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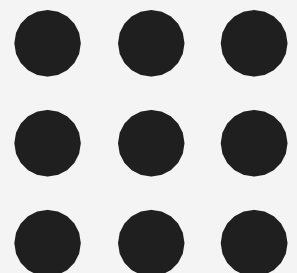
Department of Artificial Intelligence and Data Science

**Course Name – 19AD601 – Natural Language
Processing**

III Year / VI Semester

Unit 4 – SEMANTICS

Topic 5- Thematic Roles



Thematic Roles

- Thematic roles basically indicate the semantic (i.e., meaning) relationship between the noun phrase and the verb in a sentence.
- In other words, Thematic Roles tell us what “role” the NP plays in the action described by the verb in a sentence.
- Consider the example

(19.1) Sasha broke the window.

(19.2) Pat opened the door.

A neo-Davidsonian event representation of these two sentences would be

$$\begin{aligned} & \exists e, x, y \text{ Breaking}(e) \wedge \text{Breaker}(e, \text{Sasha}) \\ & \quad \wedge \text{BrokenThing}(e, y) \wedge \text{Window}(y) \\ & \exists e, x, y \text{ Opening}(e) \wedge \text{Opener}(e, \text{Pat}) \\ & \quad \wedge \text{OpenedThing}(e, y) \wedge \text{Door}(y) \end{aligned}$$



Thematic Roles

- In this representation, the roles of the subjects of the verbs break and open are Breaker and Opener respectively.
- These deep roles are specific to each event; Breaking events have Breakers, Opening events have Openers, and so on.
- Thematic roles are a way to capture this semantic commonality between Breakers and Openers. We say that the subjects of both these verbs are agents.
- Thus, AGENT is the thematic role that represents an abstract idea such as volitional causation.
- Similarly, the direct objects of both these verbs, the BrokenThing and OpenedThing, are both prototypically inanimate objects that are affected in some way by the action. The semantic role for these participants is theme.

Thematic Roles

Thematic Role	Definition
AGENT	The volitional causer of an event
EXPERIENCER	The experiencer of an event
FORCE	The non-volitional causer of the event
THEME	The participant most directly affected by an event
RESULT	The end product of an event
CONTENT	The proposition or content of a propositional event
INSTRUMENT	An instrument used in an event
BENEFICIARY	The beneficiary of an event
SOURCE	The origin of the object of a transfer event
GOAL	The destination of an object of a transfer event

Figure 19.1 Some commonly used thematic roles with their definitions.



Thematic Roles

Problems with Thematic Roles

- Representing meaning at the thematic role level seems like it should be useful in dealing with complications like diathesis alternations. Yet it has proved quite difficult to come up with a standard set of roles, and equally difficult to produce a formal definition of roles like AGENT, THEME, or INSTRUMENT.
- For example, researchers attempting to define role sets often find they need to fragment a role like AGENT or THEME into many specific roles.
- In addition to the fragmentation problem, there are cases in which we'd like to reason about and generalize across semantic roles, but the finite discrete lists of roles don't let us do this.
- Finally, it has proved difficult to formally define the thematic roles. Consider the AGENT role; most cases of AGENTS are animate, volitional, sentient, causal, but any individual noun phrase might not exhibit all of these properties.
- These problems have led to alternative semantic role models that use either many fewer or many more roles.



Thematic Roles



Selectional Restrictions

A selectional restriction is a semantic type constraint that a verb imposes on the kind of concepts that are allowed to fill its argument roles. Consider the two meanings associated with the following example:

(19.29) I want to eat someplace nearby.

There are two possible parses and semantic interpretations for this sentence. In the sensible interpretation, eat is intransitive and the phrase someplace nearby is an adjunct that gives the location of the eating event.

In the nonsensical speaker-as- Godzilla interpretation, eat is transitive and the phrase someplace nearby is the direct object and the THEME of the eating, like the NP Malaysian food in the following sentences.

I want to eat Malaysian food.

Thematic Roles

Representing Selectional Restrictions

One way to capture the semantics of selectional restrictions is to use and extend the event representation.

Ignoring the issue of the -structures and using thematic roles rather than deep event roles, the semantic

contribution of a verb like eat might look like the following:

$$\exists e, x, y \text{ Eating}(e) \wedge \text{Agent}(e, x) \wedge \text{Theme}(e, y)$$

With this representation, all we know about y , the filler of the THEME role, is that it is associated with an Eating event through the Theme relation. To stipulate the selectional restriction that y must be something edible, we simply add a new term to that effect:

$$\exists e, x, y \text{ Eating}(e) \wedge \text{Agent}(e, x) \wedge \text{Theme}(e, y) \wedge \text{EdibleThing}(y)$$



Thematic Roles

When a phrase like ate a hamburger is encountered, a semantic analyzer can form the following kind of representation

$$\exists e, x, y \text{ Eating}(e) \wedge \text{Eater}(e, x) \wedge \text{Theme}(e, y) \wedge \text{EdibleThing}(y) \wedge \text{Hamburger}(y)$$

This representation is perfectly reasonable since the membership of y in the category Hamburger is consistent with its membership in the category EdibleThing, assuming a reasonable set of facts in the knowledge base.

Correspondingly, the representation for a phrase such as ate a takeoff would be ill-formed because membership in an event-like category such as Takeoff would be inconsistent with membership in the category EdibleThing.



THANK YOU