is composed of two words: ถ้วย [t^{h}uâɪ] *cup* and พระสุธารส [p^{h}rásùt^{h}aːrót] *tea*.

1.7 Prefixes

Despite its name, all kinds of prefixes are separated from the core part because they can generatively combine with lengthy phrases. These prefixes include: nominalizers (การ [kaːn] *action*, ความ [k^{hw}aːm] *abstract concept*, ผู้ [p^{h}ûː] *person*, ชาว [tɕ^{h}aːʊ] *citizen*, and นัก [nák] *professional*), adjectivizers (น่า [nâː] *likely*), adverbializers (โดย [doːɪ] *with*, and อย่าง [jàːŋ] *fashion*), courteous verbalizer ทรง [soŋ], and derivational prefixes (การ [kaːn] *action*, ชาว [tɕ^{h}aːʊ] *citizen*, and นัก [nák] *professional*).

For the ease of understanding and typesetting, we will omit the separation of prefixes from the stem in some linguistic examples, if the stem consists of only one word. Instead of fully displaying the prefixes and stem in example 6a, we will reduce them into one chunk delimited by ‘-’ as shown in example 6b.

(6) a. [$_{\mathrm{NP}}$ k^{hw}aːm/FX [$_{\mathrm{ADJP}}$ nâː/FX rák]] k^{h}ɔ̌ːŋ t^{h}əː tɕ^{h}âːŋ sàdùt.taː
NOMZ ADJZ love of 3RD.SING.FEM quite be eye-catching
‘Her cuteness is quite eye-catching.’

b. k^{hw}aːm-nâː-rák k^{h}ɔ̌ːŋ t^{h}əː tɕ^{h}âːŋ sàdùt.taː
NOMZ-ADJZ-love of 3RD.SING.FEM quite be eye-catching
‘Her cuteness is quite eye-catching.’

1.8 Connectors and Prepositions

Thai allows multiple connectors and prepositions to juxtapose in the sentence. They will be segmented and annotated separately. For example, ‘ไขควง อยู่ ใน ที่ บน ชั้น วาง ของ’ *The screwdriver is on the shelf* consists of three consecutive prepositions, all of which being separated.

(7) k^{h}ăɪk^{h}uaŋ jùː naɪ t^{h}îː bon tɕ^{h}án ʋaːŋ k^{h}ɔ̌ːŋ
screwdriver be in at on level lay thing
‘The screwdriver is on the shelf.’

Furthermore, ‘หรือ แม้แต่ เขา ก็ อ่าน หนังสือ’ *Even he also revises the lessons* consists of two consecutive connectors.

(8) rɯ̌ː mǽːtæ̀ː k^{h}ăʊ kɔ̂ː ʔàːn năŋsɯ̌ː
or even 3RD.SING.MASC also read book
‘Even he also revises the lessons.’

1.9 Punctuation Marks

All punctuation marks, including ๆ *mai yamok* (reduplication), ฯ *paiyal noi* (abbreviation), and ฯลฯ *paiyal yai* (et cetera), are treated as separate words. Consecutive non-Thai punctuation marks are treated a single token. URLs are also treated as single tokens.

Chapter 2

POS Tagging Guideline

In the LST20 Guideline, all Thai words are generally classified, according to their semantic contents, into two classes: content words and function words. The content words are then divided into nouns, verbs, adjectives, and adverbs. Meanwhile, the function words are divided into auxiliary, connector, classifier, prefix, interjection, negator, number, preposition, punctuation, and others. In total, there are 16 distinct POS tags as shown in Table 2.1.

The annotation format for POS tags is as follows. We assume that each sentence is annotated with word boundaries with respect to our word segmentation guideline, where each word is delimited with a vertical bar '|'. For example:

(9) อย่างไรก็ตาม | บริษัท | ⊔ | เอบีซี | ⊔ | จำกัด | จะ | รีบ | แจ้ง | เตือน | ลูกค้า | ถึง | ปัญหา | ที่ | เกิด | ขึ้น | ทันที |
'However, ABC Corporation will notify all customers about the current issues immediately.'

POS tags will be annotated to each word separated by a forward slash '/'. Therefore the above sentence will be annotated with POS tags as follows.

(10) อย่างไรก็ตาม/CC | บริษัท/NN | ⊔/PU | เอบีซี/NN | ⊔/PU | จำกัด/VV | จะ/AX | รีบ/VV | แจ้ง/VV | เตือน/VV | ลูกค้า/NN | ถึง/PS | ปัญหา/NN | ที่/CC | เกิด/VV | ขึ้น/AV | ทันที/AV |
'However, ABC Corporation will notify all customers about the current issues immediately.'

In the case of annotation ambiguity, we first classify a word by its semantic content. If it contributes to the meaning of the sentence in which it occurs, it is a content word, which we will further classify it with distributional test frames. Otherwise, if it rather denotes grammatical relationships between content words, we consider it a function word, which we will classify it based on the grammatical relationship it manifests.

2.1 Content Words

The content words are divided into four categories: noun, verb, adjective, and adverb. The definition of each tag is based on those defined in Thai Grammar [1]. We discern each of these categories with a simple set of distributional test frames, previously explored in [2].

Noun (NN) is a word used to identify any of a class of people, places, things, or abstract concepts (common noun), or to name a particular one of these (proper noun). We use the following distributional test frames to validate if a word is a noun.

NN.1: It can perform as the subject of a verb: ____ VV AV, *and*

NN.2: It can perform as the object of a verb: NN VV ____ AV, *and*

NN.3: It can perform as the complement of a preposition: NN VV PS ____ AV, *and*

NN.4: It can be modified by a classifier and an adjective: ____ CL AJ.

Here the underline ____ is a placeholder for a word to be tested, and each pair of parentheses denote an optional part in the test frames. If any word passes *all* of these test frames, it is said to be a noun.

For example, สุนัข [sùnák] *dog* is a noun because it passes the following test frames.

Table 2.1: 16 POS tags of LST20

Tags	Names	Descriptions
AJ	Adjective	A word naming an attribute, added to or grammatically related to a noun to modify or describe it
AV	Adverb	A word that modifies or qualifies an adjective, verb, or other adverb or a word group, expressing a relation of place, time, circumstance, manner, cause, degree etc.
AX	Auxiliary	A word used in forming the tenses, aspects, moods, and voices of the verbs or used in expressing necessity or possiblity
CC	Connector	A word used to connect clauses or sentences or to coordinate words in the same clause (conjunction), and a word that refers to an expressed or implied antecedent and attaches a subordinate clause to it (relative pronoun)
CL	Classifier	A word that indicates the semantic class or measurement unit to which a noun or an action belongs
FX	Prefix	A word placed before a noun, a noun phrase, a verb, or a verb phrase to adjust or qualify its meaning
IJ	Interjection	A word used for exclamation
NG	Negator	A word expressing negation
NN	Noun	A word used to identify any of a class of people, places, things, or abstract concepts (common noun), or to name a particular one of these (proper noun)
NU	Number	An arithmetical value expressed by a word, symbol, or figure, representing a particular quantity and used in counting and calculations and for showing an order in the series or for identification
PA	Particle	A word used with a phrase or a sentence used for linguistic nuance e.g. politeness, intention, belief, and question
PR	Pronoun	A word that refers either to a noun phrase or to an element in the discourse
PS	Preposition	A word governing a noun phrase or pronoun and expressing a relation to another word or element in the clause
PU	Punctuation	A mark used in writing to separate sentences and their elements and to clarify meaning
VV	Verb	A word used to describe an action, state, or occurrence, and forming the main part of the predicate of a sentence
XX	Others	A word having an ambiguous grammatical function or belonging to an unknown category

(11) a. sùnák/NN ʋîŋ tɕú:t
dog run blazingly
‘The dog runs blazingly.’

b. mæ̂: ti: sùnák/NN ʔì:k
mother hit dog again
‘Mother hits the dog again.’

c. màt kràdò:t tɕà:k sùnák/NN ʔì:k
flea jump from dog again
‘The fleas jump from the dog again.’

d. sùnák/NN tua tɔ̀:paɪ
dog CL next
‘the next dog’

Verb (VV) is a word used to describe an action, state, or occurrence, and forming the main part of the predicate of a sentence. We employ the following distributional test frames to validate if a word is a verb.

VV.1: It takes a subject: NN [$_{\text{VP}}$ AX ___] AV, *or*

VV.2: It takes either an object or a noun complement: [$_{\text{VP}}$ AX ___ NN] AV, *or*

VV.3: It takes direct and indirect objects: [$_{\text{VP}}$ AX ___ NN$_{\text{DO}}$ NN$_{\text{IO}}$] AV, *or*

VV.4: It takes a topic and a property: NN$_{\text{T}}$ [$_{\text{VP}}$ AX NN$_{\text{P}}$ ___ (NN)] AV, *or*

VV.5: It requires a complementing verb phrase after it: NN [$_{\text{VP}}$ ___ VV (NN)] AV.

