Legal Logical Breakdown

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05.12.2022

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Problem: the statements in legal texts are **long** and **hard to analyze**

Example of statement from AI Act:

This Regulation shall not apply to public authorities in a third country nor to international organisations falling within the scope of this Regulation pursuant to paragraph 1, where those authorities or organisations use AI systems in the framework of international agreements for law enforcement and judicial cooperation with the Union or with one or more Member States.

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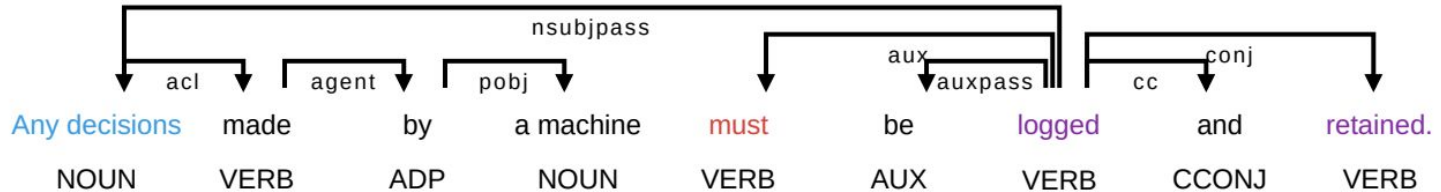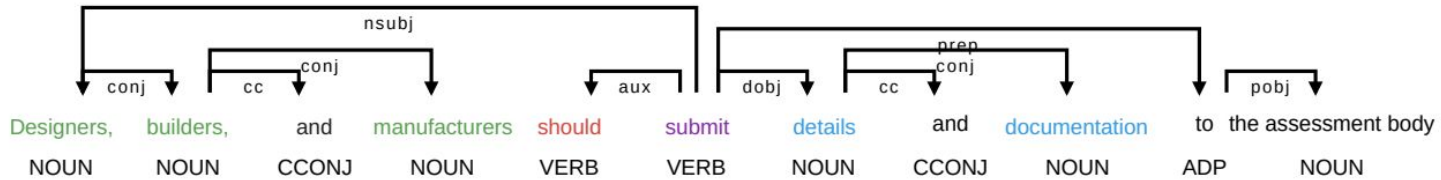# Institutional Grammar

> *Constituted Entity*: Council
>
> *Modal*: shall
>
> *Constitutive Function*: include
>
> *Constituting Properties*: organic farming representatives
>
> *Activation Condition*: From 1st January onward
>
> *Execution Constraint*: to review chemical allowances within organic food production standards
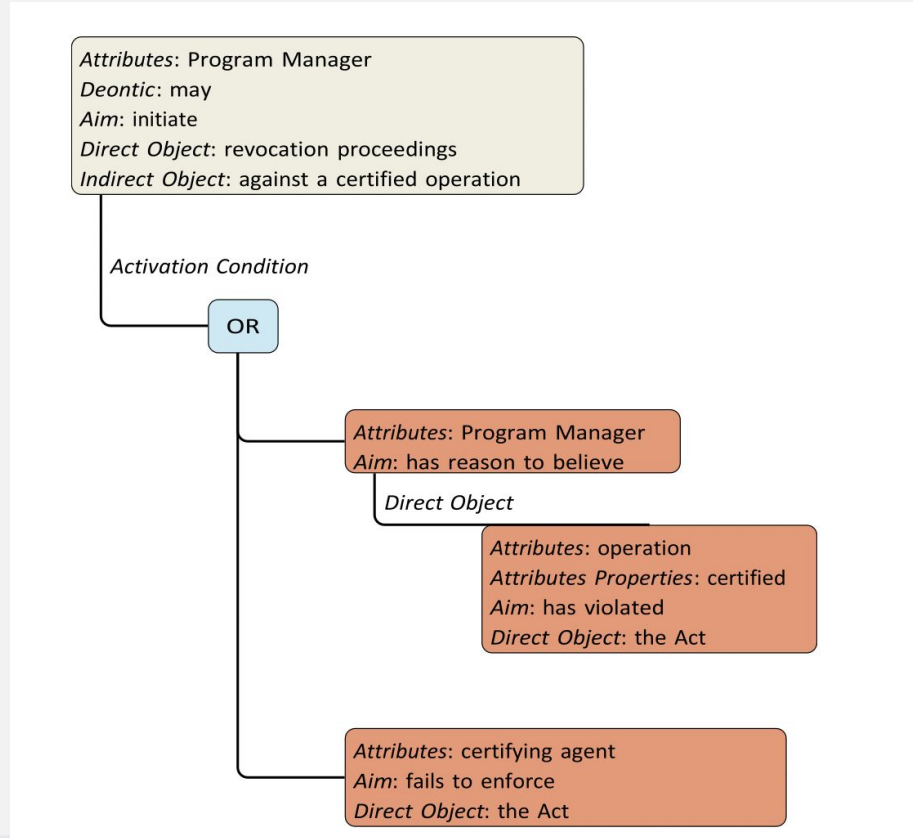
Institutional Grammar

