

# Annotating Entity Relation: Manual

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## Abstract

This is an annotation manual for entity relations.

## 1 Introduction: Goal of Annotation

We annotate two types of relations. The first is relations between events annotated in the event co-reference annotation. Events are grouped into Superset, Subset, Superevent, and Subevent relations. The second is related entities from the semantic roles in the event co-reference annotation. Roles such as agent or theme may be involved in these relations.

The interest of the annotation is clear: we want to be able to know which events are related to other events at the document level. Entity relations within these related events will provide further information about the main actors, targets, causes, et al of the events. This annotation is a step towards that goal.

## 2 Annotation Units

Annotation units for events:

- Related events from event co-reference annotations
- Arguments from semantic roles in event co-reference annotations

## 3 Annotating event co-reference

Our intentions are to annotate the following:

- **Related Events:** Such events could be in a Subset- Superset relation or Subevent-Superevent relation. These relations will be explained below.

**Related Semantic Roles:** The semantic roles come from the event co-reference annotation and include: *agent, experiencer, location*, et al. Particular relations pertaining to these roles will be explained below.

## 4 Relations

Relations are broken down into two types: Related events and Related semantic roles.

### 4.1 Related Events

Related events fit into four possible relations. The naming convention is the type of relation followed by a number and hyphen, which is followed by the event name. For example, Superset1 - Bombing1. The **Subset** and **Subevent** relations have an additional argument linking them back to the respective **Superset** or **Superevent**. The name of the argument is **Superset** or **Superevent** followed by a number, and the value is the name of the **Superset** or **Superevent**. For example, Subset1 - Bombing2 : Superset1 - Bombing1. The numbering of the **Superset**, **Superevent**, **Subset**, and **Subevent** relations follows the order they appear in a document.

- **Superset:** A set S1 is a superset of another set S2 if every element in S2 is in S1. S1 may have elements which are not in S2.

(1) The above groups pose the following dangers: Attacking...

In (1) above, *dangers* includes the *attacking* event. As such, *dangers* is a **Superset** of *attacking*.

- **Subset:** A set S1 is a subset of another set S2 if every element in S1 is in S2. S2 may have exactly the same elements as S1.

(2) The above groups pose the following dangers: Attacking...

In (2) above, the *Attacking* event is contained within *dangers*. As such, the *Attacking* event is a **Subset** of the *dangers*.

- **Superevent:** An event E1 is a superevent of another event E2 if E1 contains E2.

(3) Attacking for the purpose of: Assassination, Kidnapping...

In (3) above, the *Attacking* event contains the *Assassinating* and *Kidnapping* events. As such, *Attacking* is a **Superevent** of the *Assassinating* and *Kidnapping* events.

- **Subevent:** An event E1 is a subevent of another event E2 if E1 is contained within E2.

(4) Attacking for the purpose of: Assassination, Kidnapping...

In (4) above, the *Assassinating* and *Kidnapping* events are contained within the *Attacking* event. As such, *Assassinating* and *Kidnapping* are **Subsets** of the *Attacking* event.

## 4.2 Related Semantic Roles

Related semantic roles fit into 74 possible relations. These relations cover geography, employment, co-reference, social relations, group membership, and building subparts. It is important to distinguish between *organizations*, *political groups*, *companies*, and *groups*. An *organization* contains an administrative and functional structure and includes entities such as the *UN*, *Al Qaeda*, and the *military*. *Political groups* are similar to organizations but have a decidedly political purpose. Examples include *hamas*. *Companies* are also similar to organizations but have a decided desire to make money. Examples include *CNN* and *Enron*. Finally, *groups* are a catch-all and include any collection of people. Examples include: *area patrols* and *visitors*.

- **Country.Relation.Link**: This relation highlights the link between multiple countries. The linked countries are the arguments.

(5) The Dayton Democrat, who has traveled to other crisis points... North Korea ...

In (5) above, the *crisis points* is labeled with the above relation, as it links the listed countries. The arguments would be the countries listed as crisis points. North Korea, et al in this case; denoted by Country1, Country2,...

- **Entity.Name.Acronym:** This relation highlights an entity that is known by an acronym. The argument is the acronym by which the entity is known.

(6) Inviting you to join the Georgia O'Keefe Circle of the... Second Century Society (SCS)

In (6) above, the *Second Century Society* is labeled with the above relation, and *SCS* fills the Acronym argument.

