Legal Knowledge Modelling: from Legal Documents to Legal Rules

LegalRuleML

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Outline

- Introduction from the Legal Text to Legal Rules
- Introduction to LegalRuleML
  - Motivations, Goals, Principles
  - Design principles
  - LegalRuleML main blocks: meta, context, rules
    - Legal Statements and References
    - Temporal Events and Temporal Situations
    - Deontic
    - Penalty and Reparation
    - Defeasible
    - Alternatives
    - Metadata (Authority, Jurisdiction, Actor, Figure, Roles)
- Future work
From the text to the rules

Legal Theory Methodology
Legal Document, Legal Rules, Legal Ontology

Legal document in XML

Legal Ontology

Logic Rules

Annotation
Crowd-sourcing
Citizen participation
Market applications
Civic media

Linked Open Data

Web of things

Certified process

Rendering for the end-user
Semantic Web Stack

Tim Berners-Lee

Explicability
The Principle of Explicability: “Operate transparently”

Transparency is key to building and maintaining citizen’s trust in the developers of AI systems and AI systems themselves. Both technological and business model transparency matter from an ethical standpoint. Technological transparency implies that AI systems be auditable, comprehensible and intelligible by human beings at varying levels of comprehension and expertise. Business model transparency means that human beings are knowingly informed of the intention of developers and technology implementers of AI systems.

Explicability is a precondition for achieving informed consent from individuals interacting with AI systems and in order to ensure that the principle of explicability and non-maleficence are achieved the requirement of informed consent should be sought. Explicability also requires accountability measures be put in place. Individuals and groups may request evidence of the baseline parameters and instructions given as inputs for AI decision making (the discovery or prediction sought by an AI system or the factors involved in the discovery or prediction made) by the organisations and developers of an AI system, the technology implementers, or another party in the supply chain.
Scenario

Lawyer-readable

Machine-readable

Machine-execute

Explainable
From text to rule

- **Legal language** is:
  - legal tradition dependent (e.g., enacting formula)
  - full of normative citations (e.g., art. 3, act 43 at 2019)
  - definitions, exceptions, rhetoric sentence, vagueness, ambiguities (e.g., human rights, right, rights)
  - conditionals and temporal parameters (e.g., enter into operation when the country is annexed to the EU land)

- **Full-automatic** modelization of text in formula/rule is not possible
  - LegalRuleML helps expert to model rules *ex-ante phase when the law is created*
  - LegalRuleML helps the *ex-post phase* in order to check the application of law
  - LegalRuleML helps to model smart contract *using LegalRuleML*
Methodology to model legal rules

1. start to model the text in AKN in order to detect structure (e.g., article), references, temporal parameters, legal metadata
2. detect terms/NER in the text
3. identify of the main concepts
4. split the text in macro-rules (obligation, permission, violation, etc.)
5. detection of the fine-fragments in the text (atom)
6. modelling rules in logic
7. represent in LegalRuleML
8. check the consistency
“1. The data subject shall have the right to receive the personal data concerning him or her, which he or she has provided to a controller, in a structured, commonly used and machine-readable format and have the right to transmit those data to another controller without hindrance from the controller to which the personal data have been provided, where:

(a) the processing is based on consent pursuant to point (a) of Article 6(1) or point (a) of Article 9(2) or on a contract pursuant to point (b) of Article 6(1); and

(b) the processing is carried out by automated means.”
### Example #1:
**Art. 20 GDPR Right of portability of data**

<table>
<thead>
<tr>
<th>Enter into force in 2016</th>
<th>Enter into operation in 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jurisdiction: EU</td>
<td>Jurisdiction: but also world wide at some conditions</td>
</tr>
</tbody>
</table>

“1. The data subject shall have the **right to receive the** personal data concerning him or her, which he or she has provided to a controller, in a structured, commonly used and machine-readable format and have the **right to transmit those data to another controller without hindrance** from the controller to which the personal data have been provided, where:

(a) the processing is based on consent pursuant to point (a) of Article 6(1) or point (a) of Article 9(2) or on a contract pursuant to point (b) of Article 6(1); and

(b) the processing is carried out by automated means.”
Example #1: 
Art. 20 GDPR  Right of portability of data

• “ 2. In exercising his or her right to data portability pursuant to paragraph 1, the data subject shall have the right to have the personal data transmitted directly from one controller to another, where technically feasible. **Specification of R2**

• 3. The exercise of the right referred to in paragraph 1 of this Article shall be without prejudice to Article 17. That right shall not apply to processing necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller. **Exception- R1 and R2**

• 4. The right referred to in paragraph 1 shall not adversely affect the rights and freedoms of others.” **Specification of R1 and R2**
Right to data portability: legal analysis