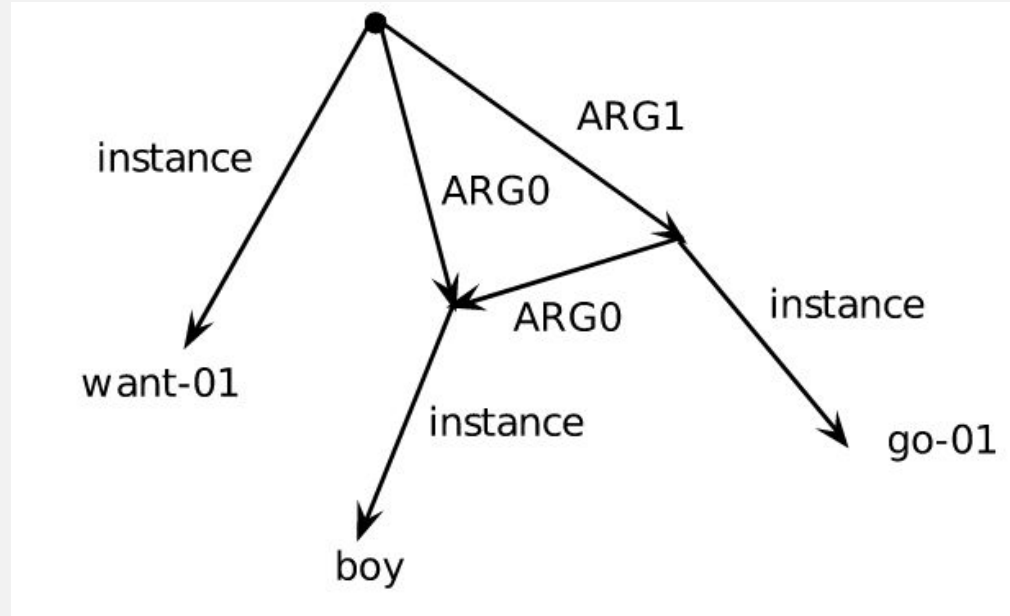# Institutional Grammar – nested sentences

There is IG annotated data, let's utilize it!

But how?

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Abstract meaning representation

Semantic representation of sentence, independent of its syntactic form.

The boy wants to go.