- **Entity.SubGroups:** This relation is similar to the Subset relation for Events. It highlights the superset of people, and the argument is the person or people who are the subgroups within the overarching group.

(7) Regulations for Visitors...Individuals

In (7) above, *Visitors* is labeled with the above relation, and the arguments are the subgroups; *individuals*, et al in this case. Such arguments would be denoted by Person.Group1, Person.Group2...

- **Entity.SubPart:** This relation highlights an overarching entity that has subparts that fit within the overarching entity. The arguments are the entities or people that fit within the overarching entity.

(8) Guarding...Patrols, Night Password, Body Guards

In (8) above, *Guarding* is labeled with the above relation. The subparts fill the argument roles and are Person.Group1 - Patrols, Entity - Night Password, and Person.Group2 - Body Guards in this case.

- **Event.Info:** This relation highlights an event and arguments are relevant info about the event. Possible arguments include Country, Target, and Year.

(9) the intifada, the spontaneous 1987 palestinian uprising

In (9) above, the *intifada* is labeled with the above relation, and the arguments are Country - Palestine and Year - 1987.

- **Geography.City:** This relation highlights a city, with Country as a possible argument.

(10) Medellin

In (10) above, the *Medellin* is labeled with the above relation.

- **Geography.City.Capital:** This relation highlights a city that is a capital with Country a possible argument.

(11) Amman, Jordan

In (11) above, *Amman* is labeled with the above relation. The argument would be Country - Jordan.

- **Geography.Country:** This relation highlights a country with Location a possible argument.

(12) Colombia

In (12) above, *Colombia* is labeled with the above relation. There are no arguments in this case. However, if the document mentioned the region where Colombia is, e.g., South America, Location - South America would be a possible argument.

- **Geography.District:** This relation highlights a district with City and Country possible arguments.

(13) while visiting a hospital in the Mansour district of the Iraqi capital.

In (13) above, *Mansour district* is labeled with the above relation. Arguments in this case would be Country - Iraq and City - Iraqi capital (which refers back to Baghdad).

- **Geography.Location:** This relation highlights a building or entity and arguments relate to its location. Possible arguments include Country, City, or Location1, Location2...

(14) Dubai's Crown Prince... inaugurated a free zone for e-commerce ...

In (14) above, the *free zone for e-commerce* would be labeled with the above relation. The argument would be City - Dubai.

- **Geography.Province:** This relation highlights a province with Country as a possible argument.

(15) Hall visited hospitals and health institutions in Baghdad and the southern Muthana Province.

In (15) above, the *Muthana Province* is labeled with the above relation. If the country of the district could be determined from the document, a possible argument would be Country - Iraq.

- **Geography.State:** This relation highlights a State with Country as a possible argument.

(16) Bill Richardson of New Mexico

In (16) above, *New Mexico* is labeled with the above relation. If further information were present in the document, a possible argument would be Country - US.

- **Government.Country:** This relation highlights the government of a country when referenced by capital city or country name. The argument is the Country.

(17) ...it is important not only to force Baghdad to give up...

In (17) above, *Baghdad* refers to the Iraqi government and not the capital. As such, it would be labeled with the above relation and Country - Iraq would be the argument.

- **Group.Info:** This relation highlights a group and arguments include pertinent info about the group. Possible arguments include Size, Transportation, Vehicle, and Weapon.

(18) Area Patrols...vehicle equipped with a machine gun...formed of 2 or 3 people at least

In (18) above, *Area Patrols* is labeled with the above relation. The arguments would be Weapon - machine gun and Size - 2 or 3 people.

- **Group.Political.Name.Acronym:** This relation highlights a political group also known by an acronym. The argument is the acronym.

(19) hamas, an acronym for islamic resistance movement

In (19) above, *islamic resistance movement* is labeled with the above relation. The argument would be Acronym - hamas.

- **Group.Political.SubPart:** This relation highlights an overarching group, and the argument is the political group that is a part of the overarching group.

(20) hamas had already become an important part of palestinian society

In (20) above, *palestinian society* is labeled with the above relation. The argument would be Group.Political - hamas.

- **Location.Example:** This relation highlights an overarching location. The arguments are the examples of the location.

(21) he will visit several places, including hospitals and schools...

