

*Building the MetaNet metaphor repository:
The natural symbiosis of metaphor analysis and
construction grammar*

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Overview

- MetaNet project goals
- System design and specifications
- A step-by-step extraction example
- Future applications

MetaNet Project Goals

1. To identify **linguistic metaphors** (LMs, metaphoric phrases) in real texts.
2. Subsequently to identify **conceptual metaphors** (CMs) that those linguistic metaphors evoke.
3. To create a computational system that uses known interconnected metaphor networks to find new LMs, and correctly identify their CMs, based on associated lexical units (LUs) found in the LMs.

Role of constructions

- To identify metaphors in text, grammatical context is needed.
 - Consider ‘poverty cripples the inner city’ vs.
‘we must cripple poverty with new policies’
- Target and source domain frames are linked to particular grammatical slots (Lakoff 1995, Goldberg 1995, Sullivan 2007, 2013).

Resources

- Using MetaNet, FrameNet
 - MetaNet schemas (definitions, relations, roles, and lexical items) designed in large part on the FrameNet model with many commonalities.
 - Large MetaNet growing database of metaphoric and other schema-to-schema relations
 - Perform metaphor extraction also with the help of FrameNet frames and WordNet.
- Additions
 - Metaphors: schema-to-schema relations (frame-to-frame).
 - Constructions: currently simple, but gradually building compatibility with ECG.
 - Schema and construction design is geared towards linguistic metaphor detection in natural texts.

Systems Design

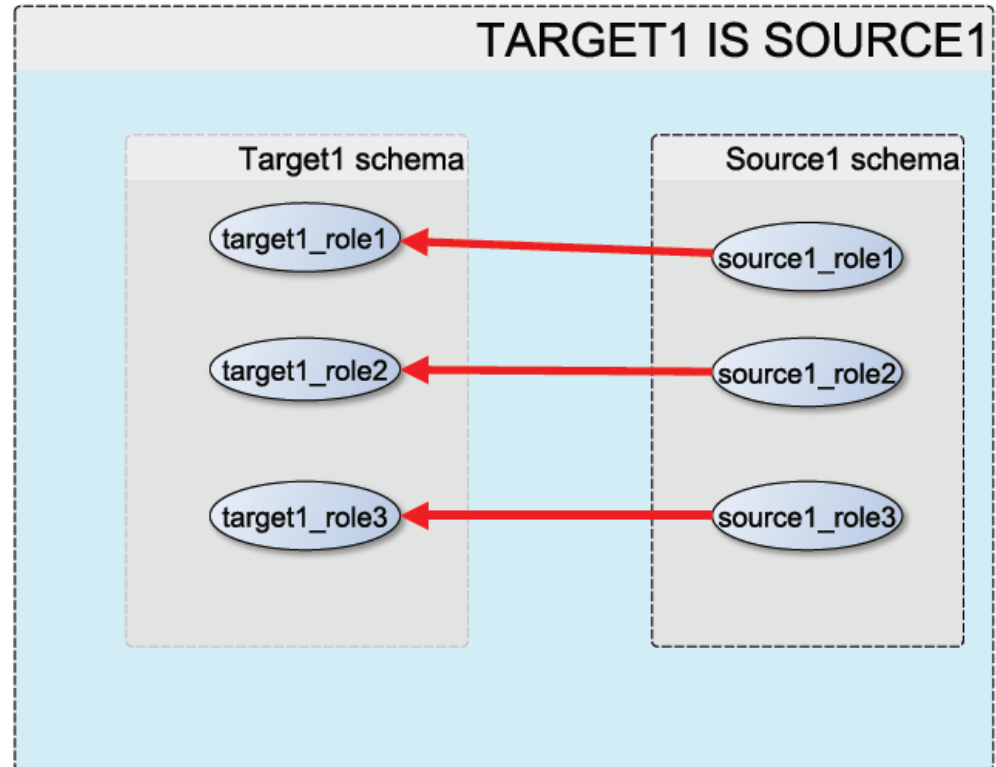
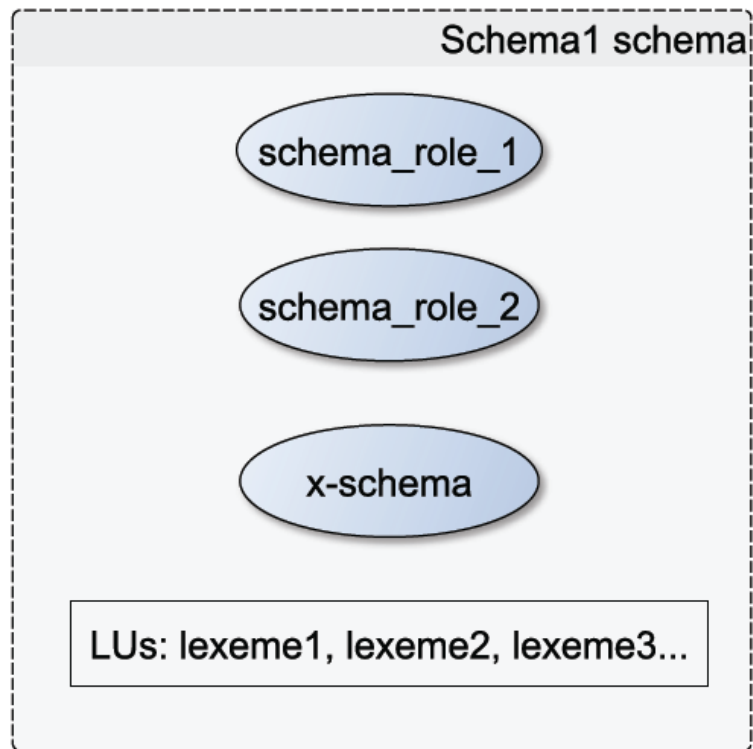
Manual portion