Right of the data subject

Ob1: Obligation to provide data to data subject in machine-readable manner

Ob2: Obligation to transmit data to data subject to other controller
Main classes

- Agent
- Object
- Event
- Right/obligation/prohibition
- Purpose/Goal/Legal Basis
- Concept
- Action
- Role
“1. The **data subject** shall have the **right to receive** the **personal data** concerning him or her, which he or she has provided to a **controller**, in a structured, commonly used and **machine-readable format** and have the **right to transmit those data** to another **controller** without hindrance from the **controller** to which the **personal data** have been provided, where:

(a) the processing is based on **consent** pursuant to point (a) of Article 6(1) or point (a) of Article 9(2) or on a **contract** pursuant to point (b) of Article 6(1); and

(b) the processing is carried out by **automated means**.”
Terminology involved

data subject
personalData
controller
obligation_to_provide_in_mrf
consent
contract
legalBasis
publicInterest

we need a controlled vocabulary or better if it is a legal ontology
Concepts: The Right to Data Portability: Action, Rule, Obligation
Concepts: The Right to Data Portability: Action, Rule, Obligation
Modelling Rules: Art. 20 GDPR
Right of portability of data

Legal Text
«The data subject shall have the right to receive the personal data concerning him or her, which he or she has provided to a controller, in a structured, commonly used and machine-readable format »

Logic rule
IF 
\[ \text{datasubject}(X) \land \text{personalData}(D) \land \text{controller}(Y) \land \text{legalBasis}\ (\text{consent} \mid \text{contract}) \land \text{automatedProcess}(D) \]
THEN 
\[ \text{oiligation}\_\text{to}\_\text{provide}\_\text{in}\_\text{mrf}(Y, D, X) \]
Modelling Rules: Art. 20 GDPR
Right of portability of data

Legal Text

« 3. That right shall not apply to processing necessary for the performance of a task carried out in the **public interest** or in the exercise of official authority vested in the controller»

Logic rule

IF

\[ \text{datasubject}(X) \land \text{personalData}(D) \land \text{controller}(Y) \land \text{legalBasis}(	ext{publicInterest}) \]

THEN

\[ \neg \text{othersubject_to_provide_in_mrf}(Y, D, X) \]

R3 > R1
Exercise #2

Messenger Kids Privacy Policy

Term of use (contract)

• Messenger Kids by ACME is a children’s messaging and video calling app that helps your children communicate with family and friends in a fun, controlled environment. This privacy policy explains what information we collect from your child when they use Messenger Kids and how we use and share that information.

Definition of child from the GDPR (Law)

• If you delete your child’s account, (then) we must delete their Messenger Kids information.

Right to erasure

Obligation to delete
Exercise #2: step 1
model the text

Akoma Ntoso markup of the term in the text

Messenger **Kids** `<term refersTo="#kid">kids</term>` by Facebook is a children’s

Akoma Ntoso markup in the metadata

`<TLCTerm eId="kid" href="/xx/PrOnto:ChildGDPR">`
Exercise #2: step 2 RDFs

Enlarge the lexicon with linguistic alternative forms and connection between the terms in the text and the concept in the ontology. In this case from term “kid” we can arrive to the PrOnto ontology class PrOnto:Child

PrOnto:Child rdf:type owl:Class;
  rdfs:subClassOf PrOnto:Role;
  rdfs:subClassOf skos:Concept.

PrOnto:ChildGDPR rdf:type PrOnto:Child;
  skosxl:prefLabel "child";
  skosxl:altLabel "children", "kid", "kids".
Exercise #2: step 3 Ontology

Using PrOnto:Child class ontology we infer new knowledge:

PrOnto:Child is a PrOnto:DataSubject
PrOnto:DataSubject hasRight PrOnto:RightToErasure
PrOnto:RightToErasure generates PrOnto:ObligationToErase
A legal definition is a «Constitutive Rule»

IF

AND

X is_a PrOnto:Person
X has Yp yearsOld
X belongs to Jp

THEN

X playRoleOf PrOnto:Child
Exercise #2: step 4 logic modelling

Prescriptive Rule

A «Prescriptive Rule» includes a command, obligation, prohibition

IF

X is_a PrOnto:Child (art. 8)
C is_a PrOnto:Controller (art. 4)
X deletes D (art. 17)