VV.6: *And* it is the complement of a relative pronoun: NN VV NN CC VP.

Note that the test frames VV.1 to VV.5 describe five kinds of verbs: intransitive verb, transitive verb, ditransitive verb, incorporative verb, and linking verb, respectively. The test frame VV.6 checks if the word can be used as the complement of a relative pronoun. If any word passes *any* of VV.1-VV.5 and it also passes VV.6, it is said to be a verb.

For example, บิน [bin] *fly*, กิน [kin] *eat*, ให้ [hâi] *give*, คล้าย [k^{h}lá:ɪ] *be similar*, กรุณา [kàrúna:] *be kind*, and อ้วน [ʔuân] *be plump* are verbs because they pass at least one of test frames VV.1-VV.5 and also passes VV.6.

(12) a. nók [$_{\text{VP}}$ tɕà bin/VV] næ̂:.næ̂:
bird FUT fly surely
‘The bird will fly surely.’ (VV.1)

b. p^{h}î: tɕàp nók t^{h}î: [$_{\text{VP}}$ tɕà bin/VV]
older brother catch bird RELPRO FUT fly
‘My younger brother catches the bird that will fly away.’ (VV.6)

(13) a. [$_{\text{VP}}$ tɕà kin/VV k^{h}â:ʊ] næ̂:.næ̂:
FUT eat rice surely
‘I will eat rice surely.’ (VV.2)

b. p^{h}î: tɕàp nók t^{h}î: [$_{\text{VP}}$ tɕà kin/VV k^{h}â:ʊ]
older brother catch bird RELPRO FUT eat rice
‘My older brother catches birds that would eat rice.’ (VV.6)

(14) a. [$_{\text{VP}}$ kamlaŋ hâɪ/VV ŋən nɔ́:ŋ] næ̂:.næ̂:
CONT give money younger brother surely
‘I am giving my younger brother some money surely.’ (VV.3)

b. mæ̂: kliàt jǐŋ t^{h}î: [$_{\text{VP}}$ kamlaŋ hâɪ/VV ŋən nɔ́:ŋ]
mother hate woman RELPRO PROG give money younger brother
‘Mother hates the woman that is giving my brother some money.’ (VV.6)

(15) a. p^{h}î: [$_{VP}$ k^{h}ə:ɪ nâ:.ta: k^{h}lá:ɪ/VV p^{h}ɔ̂:] ma:.kɔ̀:n
older brother PAST face be similar father previously
'My older brother used to have a face similar to my father.' (VV.4)

b. mɛ̂: mi: p^{h}î: t^{h}î: [$_{VP}$ k^{h}ə:ɪ nâ:.ta: k^{h}lá:ɪ/VV p^{h}ɔ̂:]
mother have older brother RELPRO PAST face be similar father
'Mother has an older brother that had a face similar to her father.' (VV.6)

(16) a. nák-rian [$_{VP}$ kàrúna:/VV faŋ k^{h}ru:] di:.di:
NOMZ-study be kind listen teacher well
'Students, please listen to the teacher well.' (VV.5)

b. mɛ̂: tɕ^{h}ɔ̂:p nák-rian t^{h}î: [$_{VP}$ kàrúna:/VV faŋ k^{h}ru:]
mother like NOMZ-study RELPRO be kind listen teacher
'Mother likes the students that kindly listen to the teacher.' (VV.6)

(17) a. sùnák [$_{VP}$ k^{h}ə:ɪ ʔuân/VV] ma:.kɔ̀:n
dog PAST be plump previously
'The dog used to be plump.' (VV.1)

b. mɛ̂: mi: sùnák t^{h}î: [$_{VP}$ k^{h}ə:ɪ ʔuân/VV]
mother have dog RELPRO PAST be plump
'Mother has a dog that used to be plump.' (VV.6)

Note that อ้วน [ʔuân] *be plump* is considered a verb in Thai, although its equivalent is an adjective in English. This kind of verbs belong to a special class called *attributive verbs*, where they describe an attribute or a quality of the subject. Thai relative pronouns are omittable if the context is clear as shown in example 18.

(18) mɛ̂: mi: [$_{NP}$ sùnák (t^{h}î:) ʔuân/VV]
mother have dog RELPRO be plump
'Mother has a plump dog.'

In this case, we still take into account อ้วน [ʔuân] *be plump* as a verb because it is the complement of an omitted relative pronoun. There are in fact only a handful of genuine Thai adjectives as we shall see below.

Adjective (AJ) is a word naming an attribute, added to or grammatically related to a noun to modify or describe it. Our distributional test frames for an adjective are as follows.

AJ.1: It shows an attribute or definiteness of the modified noun: NN (CL) ___ VV, *or*

AJ.2: It quantifies the modified noun that follows: ___ NN VV, *or*

AJ.3: It quantifies the number and classifier that follow: NN ___ NU CL VV, *or*

AJ.4: It quantifies the circumjacent number and classifier: NN NU ___ CL VV.

If it passes *any* of these test frames, it is said to be an adjective.

For example, ต่อไป [tɔ̀:paɪ] *next*, บาง [ba:ŋ] *some*, เกือบ [kɯə̀:p] *almost*, and กว่า [k^{w}à:] *more than* are adjectives because they pass one of these test frames.

(19) a. p^{h}ɛ̌:n ʔan tɔ̀:paɪ/AJ jɔ̂:tjiâm
plan CL next be excellent
'The next plan is excellent.' (AJ.1)

b. ba:ŋ/AJ ro:ŋ.rian p^{h}à:n
some school pass
'Some schools pass the test.' (AJ.2)

c. rót kɯə̀:p/AJ sìp k^{h}an siǎ
car almost ten CL be broken
'Almost ten cars are broken.' (AJ.3)

d. rót sìp k^{w}à:/AJ k^{h}an siă
car ten more than CL be broken
‘More than ten cars are broken.’ (AJ.4)

Adverb (AV) is a word that modifies or qualifies an adjective, verb, or other adverb or a word group, expressing a relation of place, time, circumstance, manner, cause, degree etc. The following are the distributional test frames for an adverb.

AV.1: It modifies or qualifies the preceding verb phrase: NN VV (NN) ____, *or*

AV.2: It modifies the succeeding sentence, making it a question: ____ NN VV NN, *or*

AV.3: It qualifies the succeeding sentence (e.g. *in fact*): ____ NN VV NN, *or*

AV.4: It resembles a verb that qualifies the preceding verb with direction (e.g. ไป [paɪ] *go*, มา [ma:] *come*, ขึ้น [k^{h}ɯ̂n] *ascend*, and ลง [loŋ] *descend*), motion (e.g. เข้า [k^{h}âʊ] *enter*, ออก [ʔɔ̀:k] *exit*, เร็ว [reʊ] *be fast*, and ช้า [tɕ^{h}á:] *be slow*), acceleration (e.g. เข้า [k^{h}âʊ] *hurry up*), anticipation (e.g. ดู [du:] *look forward* and ออก [ʔɔ̀:k] *expect*), asking (e.g. ไว้ [ʋáɪ] *continue* and เสีย [siă] *lose*), disappointment and disagreement (e.g. เสีย [siă] *lose*), decision (e.g. เสีย [siă] *lose*), and causing (e.g. ให้ [hâɪ] *cause*): NN VV NN ____.

If it passes *any* of these test frames, it is said to be an adverb.

For example, ซ่ก [sôk] *soaking*, ทำไม [t^{h}ammaɪ] *why*, ที่จริง t^{h}î:tɕiŋ *in fact*, and เข้า [k^{h}âʊ] *hurry up* are adverbs because they pass one of these test frames.

(20) a. sɯə̂: piàk sôk/AV
shirt wet soaking
‘The shirt is soaking wet.’ (AV.1)

b. t^{h}ammaɪ/AV sɯə̂: lə́ sǐ:
why shirt be stained color
‘Why is the shirt stained with colors?’ (AV.2)

c. t^{h}î:tɕiŋ/AV p^{h}ɔ̂: mi: ŋən
in fact father have money
‘In fact, father has some money.’ (AV.3)

d. nák-rian t^{h}am ka:n.bâ:n k^{h}âʊ/AV
NOMZ-study do homework hurriedly
‘Students, do your homework hurriedly!’ (AV.4)

2.2 Function Words

Function words are divided into 12 categories: auxiliary, connector, classifier, prefix, interjection, negator, number, particle, pronoun, preposition, punctuation, and others.

Auxiliary (AX) is a word used in forming the tenses, aspects, moods, and voices of the verbs or used in expressing necessity or possiblity. Table 2.2 lists some auxiliary words found in LST20 Corpus. Among those, the passive and causative voices are expressed by specific constructions in examples 21 and 22, respectively.

