Argumentation & Compliance MEDICA: an illustrative Example

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with

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Bridging Aim of Talk

Strengthen the link between argumentation and RuleML

Via

Example rather than Abstract Theory

Data Access/Sharing

- **General Problem:**
  - Decide **Level of Access** according to **user** and **current circumstances in compliance** **with legal and/or business, etc, requirements.**

- **Challenge:**
  - **Formalize and automate Legislation, Etc policies**
    - **Facilitate the management/compliance of policies**
  - **Cognitive Interaction**
    - **Explain & "Persuade" the user (possibly via a dialogue)**

Example of MEDICA Patient Data Access: Legislation

- There are 6 Access Levels (Read & Write)
  - Full Access
  - Partial Access
  - Read Only Access
  - Restricted Read Access
  - Suspended Access
  - No Access

- Decide Level of Access according to user and current circumstances, rtc.

Applications in Argumentation (Decision Making via Argumentation & Gorgias)

- **Options, e.g. different levels of medical access**

- **Preferences**
  - **Dynamic preferences over changing environment of the application**
  - **Multi-Level preferences over different CONTEXTS in the application**

- **General form of Preferences:**
  - "**Generally**, in **SITUATION** prefer Oi, **but** in **particular CONTEXT** prefer Oj."

  - **MEDICA Example:**
    - **"Generally, deny access but for the {owner} give full access."**

    - **"Generally, allow full access to {owner} but when {critical tests} suspend access.**

Argumentation & Compliance in Gorgias

- **STEP 1: Translate the law/policy to Scenario-Based Preferences**
  - **Example:** «**Generally, no one has access** to medical files. **But** the owner **CAN have** full access.»
  - **<1, {}, access(Agn, DataID, no_access)>**
  - **<2, {owner(Agn)}, access(Agn, DataID, full_access)>**
- **STEP 2: Automatic formalization and Generation of Execution Code in Gorgias**

Medical Data Access: MEDICA

Law 138(I)/2001: Personal Data Protection
Law N. 1(I)/2005: Patient Rights

- **Example:** «**Generally, no one has access** to medical files. **But** the owner **CAN have** full access.»
  - **<1, {}, access(Agn, DataID, no_access)>**
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- **Execution Code in Gorgias:**

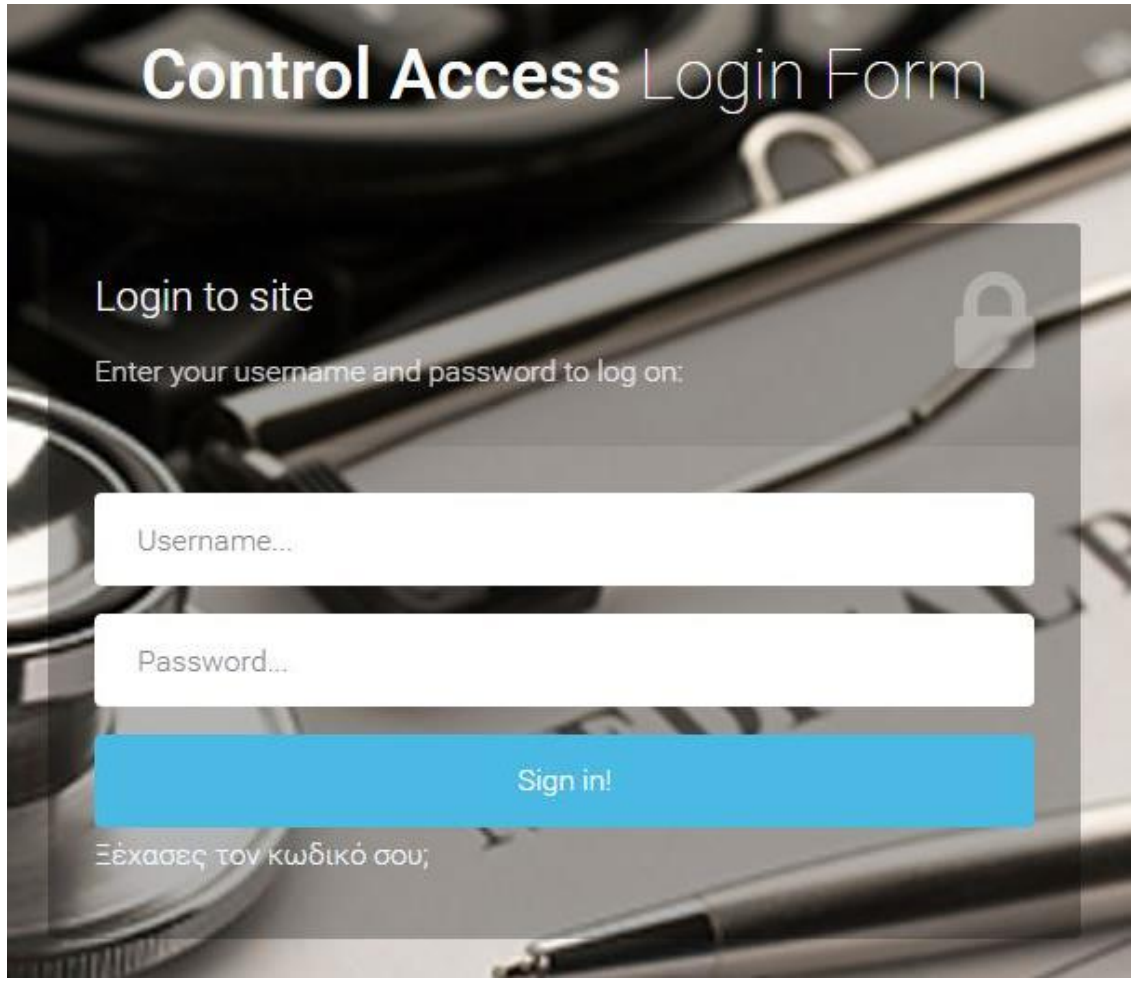
```
rule(d1(Agn), access(Agn, DataID, full_access), []).
rule(d2(Agn), access(Agn, DataID, no_access), []).
rule(hpr21(Agn), prefer(d2(Agn), d1(Agn)),[]).
rule(hpr12(Agn), prefer(d1(Agn), d2(Agn)),[]) :- owner(Agn)
rule(hpr_12_21(Agn), prefer(hpr12(Agn), hpr21(Agn)),[]).
```