THEN

OBLIGATION

C deletes D

OBLIGATION

C notifies P
LegalRuleML
LegalRuleML TC

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Chair

Guido Governatori, NICTA, Australia
Chair

Adam Wyner
Uni. Aberdeen
Secretary

Tara Athan, Athan Services

Adrian Paschke, Uni. Berlin
Secretary

Harold Boley, UNB

Chair

Secretary
Motivations

- RuleML, SWRL, RIF, LKIF

- **Legal texts** are the privileged sources for norms, guidelines and rules that often feed different concrete Web applications.
  - Legislative documents, Contracts, Judgements

- **Proper and expressive** conceptual, machine readable models of norms
Goal

The LegalRuleML TC, set up inside of OASIS at Jan 12, 2012 (www.oasis-open.org) with 25 members, aims to produce a rule language for the legal domain:

- Based on the legal textual norms
- Oriented to legal professionals
- Compact integrated annotation
- Logic-neutral
- Flexible and extensible
RuleML Family of Sublanguages

- RuleML
- LegalRuleML
- Consumer RuleML

Deliberation
- HOL
- FOL

Derivation
- Fact
  - Hornlog
- Query
  - Datalog

Consumer

Reaction
- KR
- ECAP
- CEP

Trigger (EA)
- ECA

Production (CA)

Relationships:
- Extension
- subClassOf
- Overlaps
- Syntactic specialization of
LegalRuleML: Main features

- Different **types of rules**:
  - Constitutive rules (e.g. definitions)
  - Prescriptive rules (e.g. obligation, permission, etc.)
  - Facts
- **Isomorphism** – connecting rules with the text *(fill the gap)* [Bench-Capon and Coenen, 1992]
- **Deontic operators**
  - obligation, permission, right, prohibition, compliance, violation, reparation
- **Defeasibility** [Gordon, 1995, Prakken and Sartor, 1996, Sartor, 2005]
- **Temporal parameters**
- **RDF meta model**

*Tara Athan, Guido Governatori, Monica Palmirani, Adrian Paschke, Adam Z. Wyner: LegalRuleML: Design Principles and Foundations. Reasoning Web 2015: 151-188*
LegalRuleML Design Principles (1/2)

Multiple Semantic Annotations:
- A legal rule may have multiple semantic annotations where each annotation can represent a different legal interpretation.
- Each such annotation can appear in a separate annotation block as internal or external metadata.

Tracking the LegalRuleML Creators:
- As part of the provenance information, a LegalRuleML document or any of its fragments can be associated with its creators.

Linking Rules and Provisions:
- LegalRuleML includes a mechanism, based on IRI, that allows N:M relationships among the rules and the textual provisions
  - avoiding redundancy in the IRI definition and errors in the associations
  - LegalRuleML is independent respect any Legal Document XML standard, IRI naming convention
LegalRuleML Design Principles (2/2)

Temporal Management:
- LegalRuleML must represent these temporal issues in unambiguous fashion

Formal Ontology Reference:
- LegalRuleML is independent from any legal ontology and logic framework.

LegalRuleML is based on RuleML:
- LegalRuleML reuses and extends concepts and syntax of RuleML.

Mapping:
- LegalRuleML metadata can be expressed in RDF for implementing Linked Data model.
Language Design Principles

- **Minimality**, which requires that the language provides only a small set of needed language constructs.

- **Referential transparency**, which means that the same language construct always expresses the same semantics regardless of the context in which it is used. E.g., obligation

- **Orthogonality**, where language constructs are independent of each other, thus permitting their systematic combination. E.g., jurisdiction and authority

- **Pattern-based design**, where design patterns are a distillation of common wisdom in organizing the structural parts, the grammar and the constraints of a language. E.g., Associations is a collection of Association.

- **Metamodel** based, where the metamodel for a language, also defines the vocabulary for describing the language, including syntactic categories.
Metamodel in RDFS
Partial Metamodelfor Deontic Concepts

- LegalRuleML classes are shown with blue fill, LegalRuleML properties with pink fill, RuleML classes with orange fill.
RuleML/LegalRuleML XML Design principle

- Node and Edge Elements
- There is a distinction between type (also called node) elements and role (also called edge) elements
- **node** starts with an upper case letter `<Jurisdiction>`
- **edge** with a lower case letter `<hasJurisdiction>`
- Node elements correspond to **classes** of the metamodel while **edge** elements correspond to **relationships** between members of these classes
- XSD, RelaxNG
- compact, normal, basic schema
Multiple rules as (alternative) interpretations of the same text
LegalRuIML: multiple sources

Multiple sources for the same rule

<lrml:Rule key="rule3">
  <lrml:if> ...
  </lrml:if>
  ....
  <lrml:then> ...
  </lrml:then>
</lrml:Rule>...
LegalRuIML: different semantics