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Abstract meaning representation

```
(s / hum-02
   :arg0 (s2 / soldier)
   :beneficiary (g / girl)
   :time (w / walk-01
            :arg0 g
            :destination (t / town)))

The soldier hummed to the girl as she
   walked to town.
```
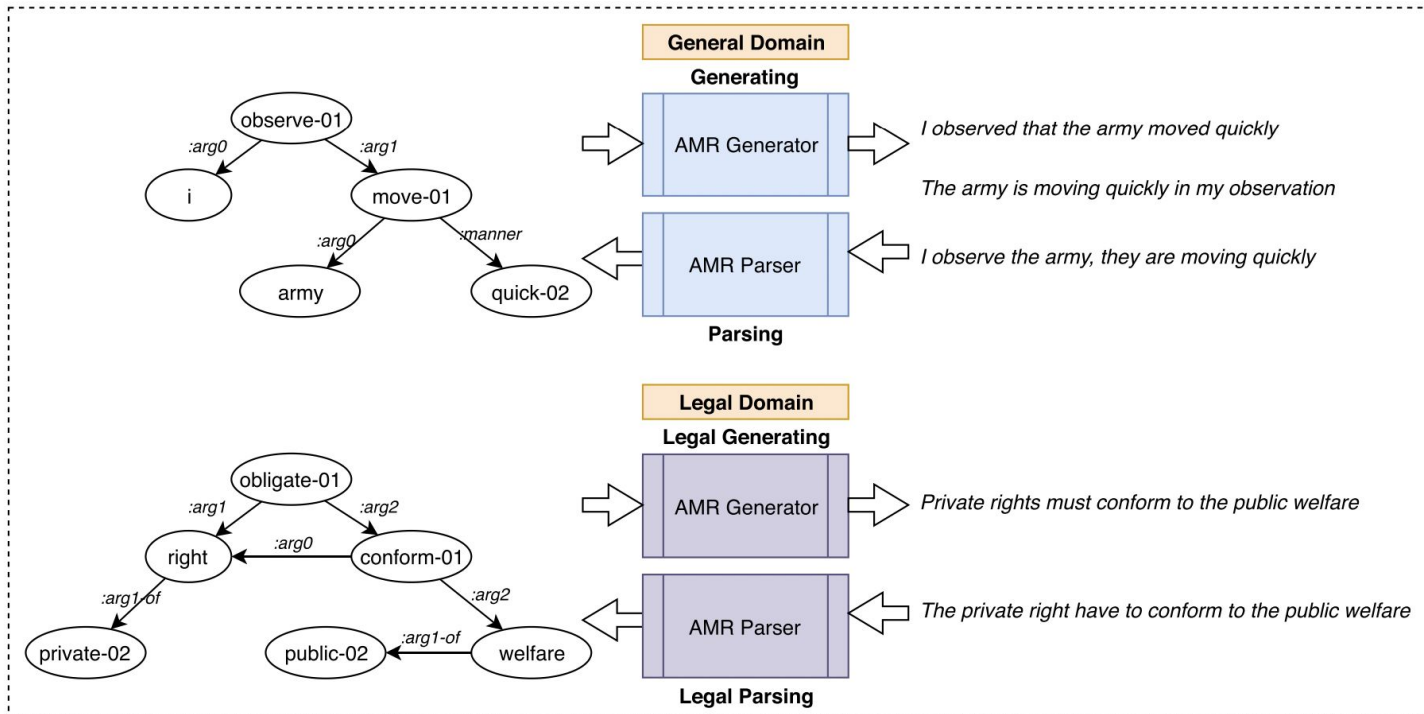
```
(g / go-01
   :arg0 (b / boy)
   :polarity -)

The boy did not go.

(p / possible
   :domain (g / go-01
              :arg0 (b / boy))
   :polarity -))

The boy cannot go.
It's not possible for the boy to go.
```

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JCivilCode – dataset for legal AMR (Vu et al. 2022)

Semantic role labeling – 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

Semantic role labeling – verb specific roles

Idea: have specific roles for each verb and set of proto-roles.

(19.11) **agree.01**

Arg0: Agreer
Arg1: Proposition
Arg2: Other entity agreeing

Ex1: [Arg0 The group] *agreed* [Arg1 it wouldn't make an offer].
Ex2: [ArgM-TMP Usually] [Arg0 John] *agrees* [Arg2 with Mary] [Arg1 on everything].

Semantic role labeling – frames

Frame is holistic background knowledge that unites specific groups of words (Fillfmore, 1985)

VERBS:	dwindle	move	soar	escalation	shift
advance	edge	mushroom	swell	explosion	tumble
climb	explode	plummet	swing	fall	
decline	fall	reach	triple	fluctuation	**ADVERBS:**
decrease	fluctuate	rise	tumble	gain	increasingly
diminish	gain	rocket		growth	
dip	grow	shift	**NOUNS:**	hike	
double	increase	skyrocket	decline	increase	
drop	jump	slide	decrease	rise	

Semantic role labeling – frames

(19.20) [ITEM Oil] *rose* [ATTRIBUTE in price] [DIFFERENCE by 2%].

