The Components of FrameNet

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Road Map

• FrameNet

• Frames
  – Frame Elements
  – Lexical Units

• FrameNet Annotation
  – Lexicographic Annotation
  – “Full-Text” Annotation

• Frame-to-Frame Relations
Road Map

✓ FrameNet

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What is FrameNet?

• A unique knowledge base with information on the mapping of meaning to form through the theory of Frame Semantics (Fillmore 1975, 1985, Fillmore and Atkins 1986, Fillmore and Baker 2010, Fillmore 2012, Fontenelle 2003, Petruck 1996)

• A resource that provides rich semantics for the core English vocabulary based on manually annotated corpus evidence, including valence descriptions for each item analyzed
What’s “in” FrameNet?

• ~ 1,200 semantic frames (including FEs)
• > 13,100 lexical units
• 200,000 manually annotated examples
• nearly 1,800 frame-to-frame relations constituting a hierarchy of semantic frames
Road Map

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What’s a Frame?

A Semantic Frame is a script-like structure of inferences, linked by linguistic convention to the meanings of linguistic units - here, lexical items - constituting a schematic representation of a situation, object, event, or relation providing the background structure against which words are understood. Each frame identifies a set of frame elements – participants in the frame.
Semantic Frames in FrameNet

- Situation: Being_attached, Being_necessary, Being_strong, Being_wet, etc.
- Event: Apply_heat, Borrowing, Catching_fire, Cooking_creation, Hiring, Replacing, etc.
- Object: Buildings, Containers, Intoxicants, Offenses, People_by_origin, etc.
- Relations: Locative_relation, Spacial_co-location, Interior_profile_relation, Similarity, etc.
What’s “in” a Frame?

• **Frame Definition**
  a prose description of a *situation* involving various participants and other conceptual roles, each of which constitutes a frame element

• **Frame Elements (FEs):**
  *semantic roles* as the basic unit of a frame, defined specifically to each frame

• **Lexical Units (LUs):**
  pairing of a lemma and a frame, i.e. “word” in one of its senses; LU *evokes* a frame
Apply\textsubscript{heat}: Definition

A Cook applies heat to Food, where the Temperature\_setting of the heat and Duration of application may be specified. A Heating\_instrument, generally indicated by a locative phrase, may also be expressed. Some cooking methods involve the use of a Medium (e.g. milk or water) by which heat is transferred to the Food.

This frame focuses on the process of handling the ingredients, rather than the end result (See Cooking\_creation).
Apply_heat: Frame Elements

Cook
Food
Temperature_setting
Duration
Heating_instrument
Medium

Lila FRIED the eggs in a copper pan.
Frame Elements: Coreness

- Core: uniquely defines a frame
  
  **Commerce**: Buyer, Seller, Money, Goods

- Peripheral: for aspects of events in general
  
  e.g. Time, Place, Manner

- Extrathematic: situate an event against the backdrop of another state of affairs; conceptually do not belong to the frame in which they occur
  
  - e.g. Iteration, Recipient

  Sue **BAKED** the cookies [twice Iteration].

  Sue **BAKED** the cookies [for me Recipient].
Frame Elements

Triple of Information

Frame Element
• semantic role

Grammatical Function
• External, Object, Dependent

Phrase Type
• full range of PTs for language
Apply_heat: Lexical Units

bake.v, baking.n barbecue.v, blanch.v, boil.v, braise.v, braising.n, broil.v, brown.v, char.v, coddle.v, cook.v, deep fry.v, fry.v, frying.n, grill.v, microwave.v, parboil.v, plank.v, poach.v, roast.v, saute.v, scald.v, scorch.v, sear.v, searing.n, simmer.v, singe.v, steam.v, steep.v, stew.v, toast.v
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Lexicographic Annotation

• What?
  – Dependents of one TARGET per example sentence
    • constituents that instantiate Frame Elements (semantic roles), including prepositions
  – Null Instantiated Core FEs

• Why?
  – show TARGET word (= LU) use in language
  – determine valence description of each TARGET
  – account for non-instantiated FEs
  – FN began as a computational lexicography project
Null Instantiation

• Constructional Null Instantiation (CNI)
  – construction licenses omission
    • imperative, agentless passive

• Definite Null Instantiation (DNI)
  – lexically specific, understood from discourse, knowledge of missing material required for determining referent
    • Frank **RETAILED** after the bar incident. **Offender DNI**