Multiple context for the same rule

<lrml:Rule key="rule3">
  <lrml:if> ...
  </lrml:if>
  ....
  <lrml:then>... </lrml:then>
</lrml:Rule>...
LegalRuML: versioning of legal text

Digital Millennium Copyright Act
NEW VERSION

2013

Versioning of the rules according with the updating of the law

Context T1 of rule2

Context T2 of rule2-v2
LegalRuleML main blocks

Metadata
- Legal Sources
- References
- Agents, Figures
- Authority
- Time Instants
- Temporal Characteristics
- Jurisdiction
- Role

Context
- association of metadata with statements

Context different author association of metadata with statements

Context different time and jurisdiction association of metadata with rules

Context association of alternative interpretations of the same text

<ruleml:Rule key=":rule1">
  <ruleml:if> ... </ruleml:if>
  <ruleml:then> ... </ruleml:then>
</ruleml:Rule>...

<ruleml:Rule key=":rule2">
  <ruleml:if> ... </ruleml:if>
  <ruleml:then> ... </ruleml:then>
</ruleml:Rule>...
LegalRuleML main blocks: Metadata

Metadata
  Legal Sources
  References
  Agents, Figures
  Authority
  Time Instants
  Temporal Characteristics
  Jurisdiction
  Role
LegalRuleML main blocks: Statements

<table>
<thead>
<tr>
<th>Metadata</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal Sources</td>
</tr>
<tr>
<td>References</td>
</tr>
<tr>
<td>Agents, Figures</td>
</tr>
<tr>
<td>Authority</td>
</tr>
<tr>
<td>Time Instants</td>
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<tr>
<td>Temporal Characteristics</td>
</tr>
<tr>
<td>Jurisdiction</td>
</tr>
<tr>
<td>Role</td>
</tr>
</tbody>
</table>

```xml
<lrml:Rule key="rule1">
  <lrml:if> ... </lrml:if>
  <lrml:then>... </lrml:then>
</lrml:Rule>...
```

```xml
<lrml:Rule key="rule2">
  <lrml:if> ... </lrml:if>
  <lrml:then>... </lrml:then>
</lrml:Rule>...
```
**LegalRuleML main blocks: Context**

<table>
<thead>
<tr>
<th>Metadata</th>
<th>Context association of metadata with rules</th>
<th>Context different author association of metadata with rules</th>
<th>Context different time and jurisdiction association of metadata with rules</th>
<th>Context association of alternative interpretations of the same text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal Sources</td>
<td></td>
<td></td>
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<td></td>
</tr>
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<td>References</td>
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<td>Role</td>
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</tr>
</tbody>
</table>

```xml
<lrml:Rule key="rule1">
  <lrml:if> ...</lrml:if>
  <lrml:then>... </lrml:then>
</lrml:Rule>...
```

```xml
<lrml:Rule key="rule2">
  <lrml:if> ...</lrml:if>
  <lrml:then>... </lrml:then>
</lrml:Rule>...
```
<lrml:LegalRuleML>
  <lrml:References>
    <Reference> ... </Reference>
  </lrml:References>
  ...
  <lrml:Context key="ruleInfo1-v2">
    <lrml:Association>
      <lrml:appliesSource keyref="#sec2.1-list1-itm31-par1-v2"/>
      <lrml:toTarget keyref="#rulebase1-v2"/>
    </lrml:Association>
  </lrml:Context>
  <lrml:hasStatements key="rulebase-v2">
    <lrml:ConstitutiveStatement key="rule1a">
      <ruleml:if> ... </ruleml:if>
      <ruleml:then>... </ruleml:then>
    </lrml:ConstitutiveStatement>
  </lrml:hasStatements>...
</lrml:LegalRuleML>
Very simple examples:
“Constitutive rule” – definition of controller

IF

– legalPerson(X)
– dataSubject(Y)
– euCitizen(Y)
– processingPersonalDataOf(Y)

THEN

– controller(X,Y)
IF

<lrml:Statements>
  <lrml:ConstitutiveStatement>
    <ruleml:Rule key=":r1">
      <ruleml:if>
        <ruleml:And>
          <ruleml:Atom>
            <ruleml:Rel>legalPerson</ruleml:Rel>
            <ruleml:Var>X</ruleml:Var>
          </ruleml:Atom>
          <ruleml:Atom>
            <ruleml:Rel>dataSubject</ruleml:Rel>
            <ruleml:Var>Y</ruleml:Var>
          </ruleml:Atom>
          <ruleml:Atom>
            <ruleml:Rel>EUCitizen</ruleml:Rel>
            <ruleml:Var>Y</ruleml:Var>
          </ruleml:Atom>
          <ruleml:Atom>
            <ruleml:Rel>processingPersonalData</ruleml:Rel>
            <ruleml:Var>Y</ruleml:Var>
          </ruleml:Atom>
        </ruleml:And>
      </ruleml:if>
    </lrml:ConstitutiveStatement>
  </lrml:Statements>
THEN