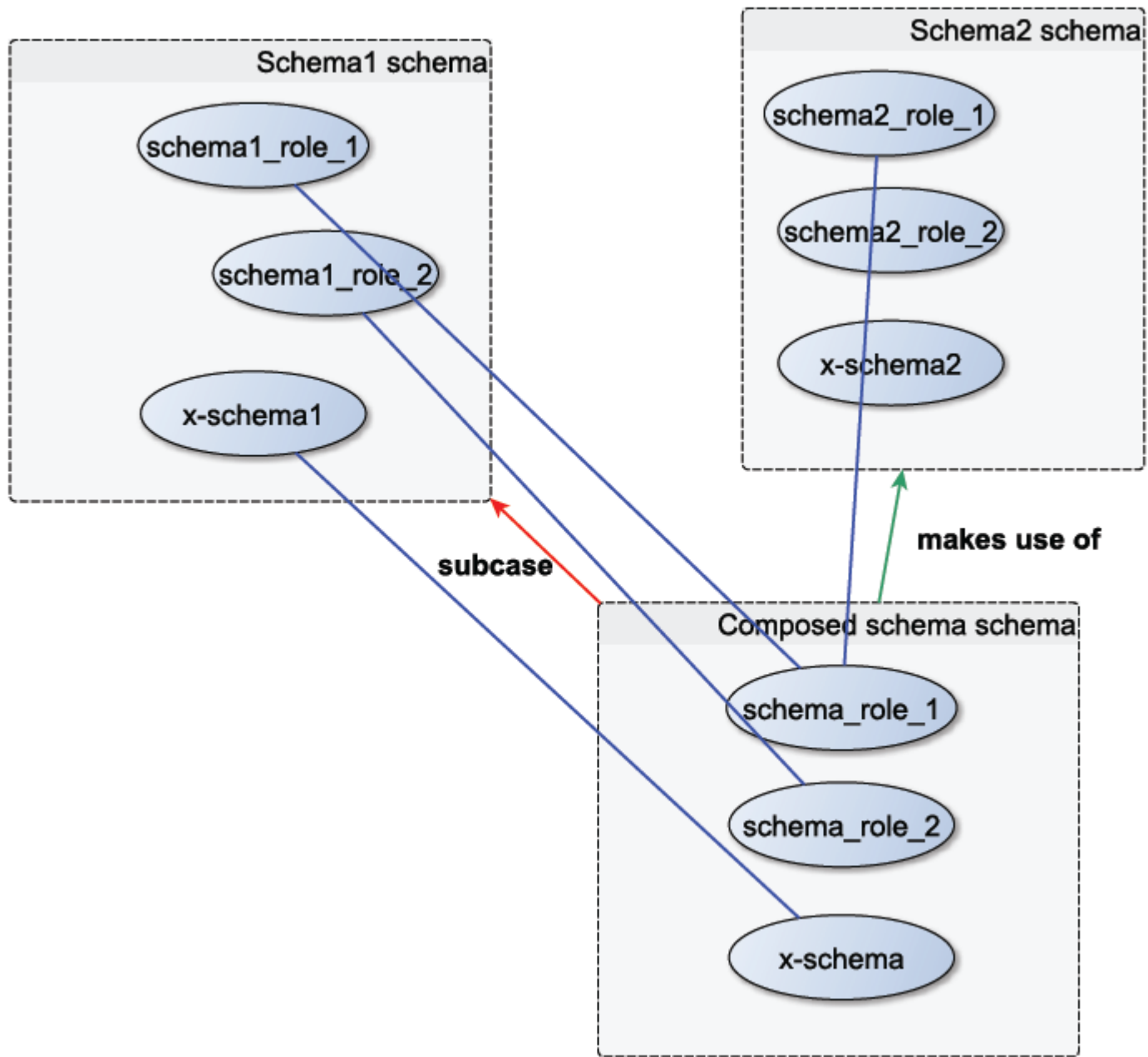
- A database of manually-entered **schemas** (frames and cogs) and **metaphors** (schema-to-schema mappings)
- Input method used is the MetaNet Wiki (4 languages).

	Persian	Russian	Spanish	English
metaphors	190	124	541	732
schemas	306	265	443	627

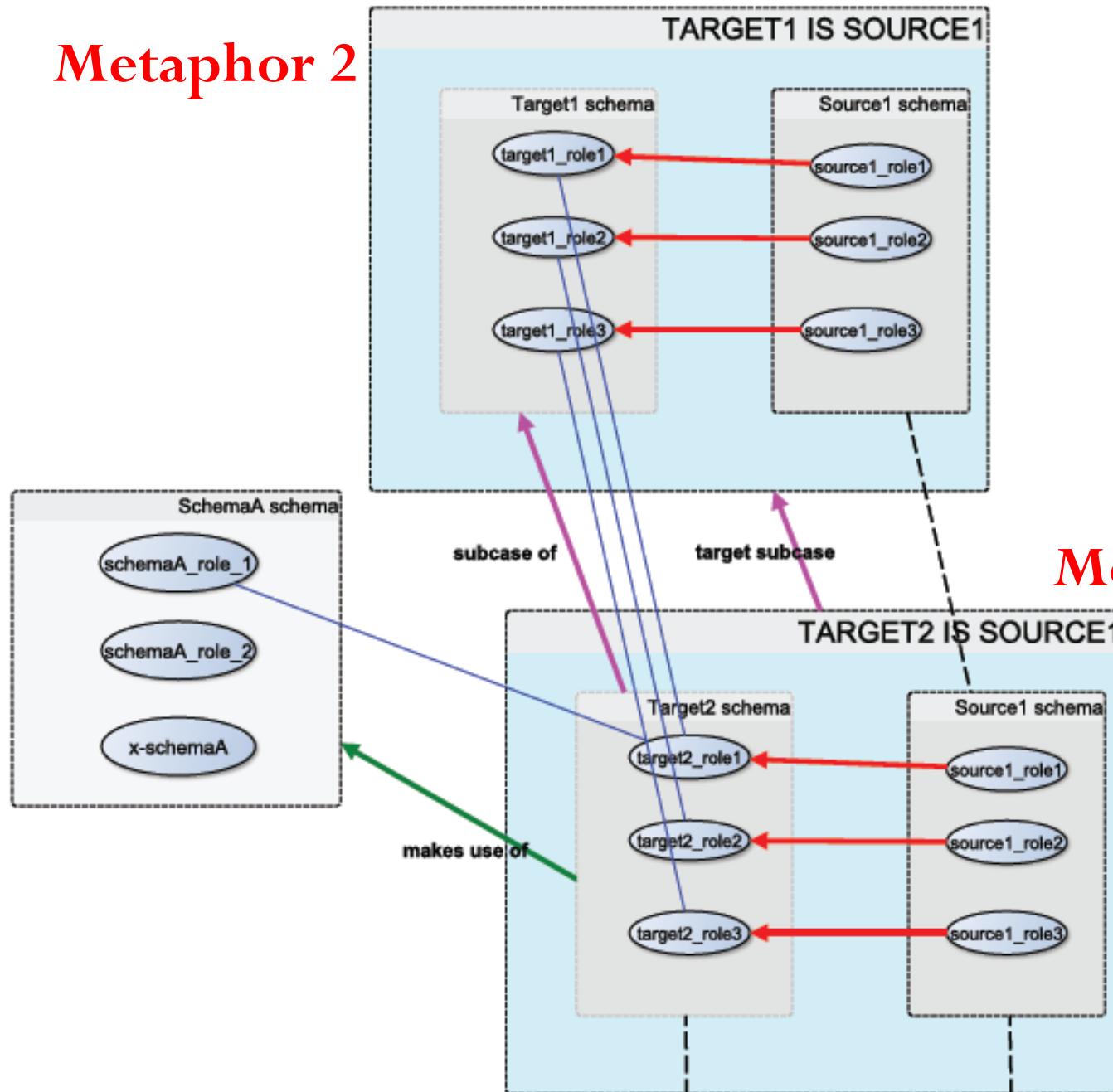
- Schemas are interrelated in networks with relations (makes use of, is a subcase of, is a perspective on)
- Schemas are assigned to source and target domain fields of metaphors.
- Schemas have roles as well as lexical units, facilitating detection in texts.

