COMPULAW
Computable Law

http://site.unibo.it/compulaw

Overview of Subproject 2

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UNIBO

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Subproject 2: Logical-Computational methods and technologies

OBJECTIVES:

- **computable models** of **rules, principles**, and **cases**
- **formal specifications** (normative concepts, socio-cognitive notions, social relations, rules, values and goals, defeasible argumentation, dialectical interactions, institutional structures, norm-related cognitive processes)
- **regulations and guidelines directed to designers of computable laws and ALAs**, to support the correct specification of computable laws and their effective implementation

Subproject 2: Logical-Computational methods and technologies

Multidisciplinary approach

- software engineering
- artificial intelligence
- multiagent systems and electronic institutions
- deontic logic and computational argumentation

advisory commitee: progress of the project

Subproject 2: Plan

Main tasks	2020		2021		2022		2023		2024	
survey of existing formal methods and technologies for the legal governance of computations	↔									
existing artifical legal agents in MAS: survey	↔									
extraction of abstraction and fundamental concepts		↔								
definition of guidelines for the comparison		↔								
survey of existing ML methods for legal governance and compuations		↔								
integration of ML concept in logical models			↔	↔						
definition of a methodology for design computable law and Artificial Legal Agents			↔	↔						
model definition: refinement and integration of methods and tools for computable law and ALAs			↔	↔						
implementation of the model into running prototypes					↔	↔	↔	↔	↔	↔
validation through interviews with experts				↔	↔	↔	↔	↔	↔	↔

Subproject 2: Plan

State of the art analysis

	2020	
survey of existing formal methods and technologies for the legal governance of computations	↔	
existing artifical legal agents in MAS: survey	↔	
extraction of abstraction and fundamental concepts		↔
definition of guidelines for the comparison		↔
survey of existing ML methods for legal governance and compuations		↔
integration of ML concept in logical models		
definition of a methodology for design computable law and Artificial Legal Agents		
model definition: refinement and integration of methods and tools for computable law and ALAs		
implementation of the model into running prototypes		
validation through interviews with experts		

DELIVERABLE:

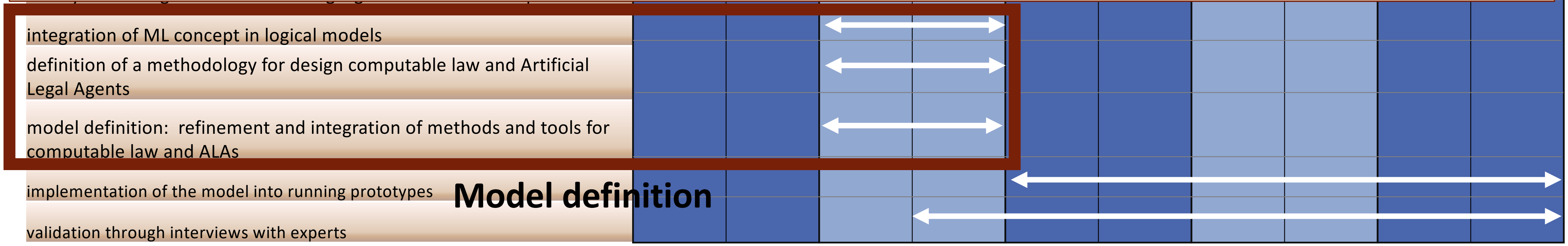
- **Article/survey:** existing formal methods and technologies for the legal governance of computations
- **Article/survey:** artifical legal agents in MAS
- **Article/Survey:** existing ML methods for legal governance and compuations
- **Live Report**: abstraction and fundamental concepts
- **Article/Live Report**: guidelines