<ruleml:then>
  <ruleml:Atom>
    <ruleml:Rel>controller</ruleml:Rel>
    <ruleml:Var>X</ruleml:Var>
    <ruleml:Var>Y</ruleml:Var>
  </ruleml:Atom>
</ruleml:then>
</ruleml:Rule>
</lrml:ConstitutiveStatement>
</lrml:Statements>
</lrml:LegalRuleML>
Very simple examples: “prescriptive rule”

IF
  – data subject(X) (art. 4)
  – controller(Y) (art. 4)
  – processingBasedOnConsent(K) (art. 6)
THEN
  Obligation [ (art. 7)
  - Y have to collect from X the consent
  ]
Paraphrase: IF datasubject(X) ∧ controller(Y) THEN obligation
Legal Statements and References

<lrml:LegalSources>
  <lrml:LegalSource key="ref1" sameAs="http://www.law.cornell.edu/uscode/text/17/504#psection-1"/>
</lrml:LegalSources>

<lrml:References>
  <lrml:Reference refersTo="ref2" refID="/us/USCode/eng@/main#title17-sec504-clsc-pnt1" refIDSystemName="AkomaNtoso2.0-2012-10"/>
</lrml:References>
Temporal Events and Temporal Situations

<lrml:TimeInstants>
   <ruleml:Time key="t1">
      <ruleml:Data xsi:type="xs:date">1978-01-01</ruleml:Data>
   </ruleml:Time>
</lrml:TimeInstants>

<lrml:TemporalCharacteristic key="tblock1">
   <lrml:forRuleStatus iri="&lrmlv;#Efficacious"/>
   <lrml:hasStatusDevelopment iri="&lrmlv;#Starts"/>
   <lrml:atTimeInstant keyref="#t1"/>
   <lrml:hasStatusDevelopment iri="&lrmlv;#End"/>
   <lrml:atTimeInstant keyref="#t2"/>
</lrml:TemporalCharacteristic>

Event that define the validity of the rules

Type of event: In force Efficacy
Deontic operators

**Obligation +**: a Deontic Specification for a state, an act, or a course of action to which a Bearer is legally bound, and if it is not achieved or performed results in a Violation.

**Prohibition +**: a Deontic Specification for a state, an act, or a course of action to which a Bearer is legally bound, and if it is achieved or performed results in a Violation.

**Permission +**: a Deontic Specification for a state, an act, or a course of action where the Bearer has no Obligation or Prohibition to the contrary.

**Right +**: a Deontic Specification that gives a Permission to a party (the Bearer) and implies there are Obligations or Prohibitions on other parties (the AuxiliaryParty) such that the Bearer can (eventually) exercise the Right.
**Penalty and Reparation**

**Penalty**: a Legal Statement of a sanction (e.g. a punishment or a correction).

**Reparation**: an indication that a PenaltyStatement is linked with a PrescriptiveStatement, meaning that a sanction may apply when the PrescriptiveStatement entails a Deontic Specification, and there is a Violation of the Deontic Specification.

A penalty of 200 criminal unit is a reparation for violating the prohibition on engaging in a credit activity without a financial license.
Penalty

<lrml:Statements>
  <lrml:PenaltyStatement key="pen1">
    <lrml:SuborderList> list of deontic formulas
    </lrml:SuborderList>
  </lrml:PenaltyStatement>
</lrml:Statements>
Reparation

<lrml:Statements>
  <lrml:ReparationStatement>
    <lrml:Reparation key="rep1">
      <lrml:appliesPenalty keyref="#pen1"/>
      <lrml:toPrescriptiveStatement keyref="#ps1"/>
    </lrml:Reparation>
  </lrml:ReparationStatement>
</lrml:Statements>
Article 84 GDPR

• Infringements of the following provisions shall, in accordance with paragraph 2, be subject to administrative fines up to 10 000 000 EUR, or in the case of an undertaking, up to 2 % of the total worldwide annual turnover of the preceding financial year, whichever is higher: <list of obligations>
Administrative Fines

Ps1 Obligations: Articles 8, 11, 25-39, 42, 43, 41(4)

P1 X pay 10.000.000 euro
P2 X pay 2%

Rep1 (Ps1,P1)
Rep2 (Ps1,P2)

R1 IF X is controller THEN Rep1
R2 IF X is controller ∧ X is legalPerson ∧ 2%> of 10.000.000 THEN Rep2
R2>R1
# Defeasibility