Schema and Metaphor Formalization



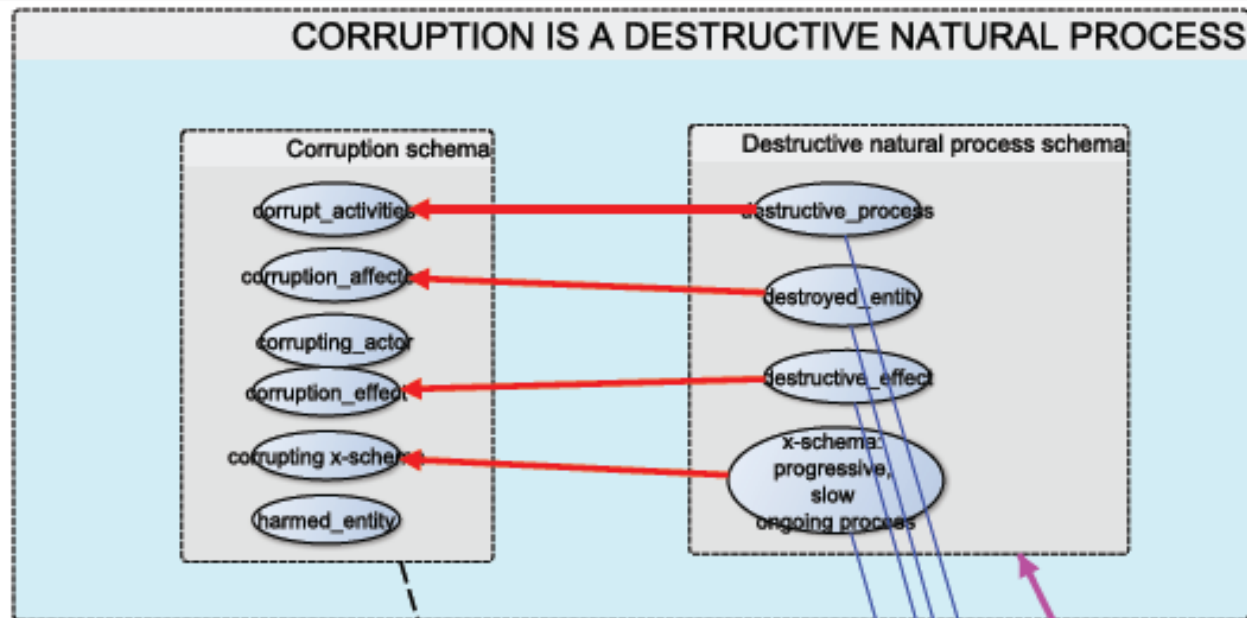


Metaphor 2

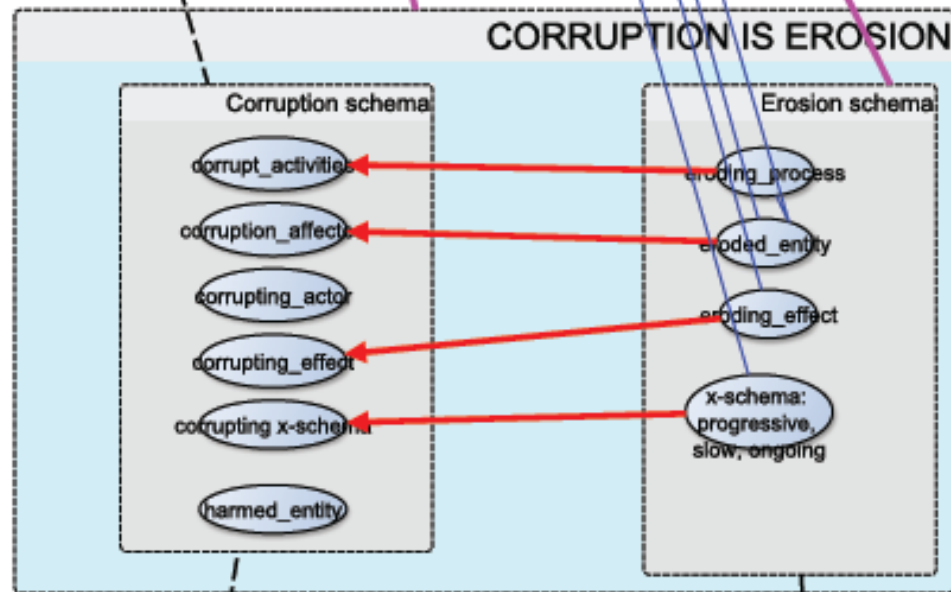


Metaphor 1

Metaphor 2



Metaphor 1



source subcase

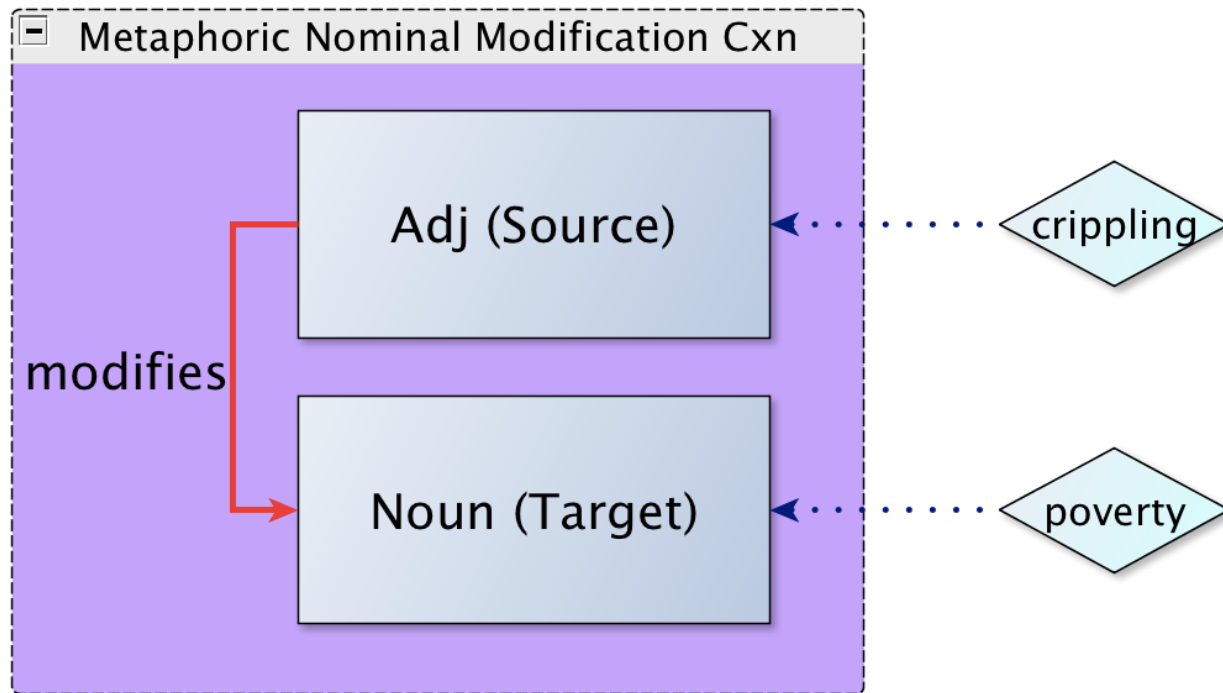
subcase of

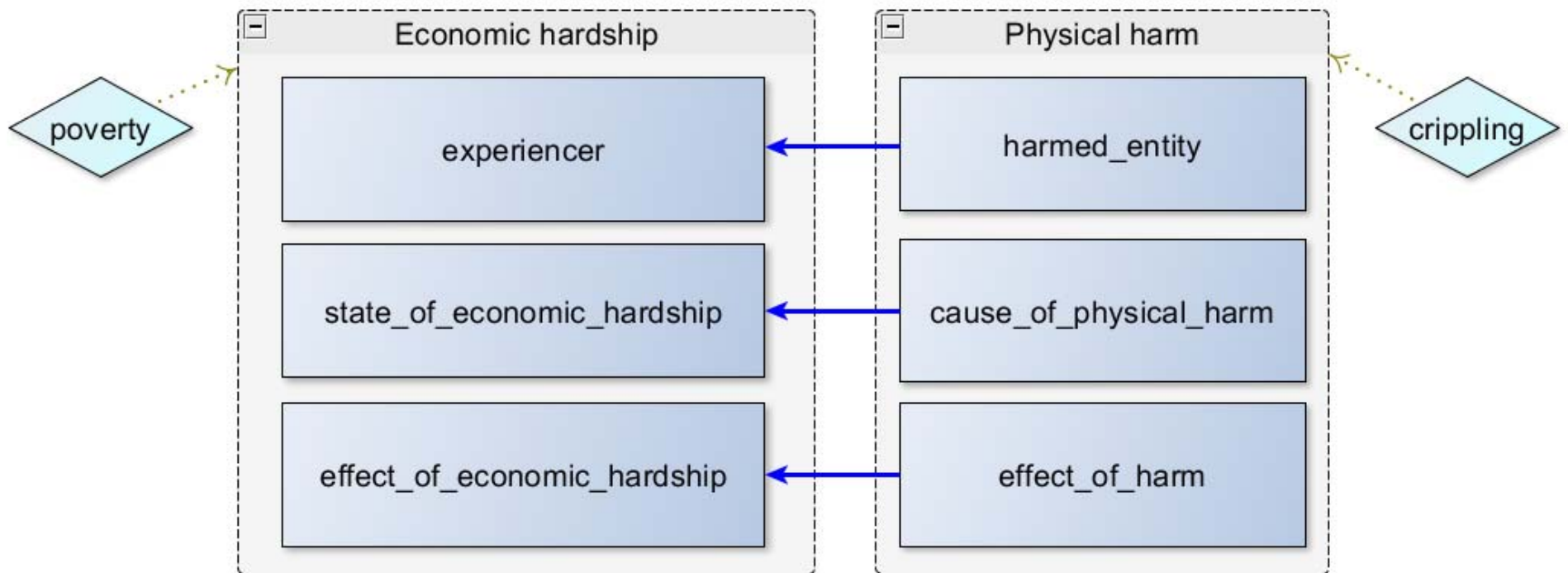
Combining constructions with MetaNet metaphors

- The constructions that the system uses are manually specified simple (two-slot) cxns:
- Their slots are specified for Target or Source status, given commonly-found patterns in that language.