In (21) above, *places* is labeled with the above relation. The arguments would be Location1 - hospitals and Location2 - schools.

- **Media.Brochure:** This relation highlights an entity that is a brochure.

(22) The SCS brochure I am enclosing will give you...

In (22) above, the *SCS brochure* is highlighted with the above relation.

- **Media.Magazine:** This relation highlights an entity that is a magazine.

(23) Previews magazine, detailing upcoming events...

In (23) above, *Previews Magazine* is labeled with the above relation.

- **Media.Newschannel:** This relation highlights an entity that is a news channel.

(24) CNN's Ed Henry was there

In (24) above, *CNN* is highlighted with the above relation.

- **Media.Newspaper:** This relation highlights an entity that is a newspaper. Possible arguments include location.

(25) please see The New York Times article I have included

In (25) above, the *New York Times* is highlighted with the above relation. The argument is Location - New York.

- **Member.Info:** This relation highlights a member of a group and important info about that group member. Possible arguments are Salary.

(26) Salary of the bachelor Mujahed is 1000 Pakistani Rupee.

In (26) above, the *bachelor Mujahed* is highlighted with the above relation. The argument is Salary - 1000 Pakistani Rupee.

- **Membership.Affiliation.Political.Party:** This relation highlights a person affiliated with a political party. The argument is the name of the political party.

(27) Hall, an Ohio Democrat...is scheduled to embark Sunday...

In (27) above, *Hall* is labeled with the above relation. The argument is Party - Democrat.

- **Membership.Benefit:** This relation highlights a group or person that benefit from a particular relation. The arguments describe the benefits and possibly the membership level.

(28) ... picnic... and the annual SCS Founders Day Celebration are free for Georgia O'Keefe members.

In (28) above, *Georgia O'Keefe members* is labeled with the above relation. The arguments are Benefit1 - picnic and Benefit2 - SCS Founders Day Celebration.

- **Membership.Employee:** This relation highlights a person who works for a company or organization. Possible arguments include Organization or Company, Position, and Employer.

(29) Arletta B Newton Donor Relation Coordinator

In (29) above, *Arletta B Newton* is labeled with the above relation. The arguments are Position - Donor Relations Coordinator and Organization - IMA.

- **Membership.Employee.Government:** This relation highlights a person who works for a government with possible arguments including Country, Employer, Position, Leader.

(30) the prime minister known as abu mazen

In (30) above, the *prime minister* is labeled with the above relation. From further information in the document, an argument would be Country - Palestine.

- **Membership.Group:** This relation highlights a group or person belonging to a certain group or country. The argument is either the groups the person or people belong to or the countries.

(31) you join the ranks of those who believe...

In (31) above, *those* is labeled with the above relation. The argument would be the group of people that 'those' belong to. In this case, the argument is Group - Donors.

- **Membership.Group.Example:** This relation highlights an overarching entity. The arguments are the entities that are examples of the super entity.

(32) Human protection... Buses ... kiosks ...towers ...Outside Patrols

In (32) above, *Human protection* is labeled with the above relation. The arguments are Entity1 - Buses, Entity2 - kiosks, Entity3 - towers, and Entity4 - Outside Patrols.

- **Membership.Group.Political:** This relation highlights a person who is a member of a political group. The argument is the political group.

(33) israel retaliated on hamas, namely al-rantissi...

In (33) above, *al-rantissi* is labeled with the above relation. The argument would be Group.Political - hamas.

- **Membership.Group.SubExample:** This relation highlights an entity that was an example of another overarching entity, but this entity has examples itself. The arguments are the entities that are examples of this sub-entity.

(34) Buses...Exposed Busses ...Camouflaged Buses

In (34) above, *Buses* were already an example of *Human protection* from a preceding example above. In this case, *Buses* is labeled with the above relation. The arguments are Entity1 - Exposed Buses and Entity2 - Camouflaged Buses.

- **Membership.Group.SubGroup:** This relation highlights an overarching group of people. The arguments are the groups of people contained within the super group.

(35) Outside Patrols... Single patrols ... common patrols

In (35) above, *Outside Patrols* is labeled with the above relation. The arguments are SubGroup1 - Single patrols and SubGroup2 - common patrols.

- **Membership.Group.SubPart:** This relation highlights an overarching entity. The arguments are entities contained within the super entity.