• Indefinite Null Instantiation (INI)
  – lexically specific, intransitive use of transitive verbs (e.g. eat, drink, sew, **bake**), knowledge of category of missing material, even if not mentioned in previous discourse or context
Lexicographic Annotation:

Apply_heat.bake.v

FE: BAKE [the souffle Food] [for 12 minutes Duration]

GF: Object

PT: NP

NH: Dep

PP: for

FrameNet Tutorial

NAACL 2015
Cover and BAKE [in a preheated 200°C/400°F/Gas 8 oven] for 15-20 minutes.
### Lexicographic Annotation Results: Apply\_heat.bake.v

<table>
<thead>
<tr>
<th>Number Annotated</th>
<th>Patterns</th>
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<tr>
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<td>CNI</td>
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FrameNet Tutorial

NAACL 2015
Cooking_creation: Definition

A Cook creates a Produced_food from (raw) Ingredients. The Heating_Instrument and/or the Container may also be specified. This frame describes food and meal preparation.
Cooking_creation: Frame Elements

Cook
Produced_food
Ingredients
Heating_Instrument
Container

Sam **MADE** vegetable soup for dinner last night.
Cooking_creation: Lexical Units

bake.v, baking.n, concoct.v, cook up.v, cooking_up.n, cook.n, cooking.n, cook.v, make.v, put together.v, whip up.v,
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✓ FrameNet Annotation
  ✓ Lexicographic Annotation
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• Frame-to-Frame Relations
Lexicographic Annotation: 
Cooking_creation.bake.v

429-s20-lcoll-bread
1. The bread would then be slipped in, the oven door sealed, and when the oven cooled, the bread would be BAKED. CNI

429-s20-rcoll-bread
1. It is also illegal in Norway for a bakery to BAKE bread on a Saturday or Sunday. CNI
2. Almost all the food is grown at camp; they BAKE their own bread and the food is not only 100% nutritious but very delicious.
3. Rosalind BAKES her own bread and croissants and will prepare an evening meal with advance notice.
4. And she BAKES some bread with the millet flour that she had brought from her own garden.

429-s20-rcoll-cake
1. Some larger stores sell special tins of all the numbers so you can BAKE a cake in the shape of your child’s age.
2. Believing in economy, Miss Lodworth had already BAKED rock and fairy cakes and spread hundreds of sandwiches with crusts still on with Marmite and plum jam which was cheaper than strawberry.

429-s20-rcoll-minute

429-s20-rcoll-oven

550-s20-np-np
1. And she would BAKE a chocolate mousse torte.
2. And for tomorrow’s Sunday dinner, she was going to roast a leg of mutton and BAKE an apple pie.
3. I BAKED some currant buns for you.
4. The wife of Senator Arlen Specter even BAKED Ali a double chocolate-mousse pie.

570-s20-np-pfor
1. Louise had BAKED a pie for him and was bringing a new pair of sheets from the airing cupboard.

620-s20-np-pother

650-s20-np-pother

660-s20-trans-simple

670-s20-pass-by

680-s20-pass
1. In Spain, breads flavoured with cinnamon and dried fruit are BAKED at Easter, and some contain hard-boiled eggs, according to Elizabeth Luard’s European Festival Food.
2. A special birthday cake was BAKED to mark the occasion, which was held in Graham School.
Lexicographic Annotation Results:
Cooking_creation.bake.v

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<td>Cook</td>
<td>ingredients</td>
<td>Produced food</td>
</tr>
<tr>
<td>1 TOTAL</td>
<td>CNI</td>
<td>Place</td>
<td>Produced food</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Time</td>
</tr>
<tr>
<td>2 TOTAL</td>
<td>Cook</td>
<td>Produced food</td>
<td>Purpose</td>
</tr>
</tbody>
</table>

FrameNet Tutorial

NAACL 2015
Lexicographic Annotation Results:

**Cooking_creation**: bake.v

[Cook The wife of Senator Arlen Specter] even \textit{BAKED} \textit{target} \textit{RecipientAlt} \textit{Produced_food\double chocolate-mousse\ pie}.

[Cook Louise] \textit{BAKED} \textit{target} \textit{Produced_food\some currant buns} \textit{Recipient for you}.

[Cook Louise] had \textit{BAKED} \textit{target} \textit{Produced_food\double chocolate-mousse\ pie} \textit{Recipient for him} and was bringing a new pair of sheets from the airing cupboard.