 - Subject(T)-Verb(S): *poverty attacks, debt crushes, taxes infect, taxes destroy, wealth cushioned*
 - Verb(S)-Object(T): *attack poverty, raising taxes, build wealth*
 - Noun(T)-noun(S): *income gap, poverty slump, debt burden, poverty epidemic, legislative firestorm*
 - Noun(S)-of-noun(T): *abyss of poverty, hurricane of taxes, dungeon of poverty*
 - Adjective(S)-noun(T): *crumbling tax system, crippling poverty, oppressive debt*

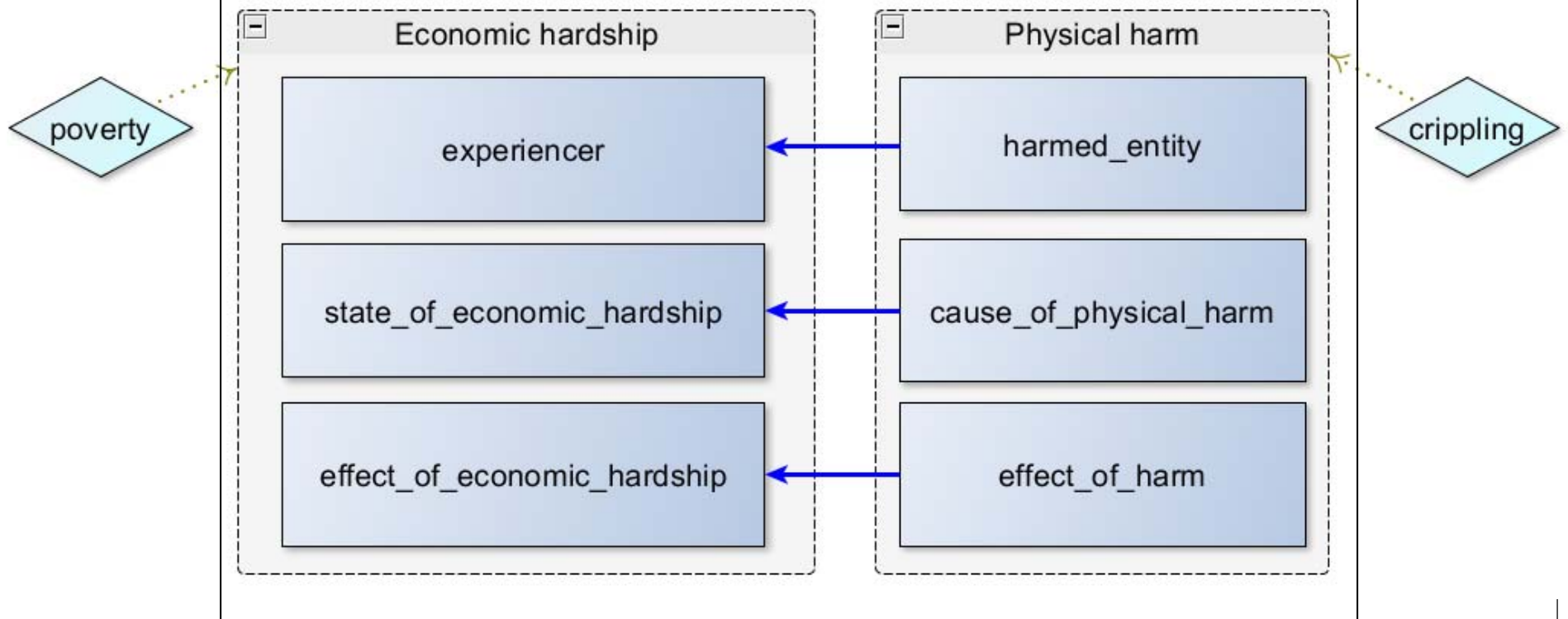
Combining constructions with MetaNet metaphors