(21) a. nák-rian t^{h}ù:k/AX k^{h}ru: t^{h}am.t^{h}ô:t
NOMZ-study PASS teacher punish
‘The student was punished by the teacher.’

b. nák-rian t^{h}ù:k/AX k^{h}ru: ríp ka:tu:n
NOMZ-study PASS teacher confiscate comic book
‘The comic book was confiscated from the student by the teacher.’

(22) a. k^{h}ru: hâɪ/AX nák-rian ʔà:n năŋsɯ̌:
teacher CAUSE NOMZ-study read book
‘The teacher asks the students to read the book.’

Table 2.2: List of some auxiliary words found in LST20 Corpus

Auxiliary (AX)	**Tense**	**Aspect**	**Mood**	**Voice**
กำลัง [kamlaŋ]		continuous		
คง [k^{h}oŋ]			hypothetical	
ควร [k^{h}uan]			imperative	
ค่อย [k^{h}ɔ̂ɪ]			cohortative	
เคย [k^{h}əːɪ]	past	habitual		
จะ [tɕà]	future			
จง [tɕoŋ]			imperative	
จวน [tɕuan]	near-future			
ได้ [dâɪ]		perfective		
ต้อง [tɔ̂ŋ]			imperative	
น่า [nâː]			potential	
ถูก [t^{h}ùːk]				passive
โดน [doːn]				passive
เพิ่ง [p^{h}ə̂ŋ]		perfective		
มัก [mák]		habitual		
ยัก [ják]			counterfactual	
ยัง [jaŋ]		perfective		
ย่อม [jôm]		habitual		
แล้ว [lǽːʊ]	past			
ไว้ [ʋáɪ]		continuous	imperative	
เสร็จ [sèt]		perfective		
ให้ [hâɪ]				causative
ทำให้ [t^{h}amhâɪ]				causative
อยู่ [jùː]		continuous		
อยู่แล้ว [jùːlǽʊ]		optative		

b. k^{h}ruː bɔ̀ːk nák-rian hâɪ/AX ʔàːn năŋsɯ̆ː
teacher tell NOMZ-study CAUSE read book
‘The teacher tells the students to read the book.’

Connector (CC) is a word used to connect clauses or sentences or to coordinate words in the same clause (conjunction), and a word that refers to an expressed or implied antecedent and attaches a subordinate clause to it (relative pronoun). There are three kinds of Thai connectors as follows.

1. **General conjunction:** Connectors of this kind conjoin more than one constituent of the same types, forming a coordinate structure. They are further divided into three subtypes: single conjunctions (e.g. และ [lǽ] *and*, ก็ [kɔ̂ː] *also*), correlative conjunctions (e.g. ถ้า…ก็ [t^{h}âː kɔ̂ː] *if…then*, เพราะ…เลย [p^{h}rɔ́ ləːɪ] *because…so*), and subordinate conjunctions (e.g. เช่น [tɕ^{h}ên] *for example*, เพราะ [p^{h}rɔ́] *because*).

2. **Cohesive marker:** Connectors of this kind conjoin two complete sentences, forming a discourse relationship. Some cohesive markers include แต่ทว่า [tɛ̀ːt^{h}áʋâː] *nevertheless*, ในที่สุด [naɪt^{h}îːsùt] *finally*, and อย่างไรก็ตาม [jàːŋraɪkɔ̂ːtaːm] *however*.

3. **Relative pronoun:** Connectors of this kind modifies the preceding noun phrase or sentence with a subordinate clause. Some relative pronouns include ซึ่ง [sɯ̂ŋ] *that/which*, ที่ [t^{h}îː] *that/which*, and ผู้ [p^{h}ûː] *who/whom*.

Note that more than one connector are allowed to occur in one sentence. For example, three connectors occur in this sentence.

(23) sɯ̂ŋ/CC k^{h}ăʊ t^{h}ùːk tɕàp lăːɪ k^{h}ráŋ tɛ̀ː/CC kɔ̂ː/CC mâɪ k^{h}èt
RELPRO he PASS arrest many time but still NEG be terrified
‘…which he was arrested many times, but he is still not terrified.’

The distinction between connectors and prepositions is not always clear due to homographs. One prominent feature that discerns them is the use of negator. For example, ระหว่าง [ráʋàːŋ] *while* is either a preposition or a connector, depending on the context. In example 24, it is considered a connector because it connects two sentences, therefore licensing the use of negator.

(24) a. p^{h}ɔ̂ː ʋaːŋ.p^{h}æ̆ːn t^{h}iâʊ ráʋàːŋ/CC ráppràt^{h}aːn aːhăːn jen
father plan travel while eat meal evening
'Father is planning his trip while he is having the dinner.'

b. p^{h}ɔ̂ː ʋaːŋ.p^{h}æ̆ːn t^{h}iâʊ ráʋàːŋ/CC mâɪ ráppràt^{h}aːn aːhăːn jen
father plan travel while NEG eat meal evening
'Father is planning his trip while he is not having the dinner.'

It is, on the other hand, considered a preposition in example 25, because it connects a sentence and a noun phrase, disallowing the use of negator.

(25) a. p^{h}ɔ̂ː ʋaːŋ.p^{h}æ̆ːn t^{h}iâʊ ráʋàːŋ/PS ʋeːlaː aːhăːn jen
father plan travel while time meal evening
'Father plans his trip during the dinner.'

b. * p^{h}ɔ̂ː ʋaːŋ.p^{h}æ̆ːn t^{h}iâʊ ráʋàːŋ/PS mâɪ ʋeːlaː aːhăːn jen
father plan travel while NEG time meal evening
—

Classifier (CL) is a word that indicates the semantic class or measurement unit to which a noun or an action belongs. The classifiers are divided into four subtypes: unit classifier (e.g. ตัว [tua] *body*, คัน k^{h}an *car*), collective classifier (e.g. โหล [lŏː] *dozen*, เครือ [k^{h}rɯəː] *vine*), measurement classifier (e.g. เมตร [méːt] *meter*, หลา [lăː] *yard*), and frequency classifier (e.g. ครั้ง [k^{h}ráŋ] *time*, ฟอด [fɔ̂ːt] *kissing time*).

Classifiers are used for counting and specifying a noun or an action. Example 26 illustrates how unit classifier tua *body* is used to form adjectival phrases for specifying the core noun and counting it, respectively. Example 27 shows two usages of collective classifiers: ฝูง [fŭːŋ] *swarm of bees* preceding the core noun and โขลง [k^{h}lŏːŋ] *herd of elephants* succeeding it, respectively. In example 28, frequency classifiers โครม [k^{h}roːm] *crashing time* and ครั้ง [k^{h}ráŋ] *time* are used to specify the manner and count the frequency of the action, respectively.

(26) miː sùnák [$_{\text{ADJP}}$ tua/CL jài] [$_{\text{ADJP}}$ săːm tua/CL]
EXIST dog CL.ANIMAL big three CL.ANIMAL
'There are three big dogs.'

(27) [$_{\text{NP}}$ fŭːŋ/CL p^{h}ûŋ] tɕoːmtiː tɕ^{h}áːŋ.pàː [$_{\text{ADJP}}$ t^{h}áŋ k^{h}lŏːŋ/CL]
COL.SWARM bee attack wild elephant entire COL.HERD
'A swarm of bees attack the entire herd of wild elephants.'

(28) troŋ.níː rót.faɪ k^{h}əːɪ tɕ^{h}on [$_{\text{ADVP}}$ k^{h}roːm/CL jài] [$_{\text{ADVP}}$ săːm k^{h}ráŋ/CL]
here train PAST crash CL.CRASH big three CL.TIME
'The trains loudly crashed here three times.'

Prefix (FX) is a word placed before a noun, a noun phrase, a verb, or a verb phrase to adjust or qualify its meaning. Prefixes are divided into two subtypes: inflectional prefix and derivational prefix. Inflectional prefixes include: nominalizers (การ [kaːn] *action*, ความ [k^{hw}aːm] *abstract concept*, ผู้ [p^{h}ûː] *person*, ชาว [tɕ^{h}aːʊ] *citizen*, and นัก [nák] *professional*), adjectivizers (น่า [nâː] *likely*), adverbializers (โดย [doːɪ] *with*, and อย่าง [jàːŋ] *fashion*), and courteous verbalizer ทรง [soŋ]. Derivational prefixes include การ [kaːn] *action*, ชาว [tɕ^{h}aːʊ] *citizen*, and นัก [nák] *professional*.