<table>
<thead>
<tr>
<th>Deontic Type</th>
<th>Logical Form</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body always head</strong></td>
<td>body -&gt; head</td>
<td><em>strict</em></td>
</tr>
<tr>
<td><strong>Body sometimes head</strong></td>
<td>body =&gt; head</td>
<td><em>defeasible</em></td>
</tr>
<tr>
<td><strong>Body not complement head</strong></td>
<td>body ~&gt; head</td>
<td><em>defeater</em></td>
</tr>
</tbody>
</table>

\[ R2 > R1 \]

**R1**: A person must not engage in a credit activity. *prohibition*

**R2**: But if the person has a financial licence they may engage in a credit activity. *permission*

```xml
<lrml:hasQualification>
  <lrml:Overrides over="#R2" under="#R1"/>
</lrml:hasQualification>
```
Defeasibility: national law overrides EU regulation

<lrml:hasQualification>
  <lrml:Overrides over="#rule2-IT" under="#rule2-EU"/>
</lrml:hasQualification>

<lrml:hasQualification>
  <lrml:Overrides over="#rule2-FR" under="#rule2-EU"/>
</lrml:hasQualification>

<lrml:hasQualification>
  <lrml:Overrides over="#rule2-ES" under="#rule2-EU"/>
</lrml:hasQualification>

<lrml:hasQualification>
  <lrml:Overrides over="#rule2-DE" under="#rule2-EU"/>
</lrml:hasQualification>
Example #3

National Consumer Credit Protection Act 2009: Section 29

(Prohibition on engaging in credit activities without a licence)

(1) A person must not engage in a credit activity unless the person holds a licence authorising the person to engage in the credit activity.

Civil penalty: 2,000 penalty units.

...  

Criminal penalty: 200 penalty units, or 2 years imprisonment, or both.
Example #3

National Consumer Credit Protection Act 2009: Section 29

(Prohibition on engaging in credit activities without a licence)

(1) A person must not engage in a credit activity unless the person holds a licence authorising the person to engage in the credit activity.

Civil penalty: 2,000 penalty units.

Criminal penalty: 200 penalty units, or 2 years imprisonment, or both.
LegalRuleML modelling

- At a given time t=2009, the author Guido, the authority “Consumer Credit Agency”, in the jurisdiction “Australia”, source text sec29
- ps1: Person(x) => [FORB]EngageCreditActivity(x)
- ps2: HasLicence(x) => [PERM]EngageCreditActivity(x)
- ps2 > ps1
- pen1: [OBL] PayCivilUnits(x,2000)
- pen2:
  - [OBL] PayPenalUnits(x,200),
  - [OBL] Imprisonment(x,2y),
  - [OBL] PayPenaltyUnitsPlusImprisonment(x,200,2y)
- rep1: [Violation]ps1, pen1
- rep2: [Violation]ps1, pen2
Alternatives

Case 1: Same legal provision(s), $T_1$, and different alternatives ($A_1$ and $A_2$).

Case 2: Different alternatives ($A_1$ and $A_2$) that share one or more pieces of text, $T_2$, but others are not shared ($T_1$ and $T_3$).

Case 3: Different alternatives ($A_1$ and $A_2$) sharing the same legal provision(s) ($T_1$), but embedding different rules ($R_1$ and $R_2$ for $A_1$ and $R_3$ for $A_1$).

Case 4: Different alternatives that share the same legal provision(s), but one or more rules are in common (e.g., $R_2$).
Alternative interpretations of the same text

Criminal penalty: 200 penalty units, or 2 years imprisonment, or both.

pen2a:

\[
\begin{align*}
\text{SUBORDERLIST} & \{ \\
& - [OBL] \text{PayPenalUnits}(x, 200), \\
& - [OBL] \text{Imprisonment}(x, 2y), \\
& - [OBL] \text{PayPenaltyUnitsPlusImprisonment}(x, 200, 2y)
\}
\end{align*}
\]

pen2b:

\[
\begin{align*}
\text{OR} & \{ \\
& [OBL] \text{PayPenalUnits}(x, 200) \\
& [OBL] \text{Imprisonment}(x, 2y), \\
& [OBL] \text{PayPenaltyUnitsPlusImprisonment}(x, 200, 2y)
\}
\end{align*}
\]

---

```
<lrml:Alternatives key="alt1">
  <lrml:fromLegalSources>
    <lrml:LegalSources>
      <lrml:hasLegalSource keyref="#sec29-par3"/>
    </lrml:LegalSources>
  </lrml:fromLegalSources>
  <lrml:hasAlternative keyref="#pen2a"/>
  <lrml:hasAlternative keyref="#pen2b"/>
</lrml:Alternatives>
```
LegalRuleML modelling

