Appendix A. MENTAL STATE LABELS

We compiled an initial seed set of 160 mental state labels for our models from popular mental and emotional state dictionaries, including the Profile of Mood States and Plutchik's wheel of emotions. These labels also include frequently used terms gathered from synsets found in WordNet.

admiring	cranky	fearful	instinctive	pleased	sympathetic
afraid	crazy	focused	interested	protective	tense
aggressive	curious	forgetful	irate	raging	terrified
agitated	cynical	frantic	irritated	rebellious	terrifying
alarmed	demented	friendly	jealous	refreshed	thankful
alert	depressed	frightened	joyful	relaxed	threatening
ambitious	desperate	frustrated	joyous	relieved	tired
amazed	determined	fun	lively	reluctant	trustful
amused	devious	furious	loathsome	remorseful	trusting
angry	disappointed	giddy	lonely	resentful	uncomfortable
annoyed	discontent	glamorous	loved	restless	uneasy
anxious	discouraged	gleeful	mad	revengeful	unhappy
apprehensive	disgusted	grateful	mellow	romantic	unworthy
ashamed	distracted	grumpy	merciless	sad	upset
assertive	drunken	guilty	mischievous	satisfied	urgent
bitter	eager	happy	miserable	scared	vengeful
bored	ecstatic	helpful	motivated	selfish	vigilant
calm	encouraged	helpless	naughty	selfless	vigorous
carefree	energetic	homicidal	nervous	serious	violent
cautious	energized	hopeful	numb	shaky	wary
cheerful	enraged	hopeless	optimistic	shocked	weary
competitive	enthusiastic	hostile	panicked	sickened	weird
complacent	envious	hurried	panicky	spiteful	welcoming
concerned	excited	impressed	peaceful	stressed	worried
confused	exhausted	indifferent	peeved	submissive	worthless
considerate	exhilarating	inebriated	pessimistic	surprised	
content	fatigued	infuriated	playful	suspenseful	

Appendix B. PARTICIPANTS EXTRACTION PATTERNS

Given a sentence containing the target event, e.g., *chase*, we look for the following patterns of syntactic dependencies to identify the nominal subject and direct object of the event, or verb. Our extraction models use the syntactic dependency parser offered by the CoreNLP[1] toolkit. All except one of the patterns below are general patterns that apply to all types of events. The last pattern is specialized for *chase*.

nsubj (nominal subject) + *dobj* (direct object)

In most cases, the nominal subject (*nsubj*) and the direct object (*dobj*) of the verb are the dependents that we seek. For the verb *chase*, the nominal subject is often the chaser and the direct object is the person being chased. Given a sufficiently complex sentence, however, we often cannot retrieve the nominal subject of the verb. Thus, our system extracts these syntactic phrases independently from each other (i.e., it is okay to retrieve just the direct object of the verb even if the *nsubj* relation is not present). Figure 1 illustrates some example sentences where both participants can be identified and Figure 2 shows cases where only the direct object can be retrieved. In the case of *chase*, dependents of the *nsubj* relation are extracted as the chasers and dependents of the *dobj* relations are the people being chased.

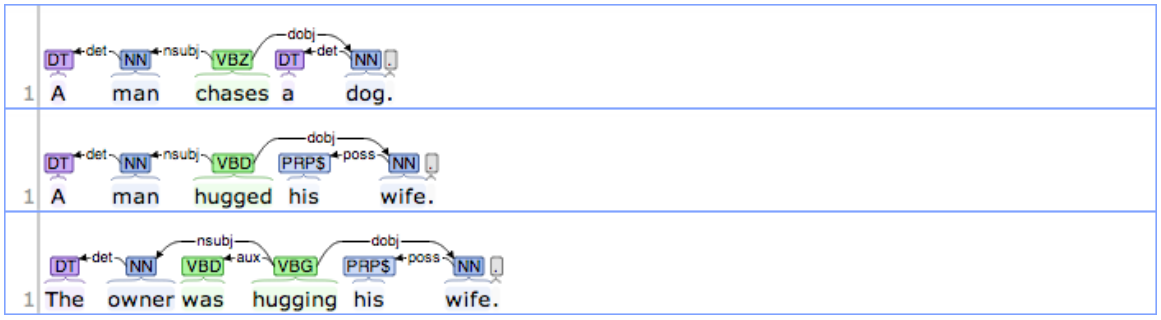

Figure 1: Example sentences where both the nominal subject *nsubj* and the direct object *dobj* relations are present. In these cases, both participants of the event can be identified.