Note that multiple prefixes may be used to form a complex constituent. In example 29, adjectivizer น่า [nâː] *likely* combines with รัก [rák] *love*, forming น่ารัก [nâː.rák] *cute*. Then nominalizer ความ [k^{hw}aːm] combines with น่ารัก [nâːrák], forming ความน่ารัก [k^{hw}aːm.nâː.rák] *cuteness*. Example 30 shows how adverbializer อย่าง [jàːŋ] combines with verb phrase มี ชั้นเชิง [miː tɕ^{h}ántɕ^{h}əːŋ] *have tactics*, forming an adverbial phrase modifying verb เต้นรำ [tên.ram] *dance*. Then nominalizer การ [kaːn] combines with such verb phrase to form a noun phrase.

(29) [$_{\text{NP}}$ k^{hw}aːm/FX [$_{\text{ADJP}}$ nâː/FX rák]] k^{h}ɔ̌ːŋ t^{h}əː tɕ^{h}âːŋ sàdùt.taː
NOMZ ADJZ love of 3RD.SING.FEM quite be eye-catching
'Her cuteness is quite eye-catching.'

(30) k^{h}ruː sɔ̌ːn [$_{NP}$ kaːn/FX [$_{VP}$ tên.ram [$_{ADVP}$ jàːŋ/FX [$_{VP}$ miː tɕ^{h}án.tɕ^{h}əːŋ]]]]
teacher teach NOMZ dance ADVZ have tactics
'The teacher teaches dancing with tactics.'

Interjection (IJ) is a word used for exclamation. Words of this category express an emotion such as pain (อูย [ʔuːɪ] *ouch!*), joy (ไชโย [tɕ^{h}aɪjoː] *hurrah!*), surprise (โอ้โห [ʔôːhǒː] *wow!*), shock (ว้าย [ʋáːɪ] *gosh!*), disappointment (อ้าว [ʔâːʊ] *oh!*), and regret (โถ่เอ๊ย [t^{h}òːʔə́ːɪ] *oh no!*).

Negator (NG) is a word expressing negation. For example, example 31 shows that negator ไม่ [mâɪ] can occur before a verb, while negator ก็หาไม่ [kɔ̂ː.hǎː.mâɪ] occurs after a verb. However, correlative negators หา…ไม่ [hǎː mâɪ] is also used in Classical Thai (circa 15th Century), as shown in example 32.

(31) a. mæ̂ː mâɪ/NG jùː bâːn
mother NEG stay home
'Mother is not home.'

b. nɔ̂ːŋ dəːn mâɪ/NG ráʋaŋ rót
younger brother walk NEG be aware car
'My younger brother walks unaware of the cars.'

c. k^{h}aʊ tɕà sǎmnɯ́k kɔ̂ː.hǎː.mâɪ/NG
3RD.SING.MASC FUT regret NEG
'He does not regret at all.'

(32) ʔɔːtɕâʊ hǎː/NG tɔ̂ŋ paɪ kiam rɯəː hâɪ k^{h}âː mâɪ/NG
2ND.SING NEG should go prepare row boat for 1ST.SING NEG
'Thou dost not have to prepare the row boat for me.'

Number (NU) is an arithmetical value expressed by a word, symbol, or figure, representing a particular quantity and used in counting and calculations and for showing an order in the series or for identification. For any cardinal number, it can be written in any numeral format, e.g. 123.45, or spelt out as words, e.g. สามสิบสอง [sǎːm sìp sɔ̌ːŋ] *thirty two* (lit. *three ten two*). For any ordinal number, it can be written in any numeral format or spelt out as order words, e.g. แรก [ræ̂ːk] *first*, กลาง [klaːŋ] *middle*, and สุดท้าย [sùt.t^{h}áːɪ] *last*. Order markers such as ที่ [t^{h}îː], if apparent, will be annotated as a preposition. For example:

(33) rót k^{h}ɔ̌ːŋ tɕ^{h}ǎn k^{h}âʊ pen t^{h}îː/PS sùt.t^{h}áːɪ/NU
car of 1ST.SING arrive be at last
'My car arrives in the last place.'

Particle (PA) is a word used with a phrase or a sentence used for linguistic nuance e.g. politeness, intention, belief, and question. Politeness particles include ครับ [k^{h}ráp] *masculine politeness*, ค่ะ [k^{h}â] *feminine politeness*, and วะ [ʋá] *impoliteness*. Intention particles include นะ [ná] *invitation* and *confirmation*, เนี่ย [niâ] *emphasis*, and เถิด [t^{h}ə̀ːt] *asking*. Belief particles include สินะ [sì.ná] *likelihood*, ซิ [sí] *certainty*, and มั้ง [máŋ] *uncertainty*. Question particles include ใช่ไหม [tɕ^{h}âɪ.mǎɪ] *yes/no question*, ยัง [jaŋ] *yet*, and หรือเปล่า [rɯ̌ː.plàːʊ] *yes/no question*.

It is sometimes challenging to distinguish between particles and adverbs, because both of them modify sentences. One prominent trait of particles is they can also modify other kinds of phrases, such as noun phrases and preposition phrases, while the adverbs cannot. For example, particle นะ [ná] modifies both a sentence and a noun phrase in example 34. Meanwhile, แล้ว [lǽːʊ] is considered an auxiliary, because it modifies only sentences but cannot modify any noun phrases as shown in example 35.

(34) a. raʊ paɪ p^{h}átt^{h}ájaː kan ná/PA
1ST.PLU go Pattaya together INVITE
'Let's go to Pattaya together.'

b. p^{h}átt^{h}ájaː ná/PA
Pattaya CONFIRM
'(Let's go to) Pattaya then.'

(35) a. raʊ paɪ p^{h}átt^{h}ájaː kan lǽːʊ/AX
1ST.PLU go Pattaya together PAST
'We went to Pattaya already.'

b. * pʰáttʰája: lǽːʊ/AX
Pattaya PAST
—

Pronoun (PR) is a word that refers either to a noun phrase or to an element in the discourse. The pronouns are divided into four subtypes: personal pronouns (e.g. กระผม [kràpʰŏm] 1ST.SING.MASC.POLITE, มึง [mɯŋ] 2ND.IMPOLITE), demonstrative pronouns (e.g. นี่ [nîː] *this/these*, นั่น [nân] *that/those*), interrogative and indefinite pronouns (e.g. อะไร [ʔàraɪ] *what*, ใครๆ [kʰraɪ.kʰraɪ] *everyone*), and partitive pronouns (e.g. กัน [kan] *each other*, ต่าง [tàːŋ] *each*).

Note that kinship terms and professional terms can be used to refer to persons as if they are pronouns. For example, นักเรียน [nák-rian] *student* refers to the listener who is a student in the following sentence.

(36) nák-rian tɕà paɪ năɪ kʰá
NOMZ-study FUT go where POLITE
'Where are you going, student?'

However, they will rather be annotated as nouns than as pronouns, because they pass all test frames of nouns NN.1-NN.4. In contrast, pronouns do not pass test frame NN.4; for instance:

(37) a. nák-rian/NN kʰon tɔ̀ːpaɪ
NOMZ-study CL.PERS next
'The next student'

b. * kʰăʊ/PR kʰon tɔ̀ːpaɪ
3RD.SING.MASC CL.PERS next
—

Preposition (PS) is a word governing a noun phrase or pronoun and expressing a relation to another word or element in the clause. Prepositions are divided into four categories: location (e.g. บน [bon] *on*, กลาง [klaːŋ] *middle*), comparison (e.g. กว่า [kʷàː] *than*, เท่า [tʰâʊ] *as*, อย่างกับ [jàːŋ.kàp] *like*), instrument (e.g. ด้วย [duâɪ] *with*, ทาง [tʰaːŋ] *by*), and exemplification (e.g. เช่น [tɕʰên] *for example*, ได้แก่ [dâɪkæ̀ː] *namely*).

Punctuation (PU) is a mark used in writing to separate sentences and their elements and to clarify meaning. This category includes all English and Thai punctuation marks, e.g. exclamation mark, question mark, ๆ *mai yamok* (reduplication mark), ฯ *paiyal noi* (abbreviation), and ฯลฯ *paiyal yai* (et cetera).

Others (XX) is a word having an ambiguous grammatical function or belonging to an unknown category. We annotate the remaining ambiguities taking place in our corpus for further studies.

Chapter 3

Named Entity Annotation Guideline

In the LST20 annotation guideline, named entities are annotated in the corpus. Listed in table 3.1, ten types of named entities are chosen because they are beneficial for general NLP applications, such as sentiment analysis, information extraction, automatic summarization, and social media monitoring.