(19.21) [ITEM It] has *increased* [FINAL_STATE to having them 1 day a month].

(19.22) [ITEM Microsoft shares] *fell* [FINAL_VALUE to 7 5/8].

(19.23) [ITEM Colon cancer incidence] *fell* [DIFFERENCE by 50%] [GROUP among men].

(19.24) a steady *increase* [INITIAL_VALUE from 9.5] [FINAL_VALUE to 14.3] [ITEM in dividends]

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Semantic role labeling – frames

Core Roles	
ATTRIBUTE	The ATTRIBUTE is a scalar property that the ITEM possesses.
DIFFERENCE	The distance by which an ITEM changes its position on the scale.
FINAL_STATE	A description that presents the ITEM's state after the change in the ATTRIBUTE's value as an independent predication.
FINAL_VALUE	The position on the scale where the ITEM ends up.
INITIAL_STATE	A description that presents the ITEM's state before the change in the ATTRIBUTE's value as an independent predication.
INITIAL_VALUE	The initial position on the scale from which the ITEM moves away.
ITEM	The entity that has a position on the scale.
VALUE_RANGE	A portion of the scale, typically identified by its end points, along which the values of the ATTRIBUTE fluctuate.
Some Non-Core Roles	
DURATION	The length of time over which the change takes place.
SPEED	The rate of change of the VALUE.
GROUP	The GROUP in which an ITEM changes the value of an ATTRIBUTE in a specified way.

Figure 19.3 The frame elements in the **change_position_on_a_scale** frame from the FrameNet Labelers Guide (Ruppenhofer et al., 2016).

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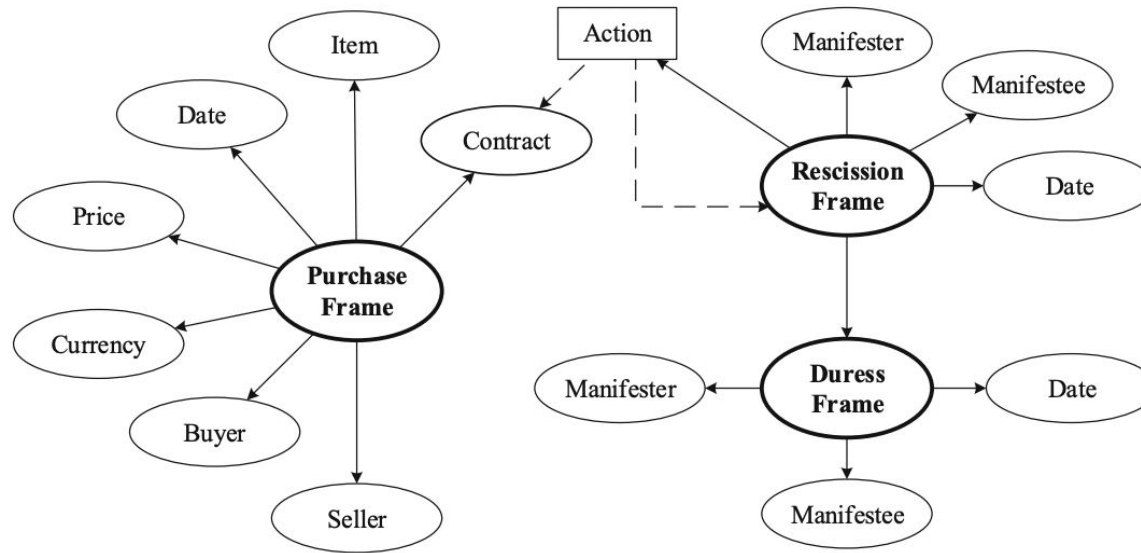# Navas-Loro et al. (2019) – frames for contract law

Fig. 2. The three different frames in the framework (Purchase, Rescission and Duress) and how they interact. An action can be a contract or a rescission, therefore a rescission can be of a contract or of another rescission. A duress is also necessarily attached to a rescission.

Open information extraction

"Sen. Mitchell is confident he has sufficient votes to block such a measure with procedural actions."

("Sen. Mitchell"; "is confident he has"; "sufficient votes to block ...procedural actions")