Medical Data Access: MEDICA

- **MEDICA:**
  http://medica.cs.ucy.ac.cy

- **Demo Online**
  - **user1**
  - **12user12**

- **Note in demo:**
  - **Explanation**
  - **Hypothetical Reasoning**



Medical Data Access: MEDICA

Law 138(I)/2001: Personal Data Protection
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- **Example:** «**Generally, no one has access** to medical files. **But** the owner **CAN have** full access.»
  - **<1, {}, access(Agn, DataID, no_access)>**
  - **<2, {owner(Agn)}, access(Agn, DataID, full_access)>**

- **FURTHER Example: «Generally, allow full access to {owner} but when {critical tests} suspend access.»**
  - **<3, {owner(Agn),critical(DataID)}, access(Agn,DataID, suspend_access)>**

Medical Data Access: MEDICA

Law 138(I)/2001: Personal Data Protection

Law N. 1(I)/2005: Patient Rights

- «**Generally, no one has access** to medical files. **But** the **doctor CAN have** limited plus access for **therapy/medical use**.»
  - **<1, {}, access(Agn, DataID, no_access)>**
  - **<2, {doctor(Agn), medical_use(DataID)}, access(Agn, DataID, limited_plus_access)>**

- «**Generally, no one has access** to medical files. **But** the **doctor CAN have** limited access for **research purpose**.»
  - Scenarios-based preferences …

Medical Data Access: Legislation

Law 138(I)/2001: Personal Data Protection

Law N. 1(I)/2005: Patient Rights

- «**Generally, no one has access** to medical files. **But owner's family member CAN have** limited plus.»
  - **<1, {}, access(Agn, DataID, no_access)>**
  - **<2, {family_member(Agn)}, access(Agn, DataID, limited_access)>**
- «**Generally, no one has access** to medical files. **But owner's legal representative CAN have** full access for **personal use**.»
  - Scenarios …

Software Development via Argumentation (SoDA Methodology)

- **SoDA methodology** we model a (compliance) application by:
  - Considering **application scenarios** and stating the preferred/desired option(s) in each scenario: **scenario-based preferences**
  - Successively **refine** the scenarios and consider **combined** scenarios, restating at each case (level) the preferred option(s).
- **No programming or Cognitive Programming!**
  - Just record your expert application or user policy/knowledge.

Software Development via Argumentation (SoDA Methodology)

Programming =

Authoring scenario-based preferences

(Call it Cognitive Programming)

Gorgias-B : Cognitive Programming

Conclusion

Evaluation of Argumentation

- **Argumentation vs "Carefully crafted set of rules"**
  - **Direct development from the domain expert!**
    - **No programming – Cognitive Programming!**
  - **Modularity of Approach**
    - **Claim: Effort to accommodation new legislation in argumentation is comparable to effort to update the legal document.**
- **Naturalness of argumentation via explanation and abductive/hypothetical reasoning**
  - **Argumentation is native to human reasoning.**

Further Reading/References

- *MEDICA paper (from MEDICA website)*, 2017
- *GORGIAS: Applying argumentation. Argument & Computation 10(1): 55-81 (2019)*
- *Gorgias-B website (http://gorgiasb.tuc.gr/)*
- *Other references on request …*

Gorgias

Greek Sophist c.485 — c.380 BCE

Extra (technical) Slides

Slides on Technical Translation of Scenario-based preferences to Gorgias framework & code