Our annotation format of named entities complies with the `BIEO` tagging convention. The boundary of each named entity is annotated with the prefixes `B_`, `I_`, and `E_`, denoting the beginning, the intermediate, and the ending, respectively, while the tag `O` denotes the outside of a named entity. We assume that each sentence is annotated with word boundaries and POS tags with respect to our guideline. That means each word is delimited with a vertical bar '|' and POS tags are annotated to each word separated by a forward slash '/'. For example,

(38) อย่างไรก็ตาม/CC | บริษัท/NN | ⊔/PU | เอบีซี/NN | ⊔/PU | จำกัด/VV | จะ/AX | รีบ/VV | แจ้ง/VV | เตือน/VV | ลูกค้า/NN | ถึง/PS | ปัญหา/NN | ที่/CC | เกิด/VV | ขึ้น/AV | ทันที/AV |

Named entities will be annotated to each word separated by a forward slash '/'. Therefore the above sentence will be annotated with named entities as follows.

(39) อย่างไรก็ตาม/CC/O | บริษัท/NN/B_ORG | ⊔/PU/I_ORG | เอบีซี/NN/I_ORG | ⊔/PU/I_ORG | จำกัด/VV/E_ORG | จะ/AX/O | รีบ/VV/O | แจ้ง/VV/O | เตือน/VV/O | ลูกค้า/NN/O | ถึง/PS/O | ปัญหา/NN/O | ที่/CC/O | เกิด/VV/O | ขึ้น/AV/O | ทันที/AV/O |

In the above example, the annotated named entity is an organization's name, which is annotated with tag `ORG`.

The named entity tags are generally divided into three groups: personal entity, collective entity, and referential entity. Personal entities include person name, title, and designator. Collective entities include organization, location, and brand name. Finally, referential entities include date and time, measurement unit, number, and terminology.

3.1 Personal Entity

Personal entity is a text chunk that refers to or specifies a person name or a family name. It can be decomposed into three components: person name, title, and designator. If a personal entity consists of more than one component, each of them will be tagged separately.

Person name (`PER`): This part is the core of the personal entity and does not include a title, a profession, and an order of family members. For example, consider the personal entity 'นายกรัฐมนตรี ดร. มหาธีร์ บิน โมฮัมหมัด' *Prime Minister Doctor Mahathir bin Mohamad*.

(40) naːjók.rátt^{h}àmontriː dóktɔ̂ː máhǎːt^{h}iː bin moːhammàt
prime minister doctor Mahathir bin Mohammad
'Prime Minister Doctor Mahathir bin Mohamad'

Only the core มหาธีร์ บิน โมฮัมหมัด *Mahathir bin Mohamad* will be annotated with the `PER` tag.

(41) นายกรัฐมนตรี | ดร. | มหาธีร์/B_PER | บิน/I_PER | โมฮัมหมัด/E_PER |

Title (`TTL`): This part is a kinship term (e.g. พี่ [p^{h}îː] *older brother/sister*, น้อง [nɔ́ːŋ] *younger brother/sister*) or a social status (e.g. นาย [naːɪ] *Mister*, ดร. [dóktɔ̂ː] *Doctor*) of a person entity. Only the social status ดร. *Doctor* will be annotated with the `TTL` tag.

Table 3.1: Named entity tagset

Tags	Names	Descriptions
TTL	Title	Family relationship, social relationship, and permanent title
DES	Designation	Position and professional title
PER	Person	Name of a person or family
ORG	Organization	Name of organization, office, or company
LOC	Location	Name of a land according to geo-political borders (e.g. city, province, country, international regions, and oceans)
DTM	Date and time	Time or a specific period of time
BRN	Brand	Name of brand, product, and trademarks
MEA	Measurement	Measurement unit and quantity of things
NUM	Number	Number specifying the quantity as a part of measurement unit
TRM	Terminology	Domain-specific words

(42) นายกรัฐมนตรี | ดร./B_TTL | มหาธีร์ | บิน | โมฮัมหมัด |

Designator (DES): This part indicates a professional title (e.g. อาจารย์ [ʔaːtɕaːn] *teacher*, พระ [p^{h}rá] *monk*), a political position (e.g. ประธานาธิบดี [pràt^{h}aːnaːt^{h}íbadiː] *President*, นายกรัฐมนตรี [naːjók.rátt^{h}àmontriː] *Prime Minister*), a rewarded title (e.g. แชมเปี้ยน [tɕ^{h}ǽmpiân] *champion*, เดอะสตาร์ [də̀.staː] *The Star*), or an academic title (e.g. ศาสตราจารย์ [sàːttraːtɕaːn] *Professor*, สารวัตร [sǎːráʋát] *Police Inspector*). Only the political position นายกรัฐมนตรี *Prime Minister* will be annotated with the DES tag.

(43) นายกรัฐมนตรี/B_DES | ดร. | มหาธีร์ | บิน | โมฮัมหมัด |

3.2 Collective Entity

Collective entity is a text chunk that refers to an organization of people, to a location in which people live, or to a brand name indicating an organization.

Organization (ORG): This kind of collective entities refer to an organization in which people work together, such as government, parties, councils, offices, unions, companies, sport teams, and coalitional organizations. For example, consider the text 'สำนักงาน ปลัดกระทรวง ⊔ กระทรวง วิทยาศาสตร์ และ เทคโนโลยี' *Office of Permanent Secretary, Ministry of Science and Technology*.

(44) sǎmnák.ŋaːn pàlàt.kràsuaŋ kràsuaŋ ʋítt^{h}ájaːsàːt lǽ t^{h}éknoːloːjiː
office permanent secretary ministry science and technology
'Office of Permanent Secretary, Ministry of Science and Technology'

This text consists of two organization names: one is an office, and the other one is a ministry that governs the office. However, they will be annotated separately as two named entities.

(45) สำนักงาน/B_ORG | ปลัดกระทรวง/E_ORG | ⊔ | กระทรวง/B_ORG | วิทยาศาสตร์/I_ORG | และ/I_ORG | เทคโนโลยี/E_ORG |

Location (LOC): This kind of collective entities specify a geographical location, a construction, a facility, or a natural terrain in which people live or work in, such as continents, cities, house addresses, buildings, bridges, and waterfalls. For example, consider the text 'ที่ โรงแรม อินโดจีน ⊔ อำเภอ อรัญประเทศ ⊔ จังหวัด สระแก้ว' *at Indo-China Hotel, Aranyaprathet County, Sakaew Province*.

(46) t^{h}îː roːŋ.ræːm ʔindotɕiːn ʔamp^{h}əː ʔàranjápràt^{h}êt tɕaŋʋàt sàkǽːʊ
at hotel Indo-China county Aranyaprathet province Sakaew
'at Indo-China Hotel, Aranyaprathet County, Sakaew Province'

This text consists of three location names: one is a hotel, the next one is a county, and the last one is a province. Each of them will be annotated separately as three named entities.

(47) ที่ | โรงแรม/B_LOC | อินโดจีน/E_LOC | ␣ | อำเภอ/B_LOC | อรัญประเทศ/E_LOC | ␣ | จังหวัด/B_LOC | สระแก้ว/E_LOC |

Brand name (BRN): This kind of collective entities refer to brands, products, or trademarks. For example, consider the text 'ไก่ ทอด เคเอฟซี' *KFC fried chicken*.

(48) kàɪ tʰɔ̂ːt kʰeɪ.ʔéf.siː
chicken fry K-F-C
'KFC fried chicken'

In this text, we annotate only the brand name in the text, resulting in the following annotation.

(49) ไก่ | ทอด | เคเอฟซี/B_BRN |

The distinction between organization, location, and brand name is sometimes unclear. One prominent feature of the organization names is that they can perform some activities and take some effects as if they are a group of people, while the others are referred to as a position or a product, respectively. For example, these texts contain the same names 'ภาควิชา ภาษาศาสตร์' *Department of Linguistics*.

(50) a. ʔaːtɕaːn sɔ̌ːn tʰîː pʰâːk.ʋítɕʰaː pʰaːsǎːsàːt kʰráp
lecturer teach at department linguistics POLITE
'I (a lecturer) work for Department of Linguistics.'

b. pʰâːk.ʋítɕʰaː pʰaːsǎːsàːt jùː tʰîː tɕʰán hòk
department linguistics be at floor six
'Department of Linguistics is on the sixth floor.'

Such name in example 50a is considered as an organization, in which a group of lecturers work together. On the other hand, the name in example 50b is rather taken into account as a location. Therefore, we annotate such names with ORG and LOC, respectively.

(51) a. อาจารย์ | สอน | ที่ | ภาควิชา/B_ORG | ภาษาศาสตร์/E_ORG | ครับ

b. ภาควิชา/B_LOC | ภาษาศาสตร์/E_LOC | อยู่ | ที่ | ชั้น | หก |

3.3 Referential Entity

Referential entity is a text chunk that refers to date and time, to measurement unit, to number, or to terminology.

Date and time (DTM): This kind of entities refer to a specific date and time and a duration, such as seasons, public holidays, festivals, and names of ages. For example, consider the following text 'โรงเรียน เปิด ใน เดือน พฤษภาคม ของ ทุก ปี' *School starts in May of every year*.