(36) to set the mark with the judicial system... prison ... jail ...

In (36) above, the *judicial system* is labeled with the above relation. The arguments are Entity1 - prison and Entity2 - jail.

- **Membership.Group.Subset:** This relation highlights an overarching group of items. The arguments are the entities that are contained within this overarching group of items.

(37) No personal computer, not even the one on a chief executive's desk

In (37) above, *personal computer* is labeled with the above relation. The argument is Entity - one on a chief executive's desk.

- **Membership.Organization:** This relation highlights an organization. The arguments are the countries that are members of the Organization.

(38) US... Canada attending the 45th ... Inter-American Press Association...

In (38) above, the *Inter-American Press Association* is labeled with the above relation. The arguments are Country1 - US and Country2 - Canada.

- **Membership.Organization.HigherRanking:** This relation highlights a person who is ranked higher in an organization than another person. The arguments are the 2 members of the organization.

(39) between member brethren... carried out by the immediate commander...

In (39) above, the *immediate commander* is highlighted with the above relation, since he or she is higher ranked than the member brethren. The arguments would be Person.Group - member brethren and Person - immediate commander.

- **Membership.Organization.SubGroup:** This relation highlights a Group that is a subgroup within an organization. The argument is the Organization and an optional argument is the level.

(40) inviting you to join the...Indianapolis Museum of Art's Second Century Society

In (40) above, the *Second Century Society* is labeled with the above relation. The argument is Organization - Indianapolis Museum of Art.

- **Membership.Organization.Terrorist:** This relation highlights a government or person who is a member of a terrorist organization. The name of the organization is the argument.

(41) between the doors of Khaled and Abu Mohammad

In (41) above, *Khaled and Abu Mohammed* are labeled with the above relation. The argument (determined from elsewhere in the document) is Organization - Al Qaeda.

- **Membership.PartOf.Community:** This relation highlights a country that is a part of a community. The argument is the community.

(42) the international community can do a much better job in helping Iraq...

In (42) above, *Iraq* is labeled with the above relation. The argument is Community - international community.

- **Membership.PartOf.Entity:** This relation highlights an overarching entity. The arguments include the other entities that are part of the super entity.

(43) Today President Bush unveiled a seven point one billion dollar plan... for a possible flu pandemic.

In (43) above, *flu pandemic* is labeled with the above relation. Late, there is mention of 'bird flu,' so the argument would be Entity - bird flu.

- **Membership.PartOf.Organization:** This relation highlights a group of people who are part of an organization. The argument is the Organization.

(44) This is fulfilled through humbleness... towards ...the Muslims

In (44) above, the *Muslims* is labeled with the above relation. The argument (determined from information elsewhere in the document) is Organization - Al Qaeda.

- **Membership.PartOf.Person:** The relation highlights an overarching group. The arguments are the people who are part of the super group.

(45) Gupto ... in the public health community

In (45) above, the *public health community* is labeled with the above relation. The argument (determined from another sentence) is Person - Dr. Sanjay Gupto.

- **Membership.PartOf.Person.Group:** This relation highlights an overarching group. The arguments are the groups of people who are part of the super group.

(46) Democrats ... spilled into open warfare today on the senate floor.

In (46) above, the *senate* is labeled with the above relation. The arguments are Person.Group - Democrats and Person.Group - Republicans.

- **Membership.PartOf.Regime:** This relation highlights an overarching regime that contains other regimes. The argument is the contained regime(s).

(47) th Gulf regimes... accommodate the policies of the Saudi regime.

In (47) above, the *Gulf Regimes* is labeled with the above relation, and the argument is Country - Saudi Arabia.

- **Membership.Person.Group.Participant:** This relation highlights an event. The arguments are the people or groups of people that participated in the event.

(48) That was the message delivered by government and private security experts at an all-day conference...

In (48) above, the *conference* is labeled with the above relation. The arguments are Person.Group - government security experts and Person.Group - private security experts.

- **Membership.Person.Group.Political:** This relation highlights a person who is part of a political group. The argument is the political group.

(49) have some judge that was paid off or had... a good old boy network...

In (49) above, the *good old boy network* is labeled with the above relation. The argument is Person - judge.

- **Membership.Person.Group.Subset:** This relation highlights an overarching group of people. The arguments are the people or groups of people contained within the super group.