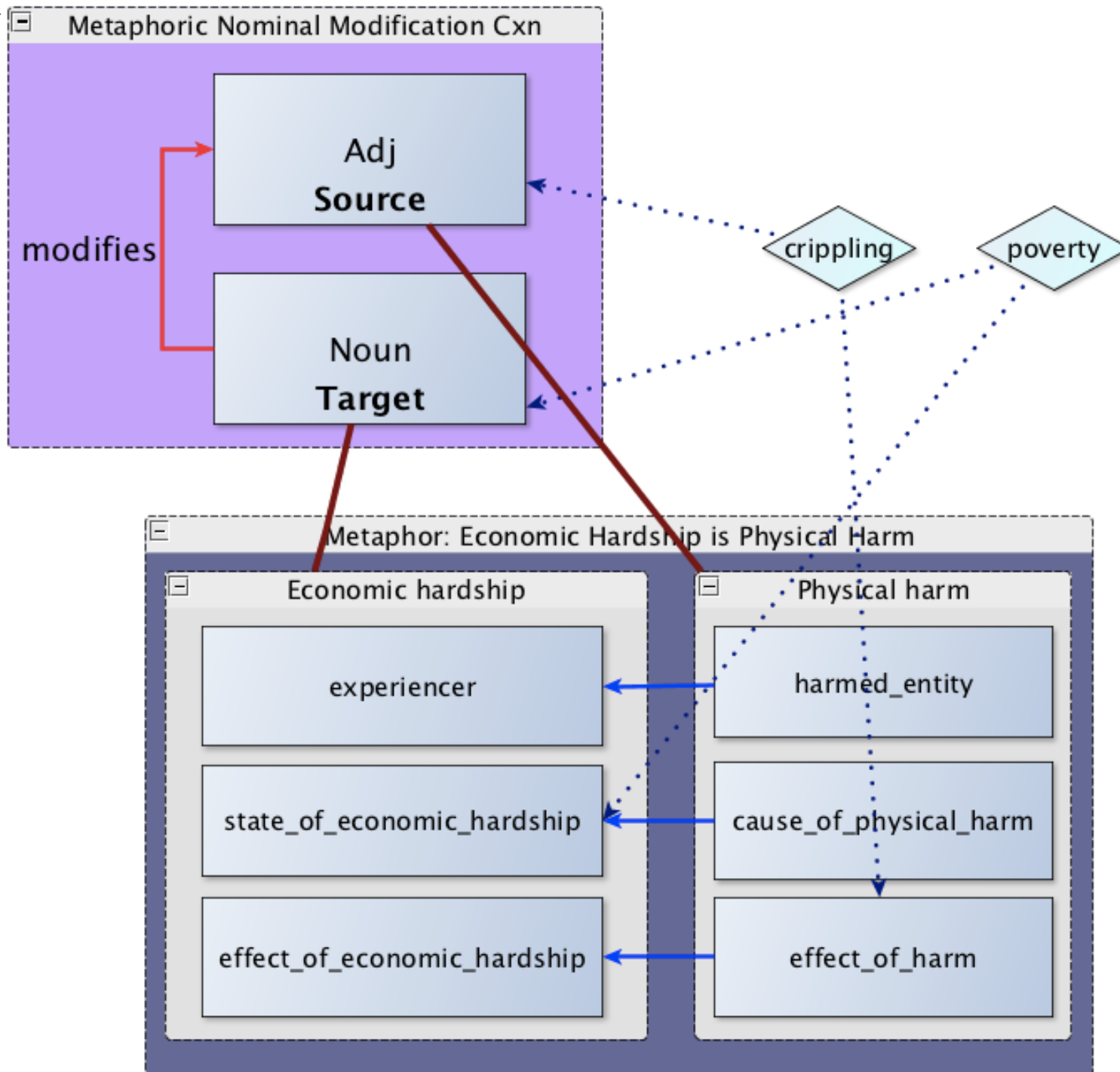
- E.g. “crippling poverty”
 - Adjective-Noun (specifically **predicative adjectival** construction, Sullivan 2007)





Metaphor: ECONOMIC HARDSHIP IS PHYSICAL HARM





System Design

- Automated portion
 - A metaphor LM extraction system that retrieves LMs from texts from the wild (corpora, the internet)
 - The extraction system uses grammatical constructions to match LMs to CMs.

Step-by-step extraction

- Step 1: Extractor finds a target LU in a portion of text.

Poverty continues to cripple millions of Canadians - the majority of which are children - across the country today. (<http://kathydobson.ca/tag/montreal/>)

- Identifies **poverty.n** as an LU in the Poverty schema.
- Step 2: using POS tagging recognition and dependency relations, the extractor identifies the cxn that the LU is found in, and its role in that cxn.
 - ‘poverty’ is identified as the subject of a Subj-Verb cxn, where subject is TARGET and verb is SOURCE.

Step-by-step extraction

- Step 3: Given the identified cxn, the extractor uses POS tagging and dependency relations to identify a source LU in the available constructional slot.
 - *poverty continues to **cripple*** ('cripple' is the verb in the Subj-Verb cxn, where subject is TARGET and verb is SOURCE).
- Step 4: the system matches the identified source LU to a repository schema
 - cripple.v is found in both **Harm_to_living_entity** and **Motion_impediments** schemas

*Poverty continues to **cripple** millions of Canadians- the majority of which are children- across the country today.*

target LU=**Poverty**

target schema=Poverty

source LU=**cripple**

source schemas=Harm_to_living_entity, Motion_impediments

CMs=POVERTY IS PHYSICAL HARM,

EXPERIENCING A NEGATIVE STATE IS EXPERIENCING HARM,

ECONOMIC HARDSHIP IS PHYSICAL HARM

cxn= T-subj_aspV_S-verb

*Poverty continues to **cripple** millions of Canadians- the majority of which are children- across the country today.*

POS: Poverty=poverty=NN=0 continues=continue=VBZ=1
to=to=TO=2 cripple=cripple=VB=3 millions=million=NNS=4
of=of=IN=5 Canadians-=Canadians-=NP=6 the=the=DT=7
majority=majority=NN=8 of=of=IN=9 which=which=WDT=10
are=be=VBP=11 children-=children-=JJ=12 across=across=IN=13
the=the=DT=14 country=country=NN=15 today=today=NN=16
.=.=SENT=17

Dependency relations:

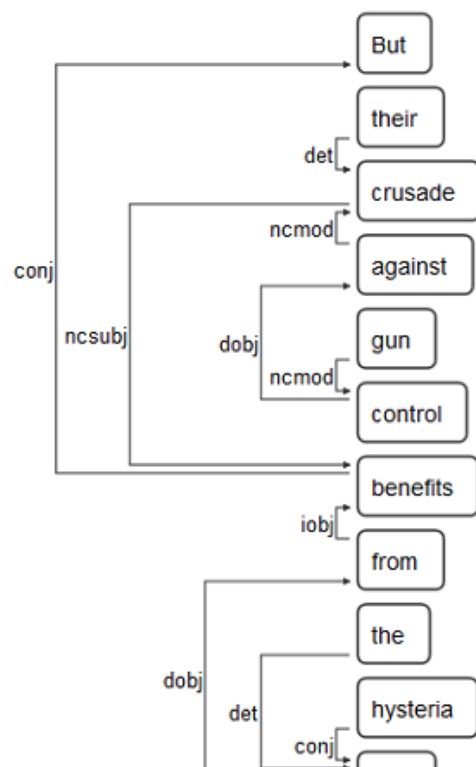
"Poverty"-0 is nsubj of "continues"-1
"cripple"-3 is xcomp of "continues"-1
"millions"-4 is dobj of "cripple"-3
"of"-5 is nmod of "are"-11
"Canadians- "-6 is dobj of "of"-5
"the"-7 is det of "majority"-8
"majority"-8 is nsubj of "are"-11
"of"-9 is iobj of "majority"-8
"which"-10 is dobj of "of"-9
"are"-11 is ccomp of "cripple"-3
"children- "-12 is xcomp of "are"-11
"across"-13 is nmod of "children- "-12
"the"-14 is det of "country"-15
"country"-15 is dobj of "across"-13
"today"-16 is nmod of "are"-11



But their **crusade** against **gun control** benefits from the hysteria and paranoia that such reckless, inflammatory rhetoric incites.

1 / 1 christine_blogs_pro_gun_control_08_07
2014-08-07 18-06-11 243:22

Dependency Tree



Linguistic Metaphors

gun control crusade

Source LU

Lemma: crusade
form: crusade
POS: crusade.n
Schema(s): Zealotry
Concept(s): (none)
Concept score: (none)
Map method: wiki

Target LU

Lemma: gun control
Form: gun control
Concept: CONTROL_OF_GUNS
Schema: Gun control
Cultural concept: CONTROL_OF_GUNS
Concept group: GUN OVERSIGHT