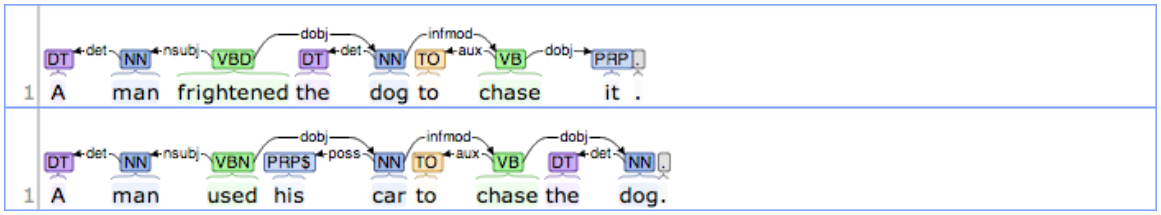

Figure 2: Example sentences where only the direct object *dobj* relation for the target verb is present; and hence, only the object of the verb can be identified.

nsubjpass (passive nominal subject) + *agent* (agent)

According to CoreNLP documentation, an agent is a complement of a passive verb which

1. http://nlp.stanford.edu/software/corenlp.shtml

is introduced by the preposition "by" and does the action. Hence, in the presence of the preposition "by", the roles of the participants are switched. That is, the syntactic subject of the sentence, captured by the passive relation *nsubjpass*, is now the object of the verb while the subject of the verb (a.k.a., the participant that does the action) is given by the syntactic relation *agent*. Figure 3 shows some examples of this pattern.

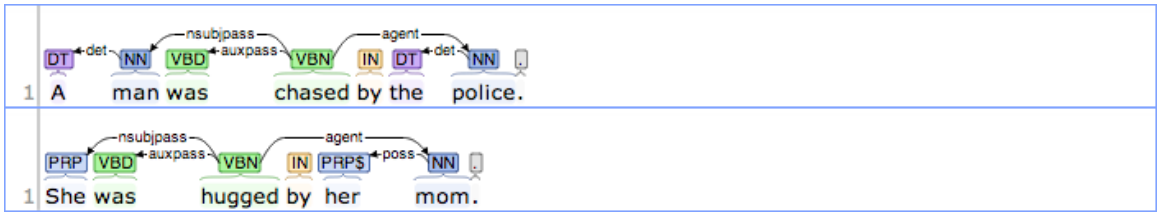

Figure 3: When the preposition "by" is present in the sentence, the agent of the corresponding passive verb is extracted as the subject of the verb (i.e., the one that does the action), while the syntactic subject is the object the verb (a.k.a, the one being acted upon).

***prep_after* (object of the preposition "after")**

Although we try to design general patterns that work across all types of events/activities, some events have specific patterns that appear so frequently in text that they warrant their own special recognition, such as the "chase after" pattern. In sentences following the "chase after" pattern, the object of the verb *chase* is usually parsed as the object of the preposition "after," captured in CoreNLP's collapsed dependencies by the *prep_after* syntactic relation. Figure 4 shows some example sentences following this pattern.