(50) many foreign firms... have their own cryptographers, conference speakers noted.

In (50) above, the *conference speakers* is labeled with the above relation. The arguments are Person1 - Noel D. Matchett and Person2 - Michelle Van Cleave (mentioned previously in the document).

- **Membership.Political.Affiliation:** This relation highlights a group of countries united by a political affiliation. The argument is the affiliation.

(51) the US and Britain imposed a no-fly zone...

In (51) above, *US and Britain* are labeled with the above relation. The argument is Affiliation - allies.

- **Membership.Representative.City:** This relation highlights a person who represents a City, with the City as argument.

(52) The Dayton Democrat...

In (52) above, the *Dayton Democrat* is labeled with the above relation. The argument is City - Dayton.

- **Membership.Representative.State:** This relation highlights a person who represents a State, with the State as argument.

(53) US Rep Bill Richardson of New Mexico...

In (53) above, *Bill Richardson* is labeled with the above relation. The argument is State - New Mexico.

- **Organization.Example:** This relation highlights a type of organization. The arguments are examples of the particular type of organization and possibly a location.

(54) Hall is expected to meet... representatives of all international aid organizations working in Iraq

In (54) above, *international aid organizations* is labeled with the above relation. The arguments are Location - Iraq, Organization1 - Red Cross and Organization2 - Red Crescent (mentioned in the previous sentence).

- **Organization.Info:** This relation highlights an organization with arguments including pertinent info about the organization. Possible arguments include Purpose and Religion.

(55) Al Qaeda: An Islamic group with an aim of Jihad.

In (55) above, *Al Qaeda* is labeled with the above relation. The arguments are Religion - Islam and Aim - Jihad.

- **Organization.Name.Acronym:** This relation highlights an organization also known by an acronym. The acronym for the organization is the argument.

(56) According to a report by the World Health Organization... the WHO found..

In (56) above, the *World Health Organization* is labeled with the above relation. The argument is Acronym - WHO.

- **Organization.SubPart:** This relation highlights an entity that is a smaller part of an Organization. The argument is the organization.

(57) Our extraordinary permanent collection and grounds... would not be possible

In (57) above, the *permanent collection and grounds* are labeled with the above relation. The argument is Organization - IMA.

- **Person.Group.Citizen.Country:** This relation highlights citizens of a country, and their country of citizenship is the argument.

(58) protecting Shi'ite Muslims from possible attacks...

In (58) above, *Shi'ite Muslims* is labeled with the above relation. The argument (determined from earlier in the document) is Country - Iraq.

- **Person.Info:** This relation highlights a person with arguments pertaining to relevant info about the person. Possible arguments include Country and Position.

(59) Bin Baz was the grand Muslim scholar in Saudi Arabia.

In (59) above, *Bin Baz* is labeled with the above relation. The arguments are Position - Muslim scholar and Country - Saudi Arabia.

- **Political.Group.Info:** This relation highlights a political group. The arguments are info about the political group. Possible arguments include Backer, Country, Aim, Founded, Founder...

(60) hamas was founded in 1988 by a blind paraplegic cleric

In (60) above, *hamas* is labeled with the above relation. The arguments are Founder - blind paraplegic cleric and Founded - 1989.

- **Political.Relation.Link:** This relation highlights a group of countries that are linked politically. The arguments are the linked countries.

(61) the four countries cited, Colombia, Cuba, Panama and Nicaragua...

In (61) above, the *four countries cited* is labeled with the above relation. The arguments are Country1 - Colombia, Country2 - Cuba, Country3 - Panama, and Country4 - Nicaragua.

- **Relation.City:** This relation highlights an entity that is co-referent with a City. The argument is the name of the City.

(62) while visiting a hospital in...the Iraqi capital.

In (62) above, the *Iraqi capital* is labeled with the above relation. Its argument is its referent, which is City - Baghdad.

- **Relation.Company:** This relation highlights an entity that is co-referent with a Company. The argument is the name of the Company.

(63) when would be the earliest we (Enron) would make the payment?

In (63) above, *we* is labeled with the above relation. The argument is the company referred to, which is Company - Enron.

- **Relation.Country:** This relation highlights a entity that is co-referent with a Country. The referred to country is the argument.

(64) Iraq has been under economic sanctions...the country's ability...

In (64) above, *the country* is labeled with the above relation. The argument is the country referred to, which is Country - Iraq.