Subproject 2: Plan

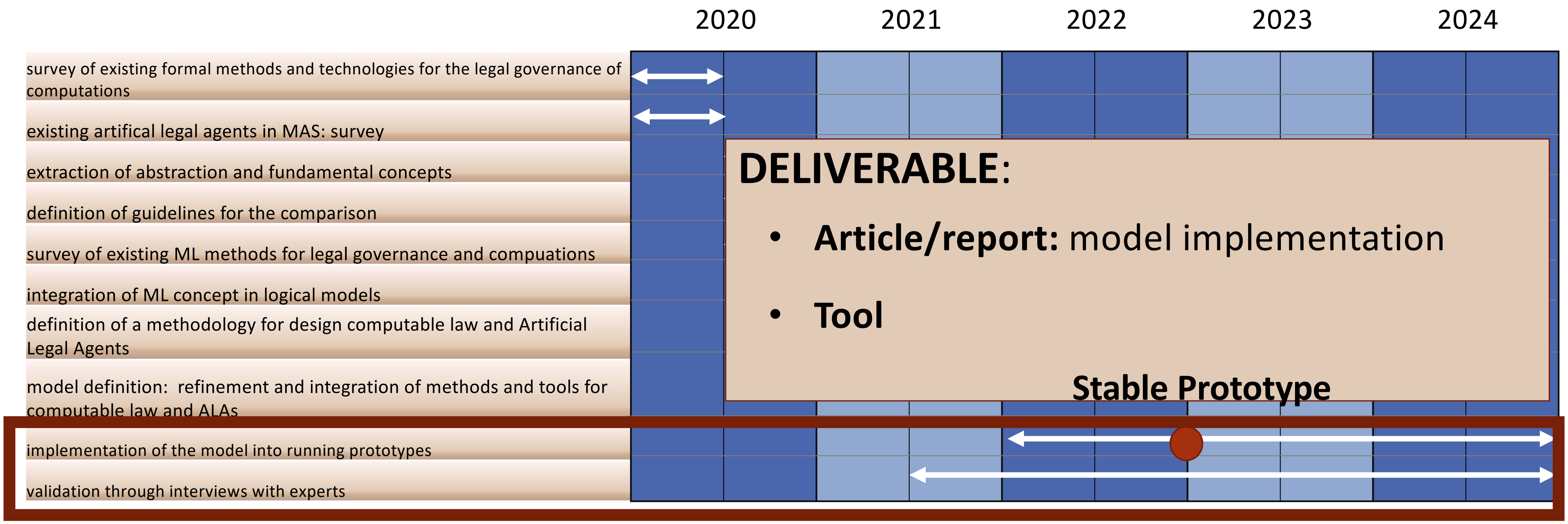
2020 2021 2022 2023 2024

DELIVERABLE:

- **Article/report:** model definition → refinement and integration of methods and tools for computable law and ALAs
- **Draft methodology:** design ALA (input for subproject 3)



Subproject 2: Plan



- survey of existing formal methods and technologies for the legal governance of computations
- existing artifical legal agents in MAS: survey
- extraction of abstraction and fundamental concepts
- definition of guidelines for the comparison
- survey of existing ML methods for legal governance and compuations
- integration of ML concept in logical models
- definition of a methodology for design computable law and Artificial Legal Agents
- model definition: refinement and integration of methods and tools for computable law and ALAs
- implementation of the model into running prototypes
- validation through interviews with experts

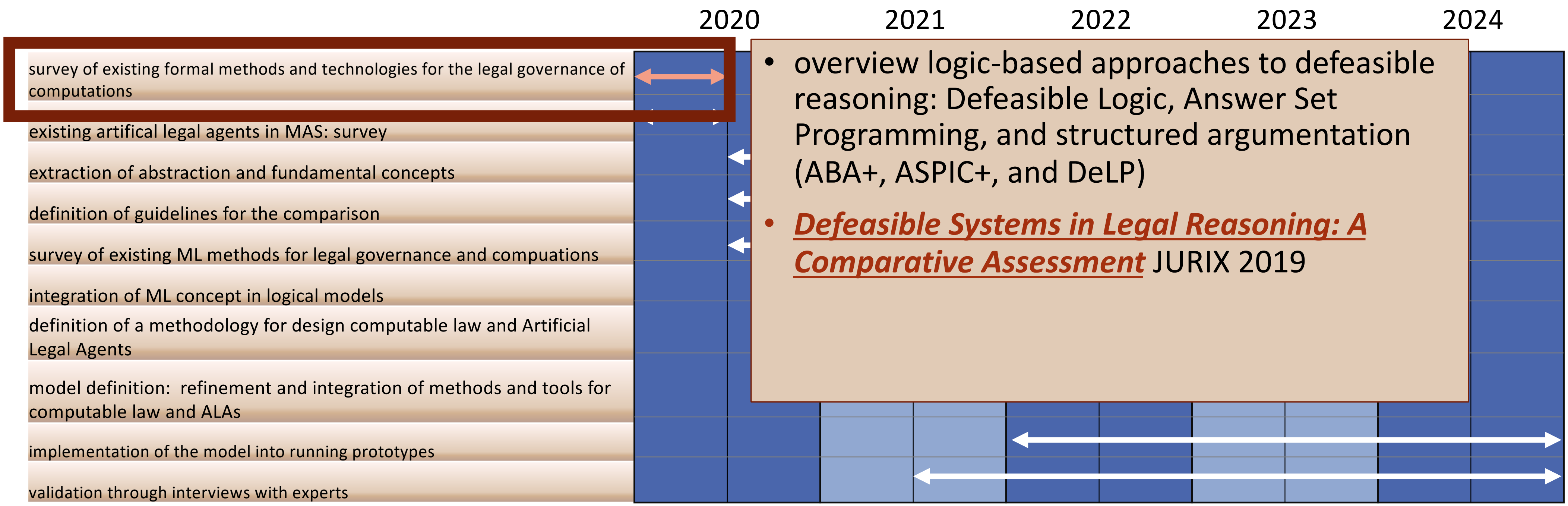
DELIVERABLE:

- **Article/report:** model implementation
- **Tool**

Stable Prototype

Tool implementation

Subproject 2: Current Status



survey of existing formal methods and technologies for the legal governance of computations

existing artifical legal agents in MAS: survey

extraction of abstraction and fundamental concepts

definition of guidelines for the comparison

survey of existing ML methods for legal governance and compuations

integration of ML concept in logical models

definition of a methodology for design computable law and Artificial Legal Agents

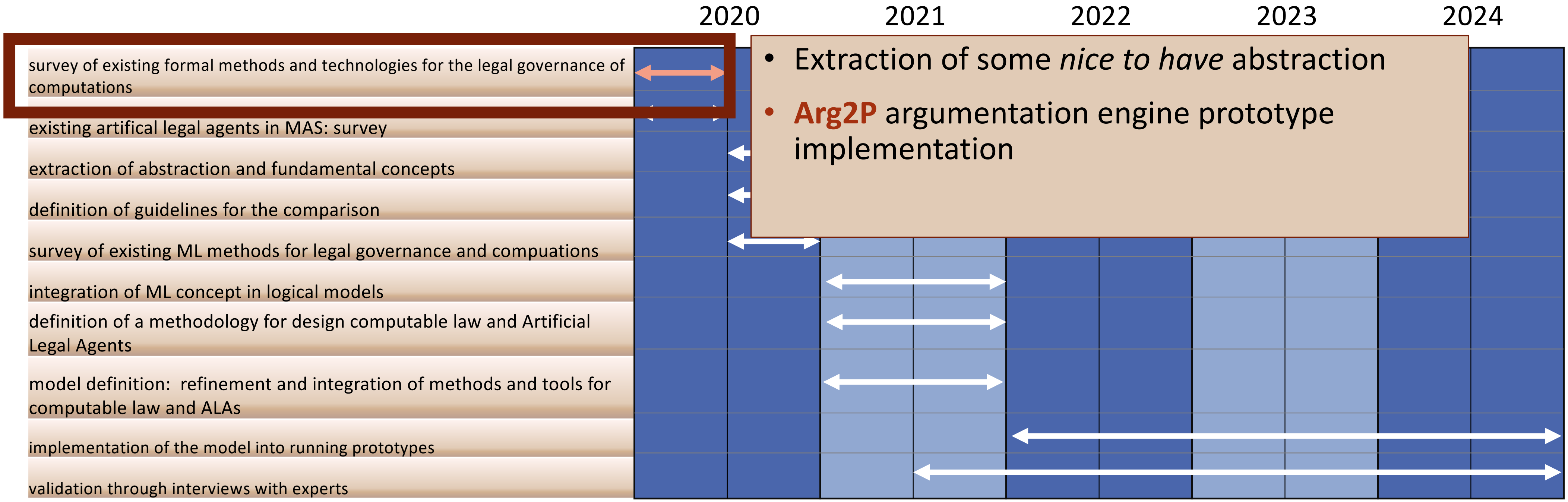
model definition: refinement and integration of methods and tools for computable law and ALAs