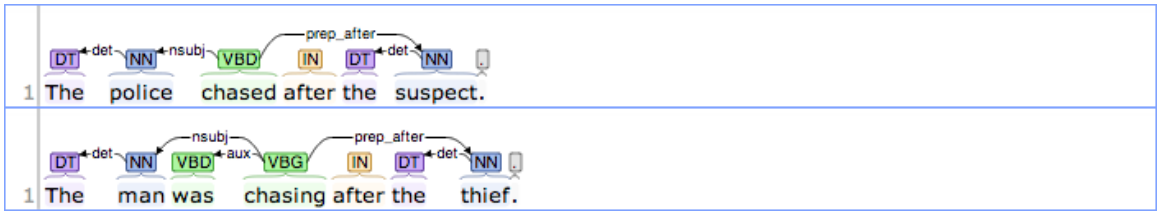

Figure 4: The "chase after" pattern is a specialized pattern that applies only to the verb *chase*. In this pattern, the object of the preposition "after" is the object of the verb. Stanford's CoreNLP collapses the preposition "after" and its object into the *prep_after* relation.

Appendix C. MENTAL STATE EXTRACTION PATTERNS

We list all syntactic patterns used by our models to extract mental state labels referencing specific event participants below. In general, we search for these labels by pattern matching the syntactic dependencies of relevant sentences to look for common patterns that involve the participants of interest and their adjective complements. Our system uses the syntactic dependency parser offered by the CoreNLP toolkit.

***amod* (adjectival modifier)**

Perhaps the most common and relevant syntactic relation of interest is the adjectival modifier relation, known as *amod*. This dependency describes any adjectival phrase that serves to modify the meaning of a noun phrase. Since we already know the noun phrases of interest (from the coreference entities), we can search the list of syntactic dependencies for *amod* relations that directly connect these noun phrases to their modifying adjectival phrases. Figure 5 illustrates some example sentences fitting this pattern. The adjectival phrases are extracted as potential complements, though further downstream filtering is required to get mental state labels.

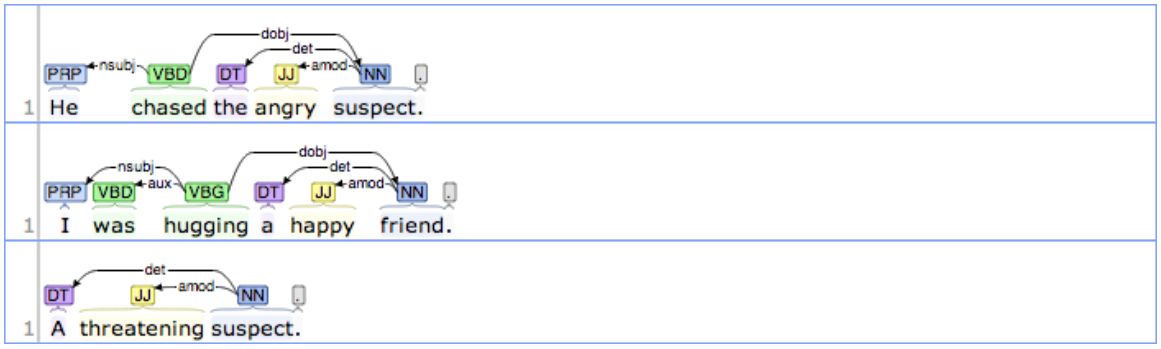

Figure 5: Example sentences containing the common adjectival modifier (*amod*) syntactic relation. The graphical representation shows the dependency relationship as an arrow pointing from the head of the relation, which is the noun phrase, to the modifying adjectival phrase.

***nsubj* (nominal subject) / *nsubjpass* (passive nominal subject)**

Noun phrases that serve as the syntactic subjects (or nominal subjects) for a clause are often captured as dependents of the syntactic relations *nsubj* and *nsubjpass*. Note that we are only interested in nominal subject relations for which an entity of interest from the coreference chains is the dependent. We refer to these as valid *nsubj* relations to distinguish them from all other *nsubj* relations that do not reference an event participant. In many cases, the root (or head) clause of these syntactic relations can oftentimes be interpreted as complements.

The most common of these cases occur when the sentence also contains a copula relation (*cop*), which captures the relationship between the complement of a copular verb and the copular verb. The Stanford representation chooses to take a copula as a dependent of its complement. Hence, when the *cop* relation shares the same head clause as a valid *nsubj*

clause, we can extract this common head clause as a complement. Figure 6 shows some example sentences containing the copular verb and mental state complements.