- **Relation.Entity:** This relation highlights an entity that is co-referent with a Entity. The argument is the name of the Entity.

(65) Oldfields, our Ravine Garden has been restored...

In (65) above, *Ravine Garden* is labeled with the above relation. The argument is the referred to entity, which is Entity - Oldfields.

- **Relation.Government:** This relation highlights an entity that is co-referent with a Government. The argument is the name of the Government.

(66) it (palestinian authority) fails to deliver...

In (66) above, *it* is labeled with the above relation. The argument is the referred to government, which is Government - palestinian authority.

- **Relation.Group.Political:** This relation highlights an entity that is co-referent with a Political Group. The argument is the name of the Political Group.

(67) he (arafat) is negotiating with them (hamas)

In (67) above, *them* is labeled with the above relation. The argument is the referred to political group, which is Group.Political - hamas.

- **Relation.Media.Newspaper:** This relation highlights an entity that is co-referent with a Newspaper. The argument is the name of the Newspaper.

(68) El Espectador... courage of its publisher and his staff.

In (68) above, *its* is labeled with the above relation. The argument is the referred to newspaper, which is Newspaper - El Espectador.

- **Relation.Organization:** This relation highlights an entity that is co-referent with a Organization. The argument is the name of the Organization.

(69) My concern is with the Red Cross, the Red Crescent... to see what they have to show me...

In (69) above, *they* is labeled with the above relation. The argument is the referred to organization, which is Organization1 - Red Cross and Organization2 - Red Crescent.

- **Relation.Person:** This relation highlights a entity that is co-referent with a Person. The referred to person is the argument.

(70) Hall flies to Amman, Jordan, on Friday, where he'll spend the night...

In (70) above, *he* is labeled with the above relation. The argument is the referred to person, which is Person - Hall.

- **Relation.Person.Group:** This relation highlights an entity that is co-referent with a Group of People. The argument is the name of the Group of People.

(71) Common Patrols which consist of one man and a dog

In (71) above, *which* is labeled with the above relation. The argument is the referred to group, which is Person.Group - Common Patrols.

- **Social.Relation.Person.Group.Similar:** This relation highlights a person or group of people that are nearly identical. The arguments are the people or groups that are similar.

(72) computer-maintenance workers... doubling as foreign spies.

In (72) above, *computer-maintenance workers* is labeled with the above relation. The arguments are Person.Group1 - computer- maintenance workers and Person.Group2 - foreign spies.

- **Social.Relation.Enemy:** This relation highlights a person or group that is the enemy of another person or group. Possible arguments include the 2 groups that hate each other or 2 people that hate each other.

(73) The enemy confronting our society...Hostile intelligence organizations, straying group, existing environment

In (73) above, *enemy* is labeled with the above relation. The arguments are Organization - Hostile intelligence organizations, Person.Group - straying group, and Entity - existing environment.

- **Social.Relation.Family:** This relation highlights a family member. Possible arguments are the familial relation, e.g., Brother.

(74) Maria Luz, was shot dead, and her mother wounded...

In (74) above, *mother* is labeled with the above relation. The argument is Daughter - Maria Luz.

- **Social.Relation.Friend:** This relation highlights a person who is friendly with another person or organization. The argument is the verb denoting friendship.

(75) Manuel Noriega is not only in league with the drug traffickers...

In (75) above, *Manuel Noriega* is labeled with the above relation. The argument is In League With - drug traffickers.

- **Social.Relation.Lasting:** This relation is similar to the Friend relation but stronger. There must be evidence that the entities have been related or been friends for an extended period of times. The arguments are the entities in the long-lasting relation.

(76) Castro... has broken off with the Medellin drug cartel ...

In (76) above, *Castro* is labeled with the above relation. The arguments are Person.Group - Medellin drug cartel and Person - Castro.

- **Subpart.Building:** This relation highlights a smaller part of a building such as a lobby. The argument is the name of the Building.

(77) ICU rooms are full so we just don't have the surge capacity...

In (77) above, *ICU rooms* is labeled with the above relation. The argument is Building - hospital.

## **5 Annotation Tool**

### Annotation Tools

- GATE (Sheffield)
- PropBank

## **6 Sources**

### Sources

- ACE (UPenn)
- NIST
- Merriam Webster Online Dictionary