(52) roːŋ.rian pə̀ːt naɪ dɯəːn pʰrɯ́tsàpʰaːkʰom kʰɔ̌ːŋ tʰúk piː
school open in month May of every year
'School starts in May of every year.'

In this case, we will annotate the specific time with the DTM tag.

(53) โรงเรียน | เปิด | ใน | เดือน/B_DTM | พฤษภาคม/I_DTM | ของ/I_DTM | ทุก/I_DTM | ปี/E_DTM

Note that the DTM tag is very specific to a particular point or duration of time. If a reference of time or duration is indeterminate, we will not annotate it with this tag. For example, these references of time will not be annotated with the DTM tag.

(54) a. pʰǒm jùː piː sɔ̌ːŋ kʰráp
1ST.SING.MASC be year two POLITE
'I am in the second year.'

b. tɕəː kan tɔːn tʰiâŋ ná
meet RECIP at midday INVITE
'Let's meet each other at midday.'

Measurement unit (MEA): This kind of entities specify a measurement unit, a percentage, ratio, quantity, and capacity without any quantifier. The classifier must be a standard measurement unit, not any other general one. For example, consider the following text 'ไอโฟน SE ราคา เริ่มต้น ประมาณ 15,000 บาท' *The starting price of iPhone SE is approximately 15,000 Baht*.

(55) ʔaɪfoːn ʔésʔiː raːk^{h}aː rɤ̂ːmtôn pràmaːn nɯ̀ŋ.mɯ̀ːn.hâː.p^{h}an bàːt
iPhone SE price start approximately fifteen thousand Baht
'The starting price of iPhone SE is approximately 15,000 Baht.'

In this case, we will annotate the currency unit with the MEA tag. Note that the quantifier ประมาณ [pràmaːn] *approximately* is not included.

(56) ไอโฟน SE ราคา เริ่มต้น ประมาณ 15,000/B_MEA บาท/E_MEA

Number (NUM): This kind of entities refer to a number and a range without any quantifier, when the classifier is not a measurement unit. For example, consider the following text 'ปี นี้ มี นักศึกษา ประมาณ 3,000 คน' *There are approximately 3,000 students this year*.

(57) piː níː miː nák.sɯ̀ksǎː pràmaːn sǎːmp^{h}an k^{h}on
year this EXIST student approximately three thousand CL
'There are approximately 3,000 students this year.'

In this case, we annotate only the number 3,000 with the NUM tag. Note that the quantifier ประมาณ [pràmaːn] *approximately* and the classifier คน [k^{h}on] *person* are not annotated.

(58) ปี | นี้ | มี | นักศึกษา | ประมาณ | 3,000/B_NUM | คน |

Terminology (TRM): This kind of entities refer to domain-specific words, such as financial terms, scientific terms, and political terms. For example, consider the following text 'ไวรัส โควิด-19 แพร่ ระบาด ไป ทั่ว โลก' *COVID-19 has spread worldwide*.

(59) ʋaɪrás k^{h}oːʋìt sìpkâːʊ p^{h}rɛ̂ː rábàːt paɪ t^{h}uâː lôːk
virus COVID-19 propagate spread go through World
'COVID-19 has spread worldwide.'

In this case, we annotate only the terminology, not any other general terms, with the TRM tag. Note that the word ไวรัส [ʋaɪrás] *virus* is not annotated.

(60) ไวรัส | โควิด-19/B_TRM | แพร่ | ระบาด | ไป | ทั่ว | โลก |

Chapter 4

Clause Segmentation Guideline

In the LST20 Guideline, texts are divided into clauses. Our annotation format for clause boundaries follows the BIEO tagging convention. The boundary of each clause is annotated with B_CLS (beginning), I_CLS (intermediate), and E_CLS (ending), respectively. The outside of the clauses is annotated with the O tag. We assume that each text is annotated with word boundaries, POS tags, and named entities with respect to our guideline. That means each word is delimited with a verticle bar '|', while POS tags and named entities are annotated to each word separated by a forward slash '/'. For example,

(61) น.พ./NN/B_PER | จรัล/NN/E_PER | ␣ | กล่าว/VV/O | ต่อ/AV/O | ว่า/CC/O | ␣ | จาก/PS/O | การ/FX/O | สอบสวน/VV/O | โรค/NN/O | พบ/VV/O | ว่า/CC/O | ␣ | ผู้/NN/O | ที่/CC/O | เสีย/VV/O | ชีวิต/NN/O | ก่อนหน้า/PS/O | นี้/PR/O | ␣ | มี/VV/O | ประวัติ/NN/O | สัมผัส/VV/O | ไก่/NN/O | ที่/CC/O | ตาย/VV/O | ด้วย/PS/O | โรค/NN/B_TRM | ไข้หวัด/NN/I_TRM | นก/NN/E_TRM |
'Dr. Charan says the disease investigation shows that the deceased previously had contact with chickens infected with avian influenza.'

Clause boundaries will be annotated to each word separated by a forward slash '/'. Therefore, the above text will be annotated with clause boundaries as follows.

(62) น.พ./NN/B_PER/B_CLS | จรัล/NN/E_PER/I_CLS | ␣/PU/O/I_CLS | กล่าว/VV/O/I_CLS | ต่อ/AV/O/I_CLS | ว่า/CC/O/E_CLS | ␣ | จาก/PS/O/B_CLS | การ/FX/O/I_CLS | สอบสวน/ VV/O/I_CLS | โรค/NN/O/I_CLS | พบ/VV/O/I_CLS | ว่า/CC/O/E_CLS | ␣ | ผู้/NN/O/B_CLS | ที่/CC/O/I_CLS | เสีย/VV/O/I_CLS | ชีวิต/NN/O/I_CLS | ก่อนหน้า/PS/O/I_CLS | นี้/PR/O/ I_CLS | ␣/PU/O/I_CLS | มี/VV/O/I_CLS | ประวัติ/NN/O/I_CLS | สัมผัส/VV/O/I_CLS | ไก่/NN/O/E_CLS | ที่/CC/O/B_CLS | ตาย/VV/O/I_CLS | ด้วย/PS/O/I_CLS | โรค/NN/B_TRM/ I_CLS | ไข้หวัด/NN/I_TRM/I_CLS | นก/NN/E_TRM/E_CLS |
'Dr. Charan says the disease investigation shows that the deceased previously had contact with chickens infected with avian influenza.'

Note that the first word of each clause is underlined. White spaces are sometimes incorporated to a clause and, in this case, they will be annotated with the punctuation mark tag (PU).

Since there is no definite consensus for clause boundaries in Thai, the choice of clause segmentation is arbitrarily personal. In this paper, we define the notion of *clause* to be a part of the sentence that contains at least one verb. If a clause contains either an explicit subject and a predicate, or only a predicate part whose verb does not require any syntactic subject (e.g. มี [miː] *exist*), it is said to be an *independent clause*. Otherwise, if it does not contain any syntactic subject that the predicate part requires, it is then said to be a *dependent clause* (also known as *subordinate clause*). We also define the clause marker to be:

- **Subordinate connector:** e.g. ซึ่ง [sɯ̂ŋ] *that/which* (relative pronoun), ถ้า [t^{h}âː] *if*, and ว่า [ʋâː] *that* (subordinate conjunction),

- **Cohesive marker:** e.g. อย่างไรก็ตาม [jàːŋraikɔ̂ːtaːm] *however*, and นอกจากนี้ [nɔ̂ːktɕàːkníː] *in addition*,

- **List marker:** e.g. เช่น [tɕ^{h}ên] *for example*, ได้แก่ [dâɪkɛ̀ː] *namely*, and ตามลำดับ [taːm.lamdàp] *respectively*.

- **Particle:** e.g. ครับ [k^{h}ráp] *masculine politeness*, and นะ [ná] *invitation*, or

- **Question adverb:** e.g. อย่างไร [jàːŋraɪ] *how*, and ไหม [mǎɪ] *yes/no question*.

We allow any clause to be preceded and followed by one or more clause markers. For instance, clause markers are underlined in the following examples.

(63) a. naːɪ.p^{h}æ̂ːt tɕàran klàːʊ tɔ̀ː ʋâː/CC
doctor Charan say continue that
'Dr. Charan says that …'

b. t^{h}îː/CC taːɪ duâɪ rôːk k^{h}âɪ.ʋàt nók
that die with disease flu bird
'…that die of avian influenza'

c. nɔ̂ːktɕàːkníː/AV jaŋ miː ʔìːk lǎːɪ kɔːrániː
in addition still EXIST yet many case
'In addition, there are yet more cases …'

Clues for clause boundaries are all syntactic and computationally deterministic in most cases. The following clues are used to determine the beginning or the end of a clause.

