

Logic in the Public Sector

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Public Sector

- ▶ in many ways similar to a large company
- ▶ at the same time, important differences

Legalitätsprinzip

- ▶ “principle of legality”
- ▶ All administrative acts must be rooted in laws.
- ▶ **constitutional principle** in Austria (Art. 18 Abs. 1 B-VG)
- ▶ **Motivation:** Administration must behave *predictably*.
- ▶ ⇒ decisions must be explainable, traceable, justifiable
- ▶ ⇒ *symbolic* AI methods are of particular relevance

Law and Logic

- ▶ law and logic are very strongly related
- ▶ however, which logic is needed to reason about laws?
- ▶ propositionally, $\models (A \rightarrow B) \vee (B \rightarrow A)$
- ▶ i.e., any arbitrary A and B are causally related?
- ▶ *deontic* logic is useful for reasoning about laws
- ▶ see for example recent work by Ciabattoni *et al.*
- ▶ lawyers are increasingly interested in this topic

Logical Reasoning in the Administration

- ▶ *Because* you run a business of type T , ...
- ▶ *Because* you are replying within the deadline, ...
- ▶ *Because* you are a citizen of Austria, ...
- ▶ *Because* you broke the speed limit L , ...
- ▶ *Because* you are studying, ...
- ▶ *Because* you have applied for a grant, ...
- ▶ etc.

Codex as Code

- ▶ in the ideal case, law is *automatically* executable
- ▶ various projects to formulate law as logic programs
- ▶ Examples:
 - ▶ eligibility for *grants*
 - ▶ proof of identity
 - ▶ delegation of powers
 - ▶ cross-border use cases
 - ▶ answer queries about laws
 - ▶ etc.
- ▶ we need better methods to implement this

Public Sector IT-Services

- ▶ public sector IT-service \simeq *automated* application of law
- ▶ IT-services in our department:
 - ▶ Business Service Portal (<https://www.usp.gv.at>)
 - ▶ e-Delivery
 - ▶ e-Procurement
 - ▶ electronic forms service
 - ▶ Once Only Principle
 - ▶ etc.
- ▶ many other IT-services in the public sector
- ▶ example: *tax administration*

Electronic Forms Service

Logical rules are relevant for our *forms* service:

- ▶ intelligent *completion*
- ▶ automated application of regulations (trademarks etc.)
- ▶ *analysis* of forms
- ▶ *description* of forms
- ▶ etc.

A web-based Prolog system such as *Tau Prolog* is useful for this:

<http://tau-prolog.org/>

Once Only Principle

Data shall be sent to the administration at most *once*.

- ▶ intelligent *exchange* of data within the administration
- ▶ rule-based reasoning about *access rights*
- ▶ detection of redundancies and overlaps in forms
- ▶ logical deductions based on existing data
- ▶ etc.

Many application opportunities for rule-based systems.

Perspective: IT-service as Platform

Goal: Intelligent customization and extension of our services.

- ▶ “If I am on holiday, I want to be notified differently.”
- ▶ “My attorney shall automatically receive a copy.”
- ▶ services between users, *smart contracts*
- ▶ needs a simple dynamic extension language
- ▶ cooperation on data analysis etc.

European Context

- ▶ European Union (EU) has **27** member states (MS)
- ▶ Legal acts:
 - ▶ **regulations** (self-executing)
 - ▶ **directives** (require national acts)

Examples:

Single Digital Gateway Regulation (SDGR)

General Data Protection Regulation (GDPR)

- ▶ *Coordinated Plan on AI (2018)*
- ▶ *White Paper On AI (2020)*
- ▶ *Ethics Guidelines for Trustworthy AI*
- ▶ national AI strategies (*ongoing*)

Single Digital Gateway (SDG)

- ▶ *Goal*: **cross-border** use cases
- ▶ *Example*: Spanish company creates branch in Austria
- ▶ *provability* of evidences
- ▶ needs formulation of logical *rules*
- ▶ *semantic mapping* is being discussed
- ▶ *executable* descriptions are needed

Cross-border Proof of Evidences

- ▶ IT-services of different countries must cooperate
- ▶ country-specific *ways* to obtain evidences
- ▶ query registers, upload documents, ask citizen etc.
- ▶ dynamic rule-based reasoning

```
evidence(place_of_birth(Person, Place)) :- ...
```

Ethics Guidelines for Trustworthy AI

7 **key requirements** of AI systems:

- ▶ Human agency and oversight
- ▶ Technical robustness and safety
- ▶ Privacy and Data governance
- ▶ Transparency
- ▶ Diversity, non-discrimination and fairness
- ▶ Societal and environmental well-being
- ▶ Accountability

Importance of Standards

Standards are very important in the public sector.

Standards . . .

- ▶ are a prerequisite for teaching
- ▶ ensure compatibility of solutions
- ▶ allow efficient cooperation
- ▶ simplify procurement
- ▶ increase markets for companies
- ▶ help mitigate legal disputes
- ▶ reduce implementation costs
- ▶ etc.

Standardisation

We represent our Ministry in several standardisation groups:

- ▶ ISO/IEC JTC1/**SC42 Artificial Intelligence**
- ▶ ISO/IEC JTC1/SC22/**WG17 Prolog**
- ▶ ASI AG **001.88 Blockchain**

Please contribute!

Many important aspects of Prolog need standardisation.

Other topics are closely related to logical reasoning.

Many opportunities for cooperation.

The search for Prolog

We need Prolog systems to implement new kinds of services.

Desiderata:

- ▶ **conforming** to the standard (*sine qua non*)
- ▶ freely available
- ▶ efficient representation of strings as lists of characters
- ▶ modern language constructs (constraints, `if_/3` etc.)
- ▶ monotonicity (`..._si/1` etc.)

Mark Thom's *Scryer Prolog* is a very promising new system:

<https://github.com/mthom/scryer-prolog>

Invitation for Cooperation

I invite you to cooperate with us on these topics!

- ▶ Interesting ideas?
- ▶ Comments?
- ▶ Questions?
- ▶ Experiences?
- ▶ Project proposals?
- ▶ ...

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