Extraction

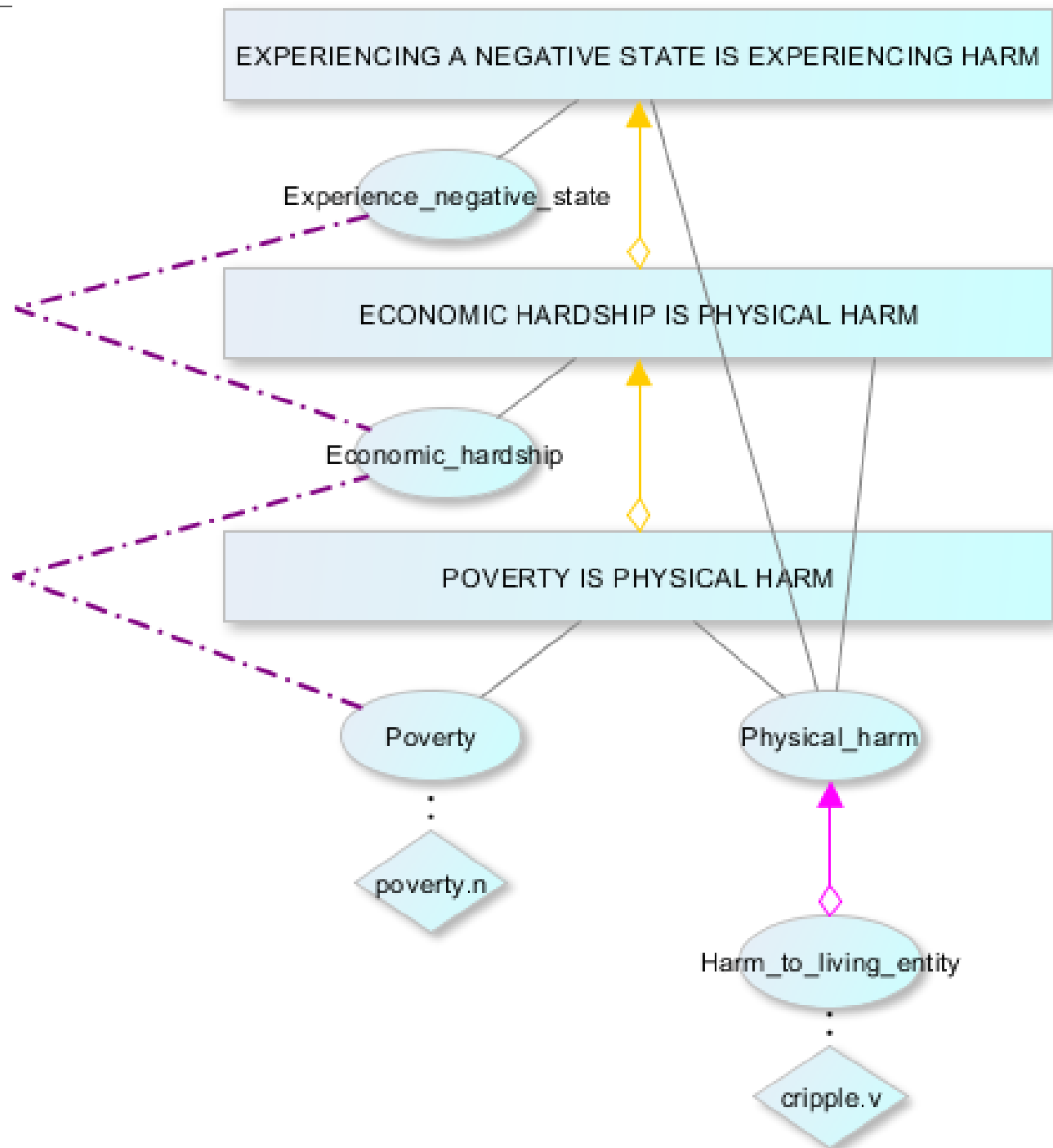
Construction: S-noun_prep_T-noun
Score: 0.5
CMs:

- Step 5: Database Search -- Repository metaphors are used to narrow down the schema selection.
- Is Harm_to_living_entity the source schema for a metaphor where Poverty is the target schema? Is there a POVERTY IS HARM TO LIVING ENTITY metaphor?
 - No.
- Is Motion_impediments the source schema for a metaphor where Poverty is the target schema? Is there a POVERTY IS A MOTION IMPEDIMENT metaphor?
 - No.

● Step 5: Database Search --

- Holding the source schema constant, if no metaphor exists where precisely Poverty is the target schema, is there one containing either of the two candidate source schemas where a parent node of Poverty acts as the target?
 - Yes. **ECONOMIC HARDSHIP IS PHYSICAL HARM**. (T:Economic hardship, S: Physical_harm)
- Holding the target constant, if no metaphor exists where either of precisely these two source schemas exist, are there any metaphors where parents of these two source schemas are the source for the Poverty metaphor?
 - Yes. **POVERTY IS PHYSICAL HARM** (T: Poverty, S: Physical_harm)
- Are there any metaphors where both target and source schemas as parents of the schemas associated with the extracted LM?
 - Yes. **EXPERIENCING A NEGATIVE STATE IS EXPERIENCING HARM**. (T:Experiencing_a_negative_state, S: Physical_harm)

Poverty continues to cripple millions of Canadians- the majority of which are children- across the country today.

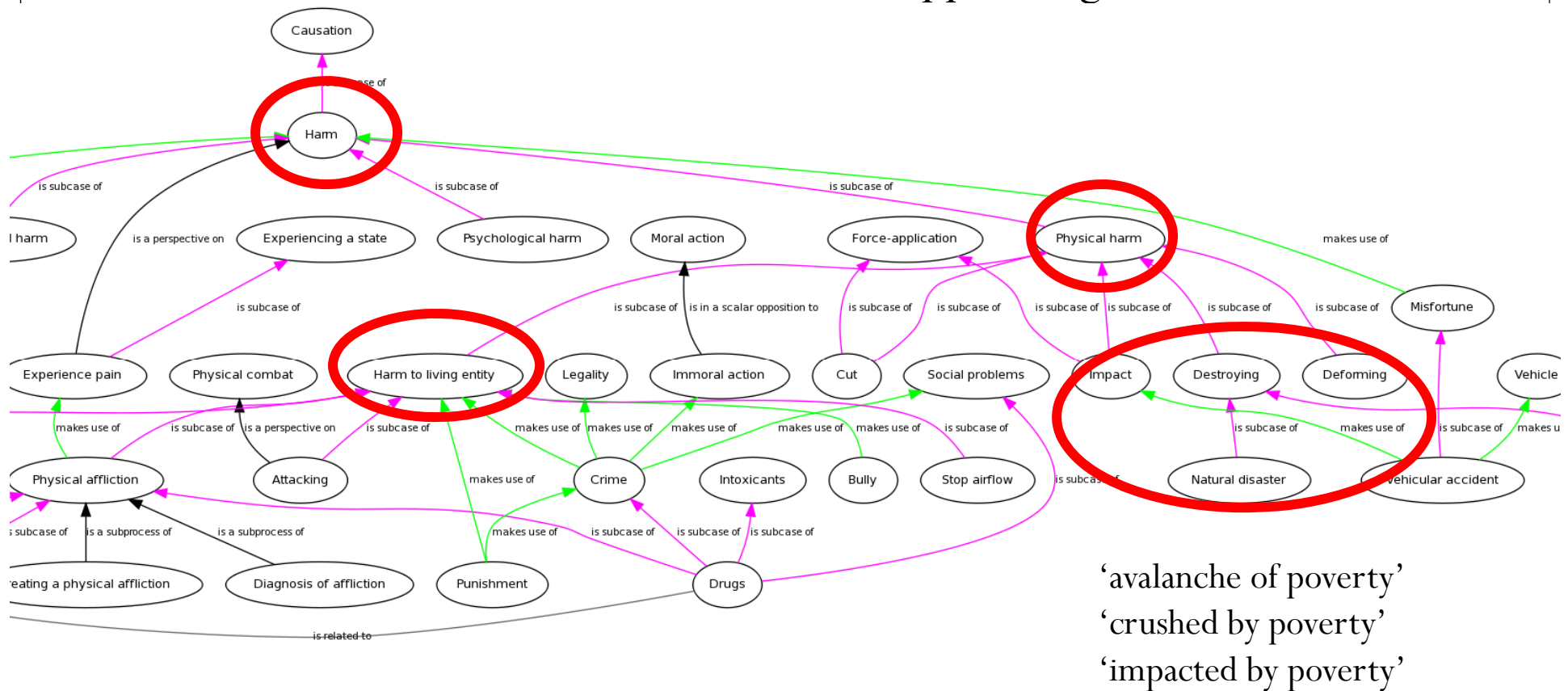


Summary

- The system relies on existing schema and metaphor networks to produce viable candidate CMs for novel LMs.
- Inheritance relations are leveraged to identify specific LMs as instances of more general metaphors, even when only a few general metaphors have been entered manually.
- The system uses ‘best fit’ on both target and source sides to yield the candidate metaphors for a given LM.
 - Note that although ‘cripple’ additionally is listed as an LU under Motion_impediments schema, no metaphor with this as a source schema is produced.