\textbf{FE:} \textit{I COOK} \textit{BAKED [s}ome currant buns \textit{produced__food} \textit{for you}\textit{RECIPIENT}. \textbf{GF:} External Object \textbf{PT:} NP NP

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NAACL 2015
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• Frame-to-Frame Relations Postponed
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✓ Frame-to-Frame Relations
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Frame-to-Frame Relations in FN

- Inheritance
- Using
- Subframes
- Precedes
- Perspective_on
- See also
- Inchoative_of
- Causative_of

regular lexical relations
Inheritance

• Relationship between a more general frame, the parent frame, and a more specific one, the child
• Child frame elaborates parent frame
• Corresponding entities, FE, frame relation, and semantic characteristics, in both child and parent
• Child frame entity is the same as or more specific than in parent frame

Apply_heat inherits Intentionally_affect
FrameGrapher

Current Frame: Apply_heat

Legend
- Parent frame ➔ Child frame
- Parent-Child Relation Types:
  - Inheritance
  - Subframe
  - Perspective On
  - Using
  - Condition Of
  - Indirect Of
  - See Also
- Ordering Relation:
  - Precedes
Using (weak inheritance)

• ...a relationship between a more general frame (*parent*) and a more specific frame (*child*) in which only *some* of the FEs in the parent frame have a corresponding entity in the child frame; if correspondences exist, they are more specific.

*Cooking_creation* uses *Apply_heat*
FrameGrapher

Activity

Intentionally_affect

Creating

Intentionally_act

Apply_heat

Absorb_heat

Cooking_creation

9 children total

Legend

Parent frame ➔ Child frame

Parent ➔ Child Relation Types:

Inheritance

Subframe

Perspective On

Using

Comitative Of

Inclusive Of

See Also

Ordering Relation:

Procedural
Fe to Fe mapping

F to F relation
Subframes

...a relationship that characterizes the different (typically, ordered) parts of a complex event in terms of the sequences of states of affairs and transitions between them, each of which can itself be described as a frame.

Getting_a_job is a subframe of Employee_scenario

Hiring is a subframe of Employer_scenario
Precedes

...captures the temporal ordering of subevents within a complex event. The relation holds between component subframes of a single complex frame, and provides additional information to the set of Subframe relations

Being_awake precedes Falling_asleep
Subframes and Precedes
FrameGrapher

Legend

Parent frame \rightarrow Child frame

Parent-\rightarrow Child Relation Types:

- Inheritance
- Subframe
- Perspective Dis
- Liking
- Cause or of
- Inclusive or of
- See Also

Ordering Relation:

- Proceeds
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✓ “Full-Text” Annotation
Full-Text Annotation

• What is full-text annotation?
  – annotation with respect to every frame evoking element in a text
  – multiple layers of lexicographic annotation

• Why did FN \textit{add} full-text annotation?
  – demonstrate the contribution of Frame Semantics to text understanding
  – client/user considerations
Full-Text Annotation

39. A series of DISASTROUS Catastrophe DECISIONS Deciding at the BEGINNING Temporal subset of the 20th CENTURY Calendar unit BEGAN Activity start to SOUND Make noise a DEATH knell for the Ottoman EMPIRE Political locales. The Turks LOST Final competition a SHORT duration description WAR Hostile encounter with Italy, and were FORCED Concession to RELINQUISH Forgoing possession the Dodecanese ISLANDS. Natural features to the ITALIANS People by origin, Greece took this opportunity to absorb the ISLANDS Natural features of the NORTHERN Part orientational and EASTERN Part orientational Aegean and to add Macedonia to its mainland TERRITORIES Political locales.

40. FOLLOWING Temporal subset this DECADE Catastrophe the OTTOMAN People by origin RULERS Leadership, and Kemal ATATÜRK ROSE Motion directional to POWER Leadership on a WAVE Quantified mass of POPULAR Massivity support. He PROMISED Commitment a MODERN Stage at progress STATE Leadership for his PEOPLE People, but as the situation BECAME Becoming Volatile, Civil STRIFE Hostile encounter BROKE Process start IN Interior profile relation TURKISH CITIES Political locales, and those CONSIDERED Categorization GREEK People by origin were VICTIMS Undergoing of THREATS Commitment and violence. Many HAD acquired event to LEAVE Departing their birthplaces, PLEASING Pleading TO Give Lesvos Chios, and Samos, the Greek ruled ISLANDS Natural features just OFFSHORE Locate relation THOUSANDS Quantified mass of PEOPLE People ARRIVED Among with little MORE Increment than the CLOTHES Clothing they WORE Wearing. PUTTING Placing Great strain on the resources of the ISLANDS Natural features. FINALLY Temp vector Greece was OUSTED Removing from its NEW Age TERRITORY Political locales IN Interior profile relation Asia Minor, which BECAME Becoming PART Part whole of the NEW Age TURKISH Empire STATE Political locales.