Paragraph boundary: Any paragraph boundary marks the end of the clause and the beginning of the next one.

White space: If two adjacent text chunks, each containing verbs, are delimited by white spaces, and at least one clause marker occurs right before or next to the delimiter, then we can mark the separation of the clauses here. For instance, two clauses in example 64 are separated by a white space ⊔.

(64) a. จาก การ สืบสวน โรค พบ ว่า/CC ⊔ ผู้ ป่วย เคย สัมผัส ไก่ ติด เชื้อ
'From the disease investigation, it was found that patients had contact with infected chickens.'

b. tɕàk kaːn sɔ̀ːpsuǎn rôːk p^{h}óp ʋâː/CC
from NOMZ investigate disease find that
'From the disease investigation, it was found that …'

c. p^{h}ûː-puàɪ k^{h}əːɪ sǎmp^{h}àt kàɪ tìt tɕ^{h}ɯə́ː
NOMZ-be ill PAST touch chicken be infected germ
'…patients had contact with infected chickens.'

Clause marker: If a text chunk contains a subordinate connector or a relative pronoun, it will mark the beginning of the next clause. For example, consider the sentence 'ฉัน ไม่ ทราบ ว่า ทำไม เขา ไม่ แถลง ข่าว' *I do not know why he did not call a press conference*.

(65) [$_{\text{CLS}}$ tɕ^{h}ǎn mâɪ sâːp] [$_{\text{CLS}}$ ʋâː/CC t^{h}ammaɪ k^{h}ǎʊ mâɪ t^{h}àlæ̌ːŋ k^{h}àːʊ]
1ST.SING NEG know that why he NEG announce news
'I do not know why he did not call a press conference.'

Subordinate connector ว่า [ʋâː] *that* marks the beginning of the second clause, although there is no white space in the text chunk.

Chapter 5

Sentence Segmentation Guideline

In the LST20 Guideline, texts are also divided into sentences. The boundary of each sentence is annotated by appending an empty symbol '‖' after it. For example,

(66) เขา/PR/O/B_CLS | ก็/CC/O/I_CLS | ไม่/NG/O/I_CLS | ได้/AX/O/I_CLS | โทร/VV/O/I_CLS | มา/AV/O/I_CLS | คุย/VV/O/E_CLS | ␣ | ต่าง/AJ/O/B_CLS | คน/CL/O/I_CLS | ก็/CC/O/ I_CLS | ต่าง/AJ/O/I_CLS | อยู่/VV/O/I_CLS | กัน/AV/O/I_CLS | ไป/AV/O/E_CLS | ␣ | ดิฉัน/PR/O/B_CLS | คิด/VV/O/I_CLS | แล้ว/AV/O/I_CLS | ว่า/CC/O/E_CLS | ␣ | ควร/AX/O/ B_CLS | วางตัว/VV/O/I_CLS | อย่างไร/AV/O/I_CLS | และ/CC/O/I_CLS | ควร/AX/O/I_CLS | ทำ/VV/O/I_CLS | อะไร/PR/O/I_CLS | ต่อไป/AV/O/E_CLS | ␣ |
'He did not call me to settle the issue. We just stayed in our corners. I have considered where my position is and what my next move should be.'

Sentence boundaries are annotated by the empty symbol '‖'. Therefore, the above sentence will be annotated with sentence boundaries as follows.

(67) a. เขา/PR/O/B_CLS | ก็/CC/O/I_CLS | ไม่/NG/O/I_CLS | ได้/AX/O/I_CLS | โทร/VV/O/ I_CLS | มา/AV/O/I_CLS | คุย/VV/O/E_CLS
‖
'He did not call me to settle the issue.'

b. ต่าง/AJ/O/B_CLS | คน/CL/O/I_CLS | ก็/CC/O/I_CLS | ต่าง/AJ/O/I_CLS | อยู่/VV/O/ I_CLS | กัน/AV/O/I_CLS | ไป/AV/O/E_CLS
‖
'We just stayed in our corners.'

c. ดิฉัน/PR/O/ B_CLS | คิด/VV/O/I_CLS | แล้ว/AV/O/I_CLS | ว่า/CC/O/E_CLS | ␣ | ควร/ AX/O/B_CLS | วางตัว/VV/O/I_CLS | อย่างไร/AV/O/I_CLS | และ/CC/O/I_CLS | ควร/AX/ O/I_CLS | ทำ/VV/ O/I_CLS | อะไร/PR/O/I_CLS | ต่อไป/AV/O/E_CLS
‖
'I have considered where my position is and what my next move should be.'

Note that each sentence is stored as a separate line and the sentence boundaries are underlined.

Similar to the clause boundaries, there is no definite consensus for sentence boundaries in Thai and the choice for sentence segmentation is arbitrarily personal. In this paper, we believe that sentence boundaries are ambiguously marked with the white spaces, whose other usages of them are English's comma and stylistics. However, unlike the clause boundaries, some clues for sentence boundaries require semantic interpretation. The following clues are used to determine the beginning or the end of a sentence.

Paragraph boundary: Any paragraph boundary marks the end of the sentence.

Topic shift: If a clause starts with a cohesive marker (for example, อย่างไรก็ตาม [jàːŋraikɔ̂ːtaːm] *however*, นอกจากนี้ [nɔ̂ːktɕàːkníː] *in addition*), such marker indicates the beginning of the next sentence.

Subject shift: This criterion is mainly based on semantic interpretation. If two adjacent clauses do not share the same subjects (explicit or contextually implied), we mark the separation of the sentences here. Otherwise, we concatenate them into one sentence. For example, consider the following clauses.

(68) a. k^{h}ǎʊ kɔ̂ː mâɪ dâːɪ t^{h}roː maː k^{h}uɪ
he also NEG PERF call come talk
'He did not call me to settle the issue.'

b. tà:ŋ k^{h}on kɔ̂: tà:ŋ jù: kan paɪ
each person also each stay RECIP go
‘We just stayed in our corners.’

These clauses are segmented as separate sentences, because they do not share the same subjects (as underlined). Otherwise, if they share the same subjects, they will be concatenated as one sentence. For example, these clauses are concatenated to form a single sentence, because they share the same subjects.

(69) a. [tɕ^{h}ɯ́ə: ʔétɕ^{h}.hâ:.ʔen.nɯ̀ŋ]$_i$ pen tɕ^{h}àp^{h}ɔ́ naɪ sàt pì:k
germ H5N1 be only in animal wing
‘H5N1 spreads only among the avians …’

b. ϕ_i p^{h}ə̂ŋ rábà:t sù: k^{h}on mɯ̂ə: tôn pi:
just spread to human at beginning year
‘…and (it) just spread to humans in the beginning of this year.’

The subject in the first clause is referred to by a zero anaphora in the second clause.

Direct speech: The construction of direct speech consists of a reporting verb and a quote enclosed in a pair of parentheses. We will treat this construction as a large sentence in our guideline. For example, consider this sentence นายกรัฐมนตรี กล่าว ยืนยัน ว่า ⊔ “ ไม่ พบ ผู้ ป่วย ราย ใหม่ ” *The Prime Minister confirms that “zero new patients have been found”*. We will treat this entire chunk as a sentence despite its length.

(70) นายกรัฐมนตรี/NN/B_TTL/B_CLS | กล่าว/VV/O/I_CLS | ยืนยัน/VV/O/I_CLS | ว่า/CC/O/ E_CLS | ⊔ | "/PU/O/B_CLS | ไม่/NG/O/I_CLS | พบ/VV/O/I_CLS | ผู้/FX/O/I_CLS | ป่วย/ VV/O/I_CLS | ราย/CL/O/I_CLS | ใหม่/VV/O/I_CLS | "/PU/O/E_CLS ||

Indirect speech: The construction of indirect speech consists of a reporting verb, a subordinate conjunction, and one or more subordinate clauses. In our guideline, we treat the verb, the subordinate conjunction, and the first subordinate clauses, whose subjects are shared, as one sentence. The remaining subordinate clauses are annotated with sentence boundaries in the same fashion. For example, consider the following clauses. They will be concatenated to form a sentence, because the subordinate clauses share the same subjects.

(71) a. na:ɪ.p^{h}ǽ:t tɕàran klà:ʊ ʋâ:
doctor Charan say that
‘Doctor Charan says that …’

b. tɕ^{h}ɯ́ə: ʔétɕ^{h}.hâ:.ʔen.nɯ̀ŋ pen tɕ^{h}àp^{h}ɔ́ naɪ sàt pì:k
germ H5N1 be only in animal wing
‘H5N1 spreads only among the avians …’

c. p^{h}ə̂ŋ rábà:t sù: k^{h}on mɯ̂ə: tôn pi:
just spread to human at beginning year
‘…and it just spread to humans in the beginning of this year.’