• In a giving time $t=2009$, the author Guido, the authority “Consumer Credit Agency”, in the jurisdiction “Australia”, source text sec29
• $ps1$: Person(x) $\Rightarrow$ [FORB]EngageCreditActivity(x)
• $ps2$: HasLicence(x) $\Rightarrow$ [PERM]EngageCreditActivity(x)
• $ps2 > ps1$
• $pen1$: [OBL] PayCivilUnits(x,2000)
• $pen2a$
  
  SUBORDERLIST {
  – [OBL] PayPenalUnits(x,200),
  – [OBL] Imprisonment(x,2y),
  – [OBL] PayPenaltyUnitsPlusImprisonment(x,200,2y)}
• $pen2b$

  OR { [OBL] PayPenalUnits(x,200)
  [OBL] Imprisonment(x,2y),
  [OBL] PayPenaltyUnitsPlusImprisonment(x,200,2y) }

• $rep1$: [Violation]$ps1$, $pen1$
• $rep2a$: [Violation]$ps1$, $pen2a$
• $rep2b$: [Violation]$ps1$, $pen2b$
Example #4
Copyright law: copyright infringement

- US “Digital Millenium Act” and modifications
- goal: in $t_x$ calculate the proper *statutory damage* in case of violation of the copyright taking in consideration all the exceptions and the modifications respect an fact.

17 USC Sec. 504
Remedies for infringement: Damages and profits

<table>
<thead>
<tr>
<th>Enter in force of the norm</th>
<th>Interval of efficacy of the norm</th>
<th>Statutory Damages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct. 31, 1988</td>
<td>[March 1, 1989, Dec. 9, 1999 [</td>
<td>$500 &lt;= statutoryDamages &lt;= $20,000</td>
</tr>
<tr>
<td>Dec. 9, 1999</td>
<td>[Dec. 9, 1999, ∞</td>
<td>$750 &lt;= statutoryDamages &lt;= $30,000</td>
</tr>
</tbody>
</table>

Three main versions
(c) Statutory Damages.

(1) Except as provided by clause (2) of this subsection, the copyright owner may elect, at any time before final judgment is rendered, to recover, instead of actual damages and profits, an award of statutory damages for all infringements involved in the action, with respect to any one work, for which any one infringer is liable individually, or for which any two or more infringers are liable jointly and severally, in a sum of not less than $250 or more than $10,000 as the court considers just. For the purposes of this subsection, all the parts of a compilation or derivative work constitute one work.

(2) In a case where the copyright owner sustains the burden of proving, and the court finds, that infringement was committed willfully, the court in its discretion may increase the award of statutory damages to a sum of not more than $50,000. In a case where the infringer sustains the burden of proving, and the court finds, that such infringer was not aware and had no reason to believe that his or her acts constituted an infringement of copyright, the court in its discretion may reduce the award of statutory damages to a sum of not less than $100.

http://www.law.cornell.edu/uscode/text/17/504
(c) **Statutory Damages.** -

The copyright owner may elect an award of statutory damages for infringements in a sum of not less than $250 or more than $10,000 as the court considers just.

---

Version 1

(c) Statutory Damages. -

The copyright owner may elect an award of statutory damages for infringements in a sum of not less than $500 or more than $20,000 as the court considers just.

Version 2
[March 1, 1989, Dec. 9, 1999]

(c) Statutory Damages. -

The copyright owner may elect an award of statutory damages for infringements in a sum of not less than $750 or more than $30,000 as the court considers just.

Version 3
[Dec. 9, 1999, ∞]
Rules

• **R1**: if a piece of work is covered by copyright, then it is forbidden to use it.
• **C1**: an infringer is defined as somebody who used a piece of work when it was forbidden to use it.

**Section 504**

• **R2**: if the copyright owner claims statutory damages then the penalty for the infringer is to pay statutory damages of between $250 and $10,000.
• **R3**: if the copyright owner sustains the burden of proof and the infringer infringes copyright willfully then the penalty for the infringer is to pay statutory damages of between $250 and $50,000.
• **R4**: if the infringer sustains the burden of proof and the infringer infringes NOT willfully then the penalty for the infringer is to pay statutory damages of between $100 and $10,000.
• **Defeasability**: $R4 > R3 > R2$
Exercise #5: minor consent in information society services

Legal Text

«Article 8 - Conditions applicable to child's consent in relation to information society services

1. Where point (a) of Article 6(1) applies, in relation to the offer of information society services directly to a child, the processing of the personal data of a child shall be lawful where the child is at least 16 years old. Where the child is below the age of 16 years, such processing shall be lawful only if and to the extent that consent is given or authorised by the holder of parental responsibility over the child. »

Art. 8 GDPR admits being trumped by domestic regulation

«Member States may provide by law for a lower age for those purposes provided that such lower age is not below 13 years.»