42. Greece ATTEMPTED Attempt to STAY State continue out of World WAR Hostile encounter II, but Mussolini SAW Categorization Greece as an IDEAL Usefulness addition to his ITALIAN Empire Political locales. His FORCES Military made a series of ATTACKS Attack from their BASES Locate by use IN Interior profile relation the Dodecanese ISLANDS Natural features, including inclusion sinking a GREEK Origin NAVAL Military VESSEL Vehicle IN Interior profile relation the HARBOR Locate by use of Thess TOWN Political locales, but they only ACCOMPLISHED Success acquire failure in STRENGTHENING Cause change of strength the resolve of the POPULATION Aggregate Against Taking sides them. LATER Time vector the GERMANS People by origin CAME Arriving in FORCE Military and occupied MANY Quantified mass of the ISLANDS Natural features.

43. AFTER Temp vector the WAR Hostile encounter IN Temporal subset 1949, the Dodecanese ISLANDS Natural features FINALLY Temp vector BECAME Becoming PART Part whole of the GREEK Origin NATION Political locales. But the COUNTRY Political locales was politically FRAGMENTED Fragmented cause in fragment, with ARGUMENTS barging between monarchists and republicans, right and left, and tension escalated into civil WAR Hostile encounter. The STRUGGLE Hostile encounter by pass most of the ISLANDS Natural features. ALTHOUGH Concessive THERE Exisitence WAS Existence fierce FIGHTING Hostile encounter ON spatial contact Samos. Even AFTER Temp vector the FIGHTING Hostile encounter STOPPED Process stop MORE Increment than a DECADE Calendar unit, LATER Time vector the COUNTRY Political locales was not stable.

44. At the same time, the massive GROWTH Change position on a scale in air and ROAD Transport CATEGORIZE Change position on a scale in IMPORTANCE Importance. The Aegean ISLANDS Natural features, which for CENTURIES Measure duration had been IMPORTANT Importance PORTS Locate by use on the trading ROUTES Roadways, BECAME BECAME Becoming the BACKWATERS Isolated places of this NEW Age TRANSPORT Transport NETWORK Network and the ECONOMY Economy of SEVERAL Quantified mass ISLANDS. Natural features came close to collapse.

45. IN Temporal subset 1977, the MILITARY Military took the reins of POWER Leadership in Interior profile relation Athens, and UNTIL Temp vector 1974, the "Colonels" held sway with a repressive and brutal REGIME Leadership. MANY Quantified mass GREEK People by origin Islanders CHOSE Choosing to LEAVE Departing rather than live in POVERTY Poverty and TERROR Terror, and MANY Quantified mass MADE Made intentionally create NEW Age Homes Buildings in Interior profile relation the United States and Australia. The EXPANSION Expansion of air TRAVEL Travel BEGAN Activity start the AGE Calendar unit of mass TOURISM Tourism, and Greece along with the Aegean ISLANDS Natural features BECAME Becoming EXCITING Stimulus focus destinations for NORTHERN Part orientational Europeans ESCAPING Avoid their DAMP Being wet, COOL Temperature SUMMERS Calendar unit.
39. A series of DISASTROUS Disasters DECISIONS Deciding at the BEGINNING Temporal subregion of the 20th CENTURY Calendaric unit BEGAN Activity start to SOUND Make noise a DEATH Death knell for the Ottoman EMPIRE Political locales. The Turks LOST Finish competition a SHORT Duration description WAR Hostile encounter with Italy, and were FORCED Causation to RELINQUISH Surrendering possession the Dodecanese ISLANDS Natural features to the ITALIANS People by origin. Greece took this opportunity to absorb the ISLANDS Natural features of the NORTHERN Part orientational and EASTERN Part orientational Aegean and to add Macedonia to its mainland TERRITORIES Political locales.