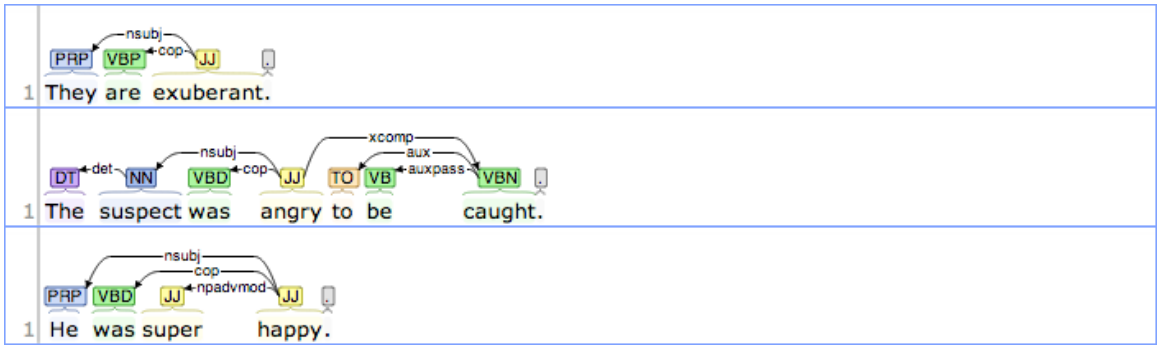

Figure 6: Example sentences showing the indirect association between an entity of interest and a complement via a copular verb. The complement to be extracted is the head clause for both the *nsubj* and the *cop* relations.

Oftentimes, however, the adjective label is mistakenly tagged as a verb by the part-of-speech tagger. In these cases, we do not get the *cop* relation as above. Instead, we usually see the auxiliary (*aux*) or passive auxiliary (*auxpass*) relation in its place. These relations describe the non-main verb of the clause, e.g., a modal auxiliary, or a form of "be", "do" or "have" in a periphrastic tense. This makes sense; as when the adjective labels are incorrectly tagged as verbs, we end up with multiple verbs in each of these sentences, inducing the auxiliary verb relations. As with the *cop* relation, when the *aux* relation shares the same head clause as a valid *nsubj* relation (and similarly for *auxpass* and *nsubjpass*), we can extract this common head clause as a complement. See Figure 7 for some example sentences demonstrating this pattern.

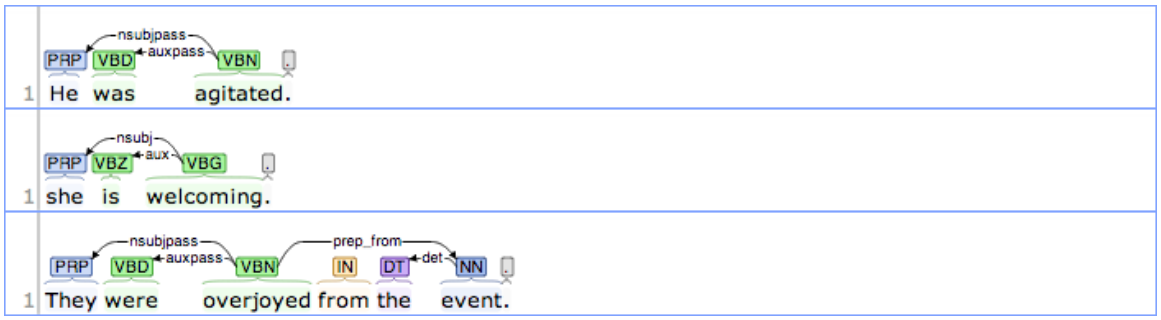

Figure 7: Example sentences showing the indirect association between an entity of interest and an incorrectly tagged complement via the main copular verb. The complement to be extracted is the head clause for both the *nsubj* and the *aux*, or *nsubjpass* and *auxpass* relations.

In practice, we have noticed that it is generally acceptable to always treat the head clause of a valid *nsubj* or *nsubjpass* relation as a possible complement for extraction, without needing to check for a matching *cop*, *aux*, or *auxpass* relation. This is because the part-

of-speech tagger is error-proned and often mis-tag adjective complements. It is simpler to be more lenient during the extraction process in order to catch more incorrectly tagged complements than to construct a different pattern for each possible error case. Though, we still enforce that the clause being extracted must be related to an entity of interest, via the *nsubj* or *nsubjpass* relation.