Medical Data Access: Legislation

Law 138(I)/2001: Personal Data Protection
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  - **<1, {}, access(Agn, DataID, no_access)>**
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- **Example: «Generally, allow full access to {owner} but when {critical tests} suspend access.»**
  - **<3, {owner(Agn),critical(DataID)}, access(Agn,DataID, suspend_access)>**

MEDICA Decision Policy

(Expressed in GORGIAS pseudocode)

- **Object-level argument rules**:

  r1(Agn,Data): no_access(Agn,Data) ← true
  r2(Agn,Data): full_access(Agn,Data) ← true
  r3(Agn,Data): supsend_access(Agn,Data) ← true

- **Priority argument rules**
  - Default Policy – Scenario 1
  - Generally, no access:
  - R12(Agn,Data): r1(Agn,Data) > r2(Agn,Data) ← true
  - R13(Agn,Data): r1(Agn,Data) > r3(Agn,Data) ← true

  - Special – Contextual- Priority: Scenario 2
  - Generally, full access to owner
  - R21(Agn,Data): r2(Agn,Data) > r1(Agn,Data) ← owner(Agn,Data)
  - C21(Agn,Data): R21(Agn,Data) > R12(Agn,Data) ← true

  - R23(Agn,Data): r2(Agn,Data) > r3(Agn,Data) ← owner(Agn,Data)

MEDICA Decision Policy

(Expressed in GORGIAS pseudocode)

- **Object-level argument rules**:

  r1(Agn,Data): no_access(Agn,Data) ← true
  r2(Agn,Data): full_access(Agn,Data) ← true
  r3(Agn,Data): supsend_access(Agn,Data) ← true

- **Priority argument rules**
  - Default Policy – Scenario 1
  - Generally, no access:
  - R13(Agn,Data): r1(Agn,Data) > r3(Agn,Data) ← true

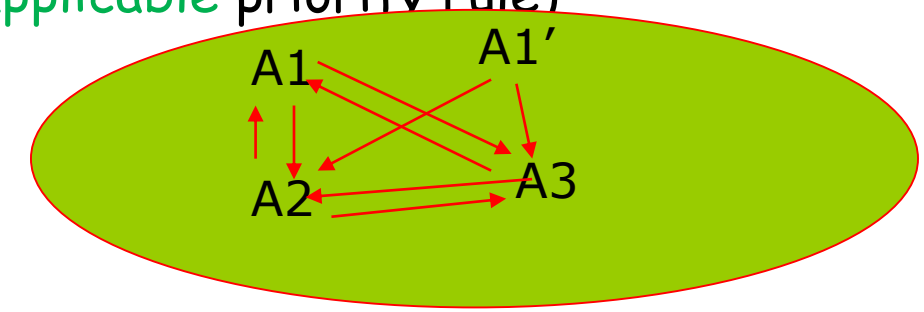
  - Special – Contextual- Priority: Scenario 3
  - Generally, suspend access to owner when critical
  - R23(Agn,Data): r2(Agn,Data) > r3(Agn,Data) ← owner(Agn,Data)
    - R32(Agn,Data): r3(Agn,Data) > r2(Agn,Data) ← critical(Data)
    - C32(Agn,Data): R32(Agn,Data) > R23(Agn,Data) ← true

  - R31(Agn,Data): r3(Agn,Data) > r1(Agn,Data) ← owner(Agn, Data), critical(Data).

MEDICA: Argumentation in Scenarios

- <1, {}, no_access(Agn,Data)>
  - A1={r1(Agn,Data)} argument supports option no_access.
  - A2={r2(Agn,Data)} argument supports option full_access.
  - A3={r3(Agn,Data)} argument supports option suspend_access.
  - A1 attacks A2, A1 attacks A3, A2 attacks A3 and vice versa.

- A1'={r1(Agn,Data), R12(Agn,Data), R13(Agn,Data), } strengthens A1
  - A1' **attacks** A2 and A3 but they **do not attack** A1'
  - Also A2 or A3 cannot be strengthened (by any applicable priority rule)
  - Hence A2 or A3 cannot be made admissible
  - Hence **sceptical decision**: no_access (from A1')



MEDICA: Argumentation in Scenarios

- **<2, {owner(Agn)}, access(Agn, DataID, full_access)>**

- A1'={r1(Agn,Data), R12(Agn,Data), R13(Agn,Data), } strengthens A1
  - A1' **attacks** A2 and A3 but they **do not attack** A1'
- A2'={r2(Agn,Data), R21(Agn,Data), R23(Agn,Data), } strengthens A2
  - A2' **attacks** A1 and A3 but they **do not attack** A2'
  - A2' **attacks** A1' and vice-versa

- A2''=A2' U {C21(Agn,Data)}
  - A2'' attacks A1' but not vice-versa.
  - (also attacks A1 and A3 – not shown)
- Hence, only A2'' admissible: full access.