The Harm Schema Family

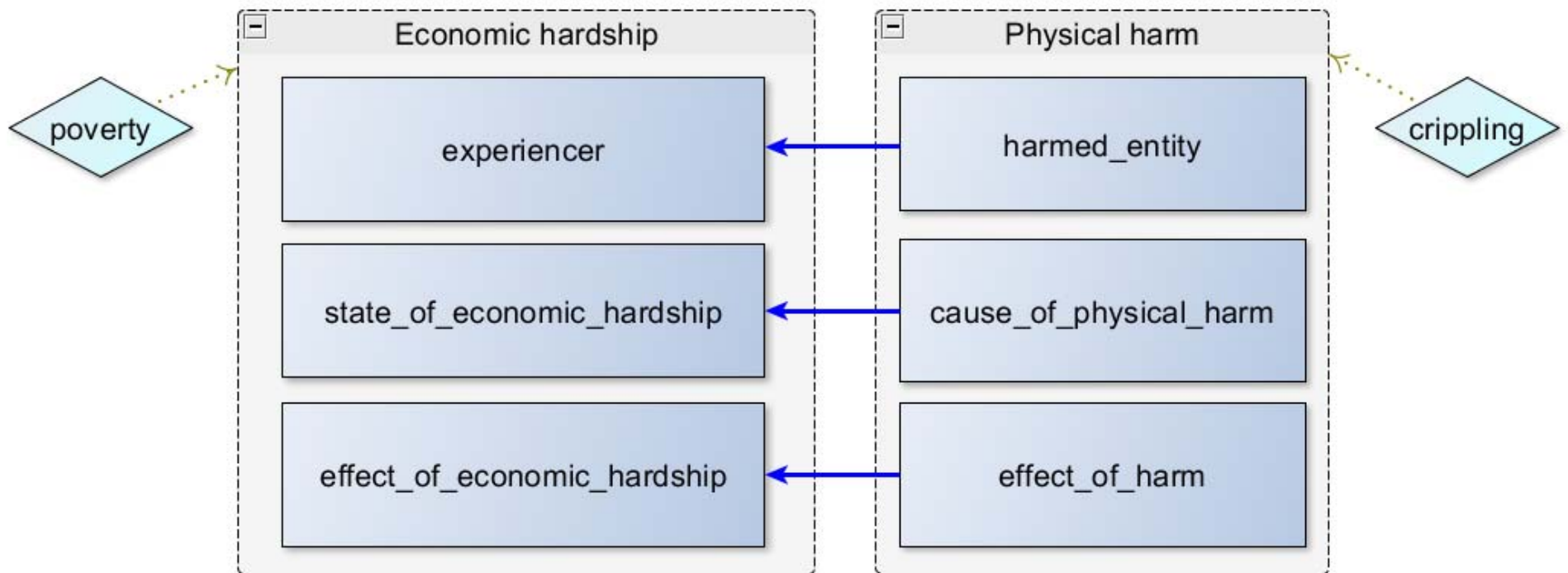
- Carefully designed, theoretically correct schema networks and schema-to-schema relations are crucial for this to happen. E.g:

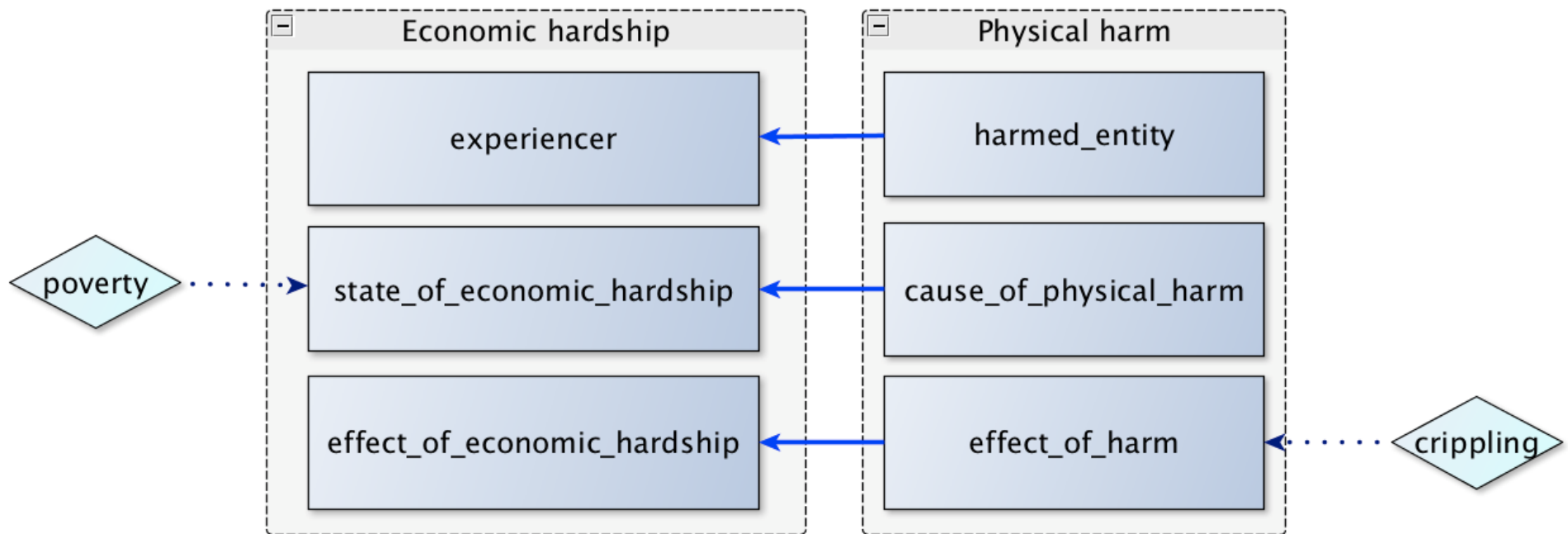


Future applications:

Constructions in the metaphor repository

- Currently, lexical items act as indexes, letting the extractor know what schema to look for (they are associated with a schema).
- Lexical items should be associated with **schema roles** rather than with schemas, for more precise mappings between grammatical slots and mapped schema roles:



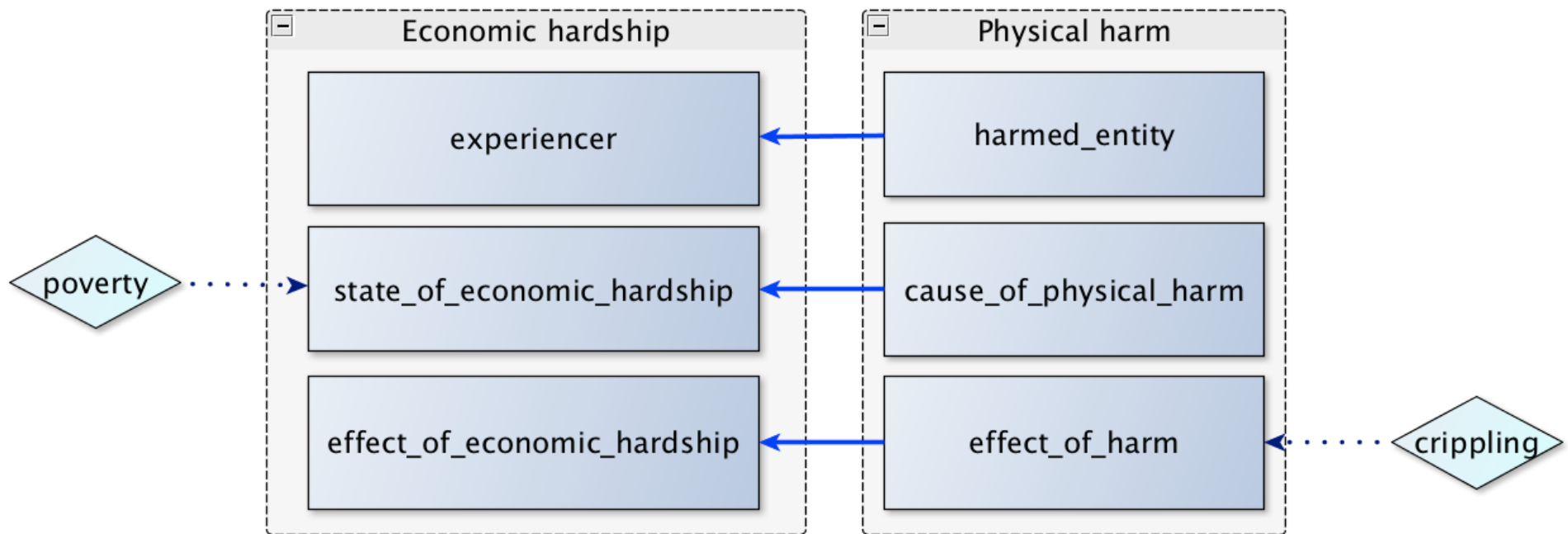


- ‘crippling’ alone does not tell us the role of ‘poverty’ in the crippling event. Poverty is the agent of harm causation, and crippling is the effect of that harm.

[Poverty \leftrightarrow Cause of economic hardship] \leftarrow Cause_harm_agent

[Impoverished entity \leftrightarrow Affectee of economic hardship] \leftarrow Harmed entity

Effect of being impoverished \leftarrow [Effect of harm \leftrightarrow Becoming crippled]



Harm_to_living_entity 'is a subcase of' Physical_harm with LUs: *hurt, injure, wound, cripple, maim, torture, stunt, poison, flog*, etc.

‘crippling poverty’ (poverty cripples us)

‘we must cripple poverty’ (we cripple poverty)

Cxn slots must know how to link to LUs that evoke specific schema roles in order to distinguish these.

Future applications:

Multiple mapping possibilities

At the moment, system cxns are still simple, and finer distinctions cannot yet be made. Sometimes, T and S are not predictable.

- E.g., Two kinds of Adj-N constructions
 - Domain adjective, e.g. ‘**economic boom**’ (*a boom that is economic):
 - The adjective is TARGET and the noun is SOURCE
 - Predicative adjective, e.g. ‘**crippling poverty**’ (a poverty that is crippling people)
 - The adjective is SOURCE and the noun is TARGET
- A system where T and S are not fixed in their assignment to cxn slots is needed; it needs to rely on filler-role relations and type constraints to handle instances like this.

Future applications: Layered constructions

- “Crippling poverty grips / threatens the nation.”
 - *crippling poverty*, POVERTY IS PHYSICAL HARM
 - *poverty threatens*, POVERTY IS AN ADVERSARY
- “We need to eradicate crippling poverty.”
 - *crippling poverty* POVERTY IS PHYSICAL HARM
 - *eradicate poverty* POVERTY/SOCIAL PROBLEMS ARE PLANTS/DISEASES
- “To extinguish crippling poverty...”
 - *crippling poverty*, POVERTY IS PHYSICAL HARM
 - *extinguish poverty* POVERTY IS A DESTRUCTIVE NATURAL FORCE (FIRE)
- Constructions are rarely simple two-slot lexical combinations.
Creating a system that takes embedded cxns as input to larger cxns is needed to handle Subj-Verb-Obj sequences.

Conclusions

- A metaphor extraction system that pulls metaphoric language from real-world texts need to have both manual and an automated components, including frames, metaphors and grammatical cxns.
- The manual component need not be exhaustive; ‘best fit’ lattice systems that ‘look up’ (or sideways) in a lattice network can help give results for any novel, even creative LM (e.g., *fan the flames* of democracy, social unrest *sparked* democracy in that country)

Thank you!

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References

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List of all Schemas

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- [2 Automatically Extracted Schemas](#)

Total number of Schema pages: 627

Manually Analyzed Schemas

Create or edit a Schema:

Create or edit

Total number of Schema pages: 627

A

- [Ability to act](#)
- [Absorption](#)
- [Access](#)
- [Access to a location](#)
- [Access to an object](#)
- [Access to education](#)
- [Access to knowledge](#)

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- [Opportunities](#)
- [Organization](#)
- [Organization of power](#)

[edu/en/index.php/Metaphor_Wiki_\(English\)](#)


Schema:Erosion

Description	The process and experience of effects of erosion
Closest FrameNet Frame(s)	
Maps to IARPA Source Concept(s)	NATURAL PHYSICAL FORCE (#1:0.04;erode)
Other aliases	
Comments	Includes both causal process and experiencing of erosion
Family	Harm, Damage
Tags	
Type	Frame
Cultural Scope	American English, Mexican Spanish
Cultural Information	checked cultural scope for English and Spanish - Karie July 8 2014

Roles:

Role Name:	eroded_entity
Role Type:	entity
Definition/Comments:	
Role Name:	erosion_process
Role Type:	x-schema
Definition/Comments:	progressive, slow, ongoing process
Role Name:	eroding_effect
Role Type:	
Definition/Comments:	depletion of content/mass
Role Name:	eroding_outcome
Role Type:	
Definition/Comments:	loss of structural integrity, functionality
Role Name:	erosion_cause
Role Type:	
Definition/Comments:	entity or process, force

Related Schemas:

Current Schema:	Erosion
Relation Type:	is subcase of
Related Schema:	Destructive natural process 
Comments:	

Relevant Lexical Units:

Lemma	erode.v
-------	---------

Lemma	erosion.n
-------	-----------

Lemma	eat away.v
-------	------------

Lemma	corrosion.n
-------	-------------

Lemma	corrode.v
-------	-----------

Role-based cxn-to-schema links

- These mappings and bindings naturally link to the schematic meanings already present in grammatical cxns.
 - The transitive cxn already sets up the subject as the causal agent and the object as the affectee.
 - Most gerundive adj-noun cxns have a null instantiated affectee and an overt causal agent in the noun slot.

Cause_harm_agent

Cause_harm_affectee

Causal_effect

Crippling_agent

Crippled_entity

Crippling

Subj.

Obj.

Verb.

Noun

Ø

Adj.