***nsubj* of "feel"**

Asides from the copular to *be* verb, the verb *feel* is also highly indicative of the presence of a mental state label. However, *feel* differs from the copular verb pattern above in that the verb itself is often the root of two syntactic relations, one connecting the verb to the nominal subject and one connecting the verb to the complement. The former is the familiar *nsubj* relation, where the head of the relation is the verb *feel* and the dependent is the nominal subject. The second relation, which connects the verb to a complement, is usually the adjectival complement (*acomp*) relation. As the name suggests, an adjectival complement of a verb is an adjectival phrase which functions as the complement, such as the object of the verb. Thus, if we find an *acomp* relation that shares the same head verb *feel* as a valid *nsubj* relation, then we can extract the dependent of the *acomp* relation as a complement. Figure 8 shows some examples of this pattern.

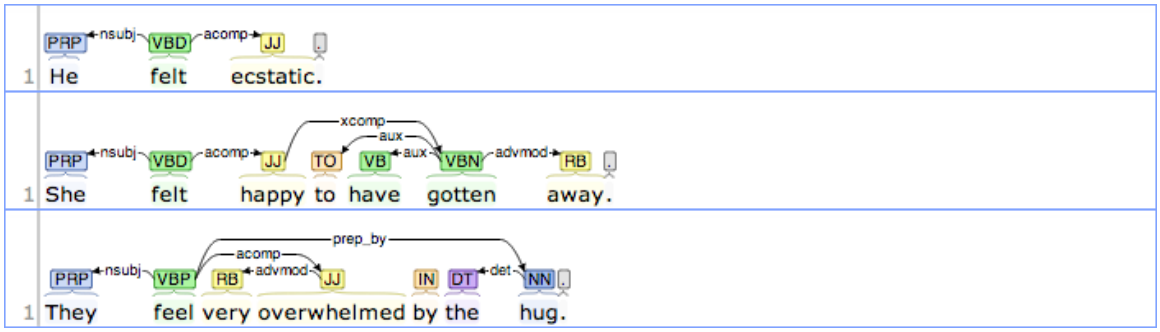

Figure 8: Example sentences showing the indirect association between an entity of interest and a complement via the verb *feel*. The complement to be extracted and the subject both share the same head verb. The complement is connected to the verb via the relation *acomp* while the nominal subject is connected to the verb via the relation *nsubj*.

As with previous patterns, when the adjective complement is mistakenly tagged as a verb by the part-of-speech tagger, we cannot count on the syntactic dependency processor to correctly give us the *acomp* relation. Instead, we often find the *dep* relation in its place, which is used when the system is unable to determine a more precise dependency relation between two words (see Figure 9).

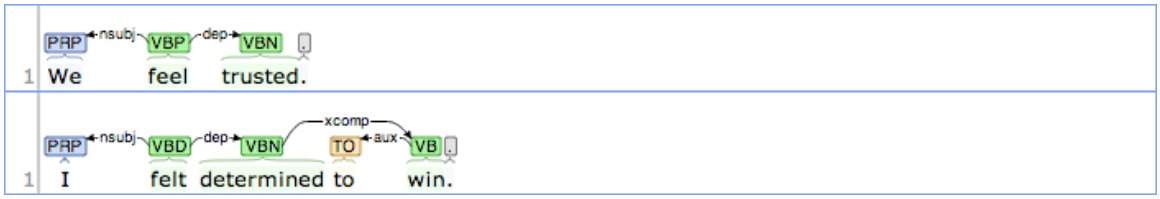

Figure 9: Example sentences showing the indirect association between an entity of interest and an incorrectly tagged complement via the verb *feel*. The complement to be extracted and the subject both share the same head verb. The complement is connected to the verb via the relation *dep* while the nominal subject is connected to the verb via the relation *nsubj*.