At present in Europe different age limitations are in place (e.g, age 13 in Spain; 14 in Italy; 11 15 in France). LegalRuleML makes it possible to use defeasible operators
Example: minor consent in information society services

Legal Text

«Article 8 - Conditions applicable to child's consent in relation to information society services

1. Where point (a) of Article 6(1) applies, in relation to the offer of information society services directly to a child, the processing of the personal data of a child shall be lawful where the child is at least 16 years old. Where the child is below the age of 16 years, such processing shall be lawful only if and to the extent that consent is given or authorised by the holder of parental responsibility over the child. »

Logic rule

IF

personaldataProcessing(d,x) \& child(x) \& at_least16years(x) \& information_society_service(s,d) \& data_controller(y,s)

THEN

obligation_to_obtain_consent(y,x,s)
PrescriptiveStatement
Rule

IF

personal_data_processing(d,x) \land child(x) \land at_least16years(x) \land information_society_service(s,d) \land data_controller(y,s)

THEN

obligation_to_obtain_consent(y,x,s)

/Rule

/PrescriptiveStatement
LegalRuleML rule modelling

<?xml version="1.0"?>
<lrml:LegalRuleML xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns="http://docs.oasis-open.org/legalruleml/examples/compactified/ex9-alternatives-compact#" xmlns:lrml="http://docs.oasis-open.org/legalruleml/ns/v1.0/"
xmlns:ruleml="http://ruleml.org/spec" xmlns:rulemlmm="http://ruleml.org/1.0/metamodel#"
    <lrml:Comment> GDPR - minor consent </lrml:Comment>
    <lrml:LegalReferences refType="http://example.org/Lrml#LegalSource">
        <lrml:LegalReference refersTo="ref1"
refID="/akn/eu/act/regulation/2016-04-27/679!/main#art_8__para_1"
refIDSystemName="AkomaNtoso3.0-2017-06"/>
    </lrml:LegalReferences>
</lrml:LegalRuleML>

From AKN XML
LegalRuleML rule modelling

```
<lrml:PrescriptiveStatement key="ps1">
  <ruleml:Rule key=":ruletemplate2" closure="universal">
    <ruleml:if>
      <ruleml:And key=":and1">
        <ruleml:Atom key=":atom1">
          <ruleml:Rel iri=":child"/>
          <ruleml:Var>X</ruleml:Ind>
        </ruleml:Atom>
        <ruleml:Atom key=":atom2">
          <ruleml:Rel iri=":at_least16years"/>
          <ruleml:Var>X</ruleml:Ind>
        </ruleml:Atom>
        <ruleml:Atom key=":atom3">
          <ruleml:Rel iri=":personal_data_processing"/>
          <ruleml:Var>D</ruleml:Ind>
          <ruleml:Var>X</ruleml:Ind>
        </ruleml:Atom>
      </ruleml:And>
    </ruleml:if>
  </ruleml:Rule>
</lrml:PrescriptiveStatement>
```

From PrOnto ontology
Exceptions

Art. 8 GDPR admits being trumped by domestic regulation «Member States may provide by law for a lower age for those purposes provided that such lower age is not below 13 years.»

At present in Europe different age limitations are in place (e.g., age 13 in Spain; 14 in Italy; 11–15 in France). LegalRuleML makes it possible to use defeasible operators

- `<lrml:appliesStrength iri="lrmlv:Defeasible"/>

And defying jurisdiction

- `<lrml:appliesJurisdiction keyref="jurisdictions:it"/>
Future work and Conclusions

• LegalRuleML provides all the instruments necessary to model legal norms: temporal parameters, legal ontology bridge, legal official sources & versioning, deontic operators, defeasible logic, alternative interpretation, minimal redundancy of rules, legal metadata association.

• Future works
  – Mathematic operators: max, min
  – Temporal calculus from RuleML
  – Restriction of the order of the blocks
Join to us

• https://www.oasis-open.org/join/membership-agreement-instructions

Thanks for your attention

monica.palmirani@unibo.it
http://sinatra.cirsfid.unibo.it/rawe-legregsw/
http://docs.oasis-open.org/legalruleml/legalruleml-core-spec/v1.0/cs01/
http://docs.oasis-open.org/legalruleml/legalruleml-core-spec/v1.0/legalruleml-core-spec-v1.0.html