Item list: Any clause that starts with a list marker will be combined to the previous clause to form a sentence. For example, consider the sentence ‘โรงงาน ของ เขา ผลิต เครื่อง ดื่ม หลาย อย่าง ⊔ เช่น ⊔ เบียร์ ⊔ น้ำ ดื่ม ⊔ ชา เขียว ⊔ ฯลฯ’ *His factory manufactures various kinds of drinks such as beers, drinking water, green tea, etc*.

(72) a. ro:ŋŋa:n k^{h}ɔ̌:ŋ k^{h}ǎʊ p^{h}àlìt k^{h}rɯ̂ə:ŋ dɯ̀:m lǎ:ɪ jà:ŋ
factory of 3RD.SING.MASC manufacture ware drink various kind
‘His factory manufactures various kinds of drinks …’

b. tɕ^{h}ên bia ná:m dɯ̀:m tɕ^{h}a: k^{h}iǎ:ʊ
for example beer water drink tea green
‘…for example, beers, drinking water, green tea, etc.’

These clauses are combined to form a sentence.

Particle: Since Thai particles always posit in the final position of the sentence, we can predetermine the sentence boundaries with them. For example, consider the following clauses.

(73) a. p^{h}rûŋníː tɕəː kan sìp moːŋ ná
tomorrow meet RECIP ten hours INVITE
‘Tomorrow let’s meet up at 10.00 hours.’

b. tɕà dâːɪ miː ʋeːlaː triam ʔèːkkàsǎːn
will ALLOW have time prepare document
‘We will have some time to prepare the documents.’

These clauses are treated as separate sentences, because the first clause ends with an invitation particle นะ [ná].

Chapter 6

Structure and Format

6.1 Genre Distribution

LST20 Corpus consists of 3,745 articles with the genre distribution illustrated in figure 6.1. The top-3 popular genres are politics, crime and accident, and economics, which is congruent with Thailand's political turmoil during that period of time.

6.2 Available Data Format

LST20 Corpus is available at `https://aiforthai.in.th` in the CoNLL-2003-style format. The latter is simply a tab-delimited text file containing four columns: word, POS tag, NE boundary, and clause boundary. Each sentence is delimited by an empty line. Boundary tags for named entities and clauses comply with the `BIEO` convention. A glimpse of the dataset is shown in figure 6.2.

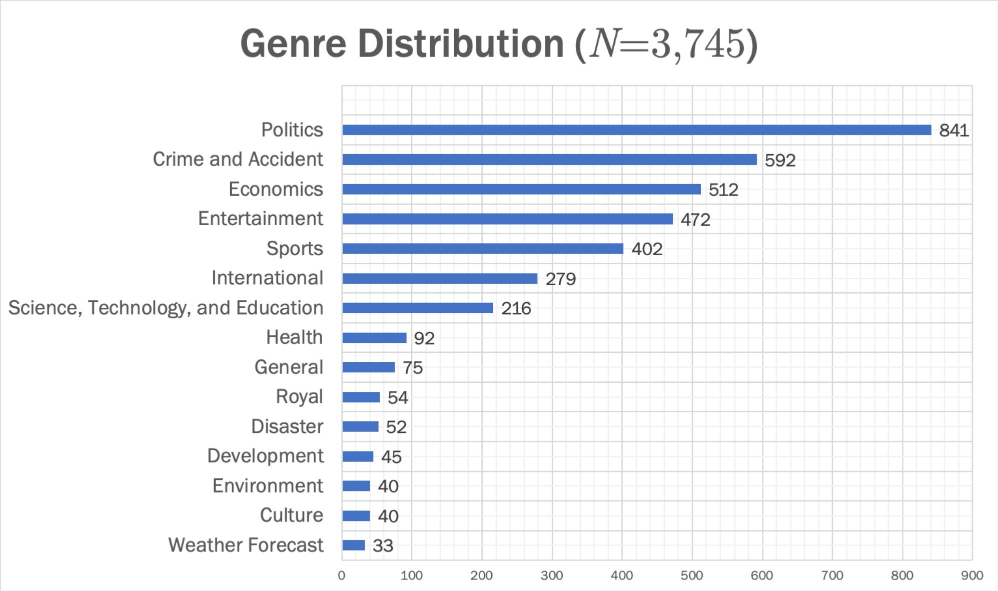
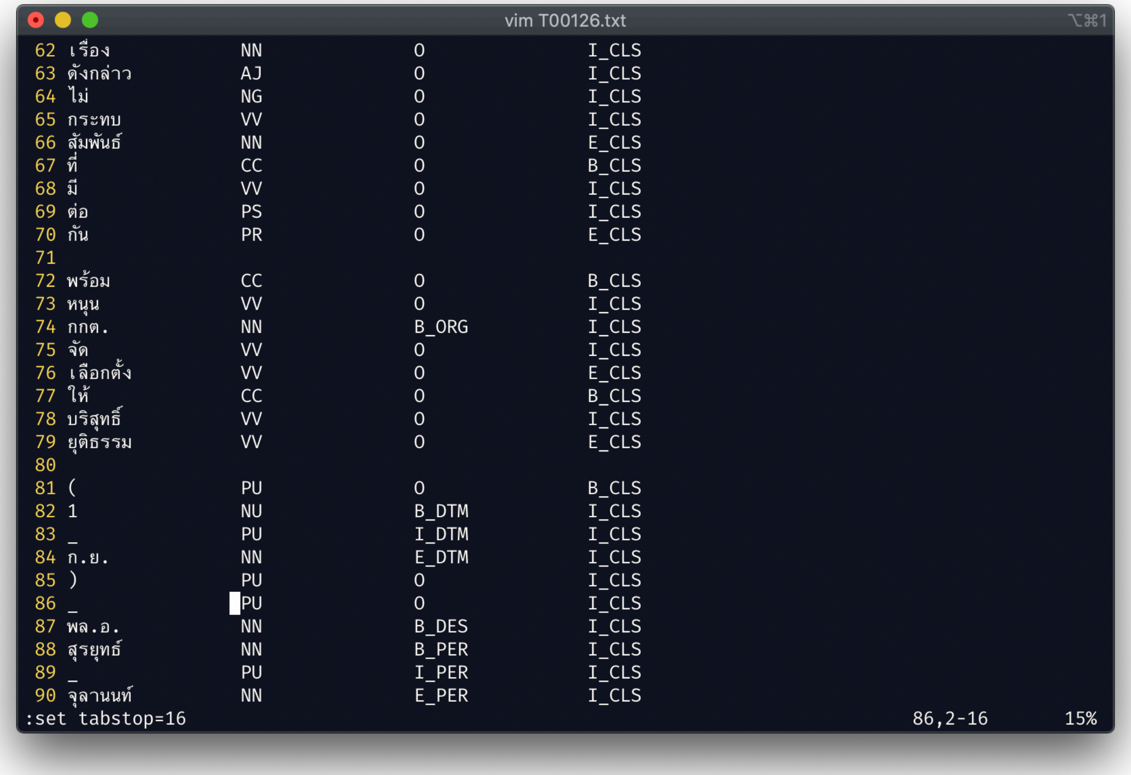


Figure 6.1: Genre distribution of LST20



```
เรื่อง          NN              O               I_CLS
ดังกล่าว        AJ              O               I_CLS
ไม่             NG              O               I_CLS
กระทบ           VV              O               I_CLS
สัมพันธ์         NN              O               E_CLS
ที่             CC              O               B_CLS
มี              VV              O               I_CLS
ต่อ             PS              O               I_CLS
กัน             PR              O               E_CLS

พร้อม           CC              O               B_CLS
หนุน            VV              O               I_CLS
กกต.            NN              B_ORG           I_CLS
จัด             VV              O               I_CLS
เลือกตั้ง        VV              O               E_CLS
ให้             CC              O               B_CLS
บริสุทธิ์        VV              O               I_CLS
ยุติธรรม        VV              O               E_CLS

(               PU              O               B_CLS
1               NU              B_DTM           I_CLS
_               PU              I_DTM           I_CLS
ก.ย.            NN              E_DTM           I_CLS
)               PU              O               I_CLS
_               PU              O               I_CLS
พล.อ.           NN              B_DES           I_CLS
สุรยุทธ์         NN              B_PER           I_CLS
_               PU              I_PER           I_CLS
จุลานนท์         NN              E_PER           I_CLS
:set tabstop=16                                                   86,2-16       15%
```

Figure 6.2: A glimpse of LST20

Bibliography

[1] N. Panmeta, *Waiyakorn Thai [Thai Grammar]*, Research and Publication Division, Faculty of Arts, Chulalongkorn University, 2011.

[2] V. Panupong, *The Structure of Thai: Grammatical System*, Ramkhamhaeng University, 1989.