40. FOLLOWING Relative time this DEBACLE Catastrophe, the OTTOMANS People by origin then allied themselves to Germany in the World WAR Hostile encounter I, LOSING Earnings and losses MORE Increment TERRITORY Political locales with the DEFEAT Beat opponent of the GERMANS People by origin in that WAR Hostile encounter. Greece was HANDED Giving a STRIP Shapes of land along the WESTERN Part orientational COAST Relational natural features of Asia Minor, which for over 2,000 YEARS Measure duration had HAD Possession a substantial GREEK Origin POPULATION Aggregate. Greece moved in to ADMINISTER Leadership the land, but a NEW Age INFLUENCE Objective influence UPSET Preventing any GRAND Dimension dreams of MAKING Cause change this REGION Locale a PART Part whole of greater Greece.

**TARGET**

Named Entity

Italics

FrameNet annotation provided

Handled by named entity recognizer

No annotation provided
40. FOLLOWING Relative_time this DEBACLE Catastrophe, the OTTOMANS People_by_origin then allied themselves to Germany in the World WAR Hostile_encounter I, LOSING Earnings_and_losses MORE Increment TERRITORY Political_locales with the DEFEAT Beat_opponent of the GERMANS People_by_origin in that WAR Hostile_encounter. Greece was HANDED Giving a STRIP Shapes of land along the WESTERN Part orientational COAST Relational_natural_features of Asia Minor, which for over 2,000 YEARS Measure_duration had HAD Possession a substantial GREEK Origin POPULATION Aggregate. Greece moved in to ADMINISTER Leadership the land, but a NEW Age INFLUENCE Objective_influence UPSET Preventing any GRAND Dimension dreams of MAKING Cause_change this REGION Locate a PART Part_whole of greater Greece.
40. **FOLLOWING** Relative time *this DEBACLE*, the **OTTOMANS** People by origin then allied themselves to **Germany** in the World **WAR** Hostile encounter, **LOSING** Earnings and losses **MORE** Increment **TERRE** TORY Political locales with the **DEFEAT** Beat opponent of the **GERMANS** People by origin in that **WAR** Hostile encounter. **Greece** was HANDED Giving a **STRIP** Shapes of land along the **WESTERN** Part orientational **COAST** Relational natural features of **Asia Minor**, which for over 2,000 **YEARS** Measure duration had **HAD** Possession a substantial **GREEK** Origin **POPULATION** Aggregate. **Greece** moved in to **ADMINISTER** Leadership the land, but a **NEW** Age **INFLUENCE** Objective influence **UPSET** Preventing any **GRAND** Dimension dreams of **MAKING** Cause_change this **REGION** Locale a **PART** Part whole of greater **Greece**.

Clear Sentences   Turn Colors On

[X] **FOLLOWING** Target *Landmark occasion the debacle*, [Focal occasion the Ottomans then allied themselves to Germany in the World War I , losing more territory with the defeat of the Germans in that war].

[X] Following this [Undesirable Event DEBACLE Target], the Ottomans then allied themselves to Germany in the World War I, losing more territory with the defeat of the Germans in that war. [Undergoer DNI]
40. **FOLLOWING** Relative_time *this DEBACLE* Catastrophe, *the OTTOMANS* People_by_origin then allied themselves to Germany in the World War Hostile_encounter. *LOSEING* Earnings_and_losses MORE Increment TERRITORY Political_locales with the DEFEAT Beat_opponent of the GERMANS People_by_origin in that WAR Hostile_encounter. *Greece was HANDED* Giving a STRIP Shapes of land along the WESTERN Part orientational COAST Relational_natural_features of Asia Minor, which for over 2,000 YEARS Measure duration had HAD Possession a substantial GREEK Origin POPULATION Aggregate. *Greece moved in to ADMINISTER* Leadership the land, but a NEW Age INFLUENCE Objective_influence UPSET Preventing any GRAND Dimension dreams of MAKING Cause_change this REGION Locale a PART Part_whole of greater Greece.

Clear Sentences  Turn Colors On

[X] FOLLOWING Target [Landmark_occasion this debacle], [Focal_occasion the Ottomans then allied themselves to Germany in the World War I, losing more territory with the defeat of the Germans in that war].

[X] Following this Undesirable_Event DEBACLE Target, the Ottomans then allied themselves to Germany in the World War I, losing more territory with the defeat of the Germans in that war. [UndergoerDNI]

[X] Following this debacle, the [Person OTTOMANS Target] then allied themselves to Germany in the World War I, losing more territory with the defeat of the Germans in that war.
Thanks!


References


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