implementation of the model into running prototypes

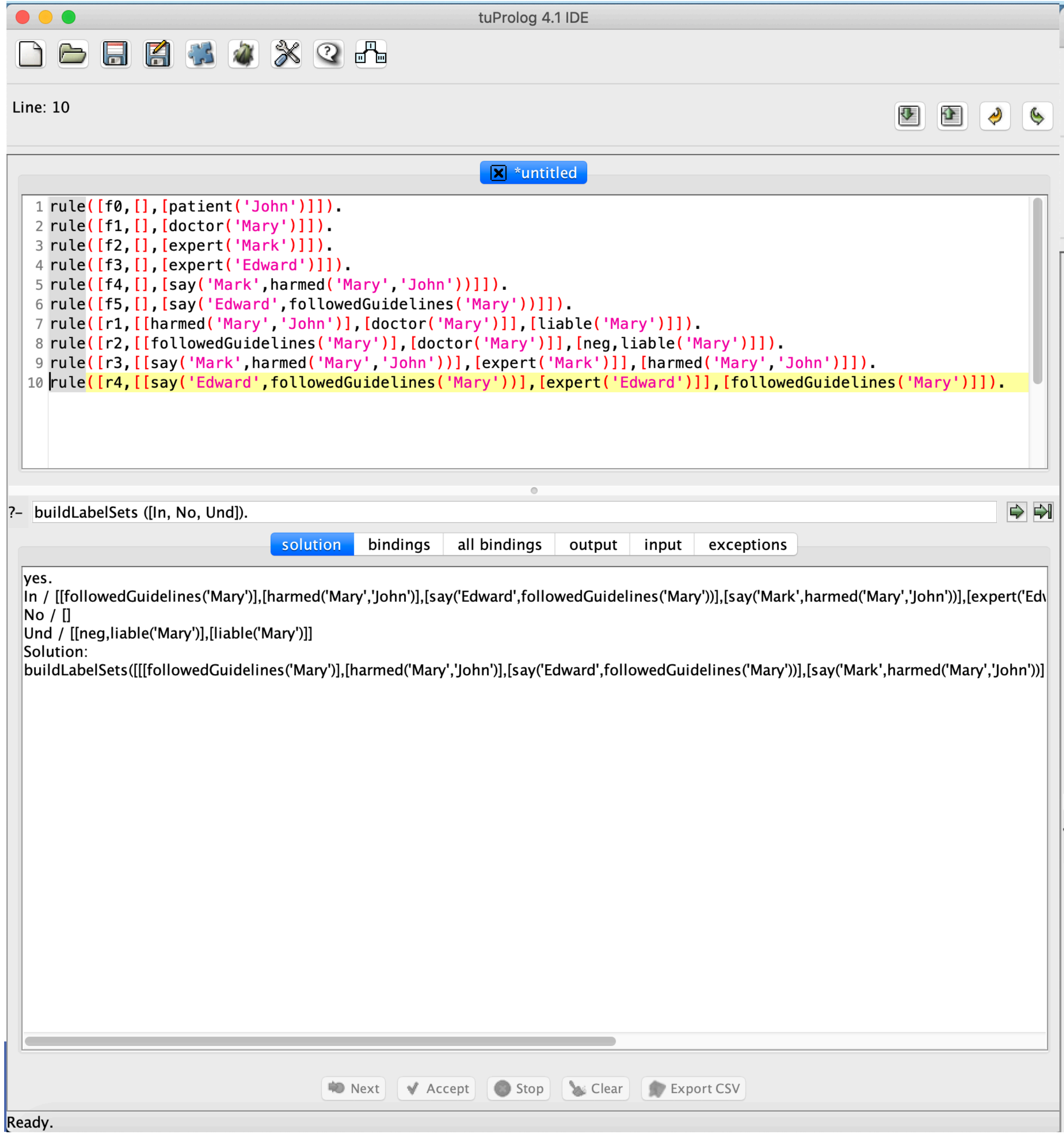
validation through interviews with experts

- overview logic-based approaches to defeasible reasoning: Defeasible Logic, Answer Set Programming, and structured argumentation (ABA+, ASPIC+, and DeLP)
- ***Defeasible Systems in Legal Reasoning: A Comparative Assessment*** JURIX 2019

Subproject 2: Current Status



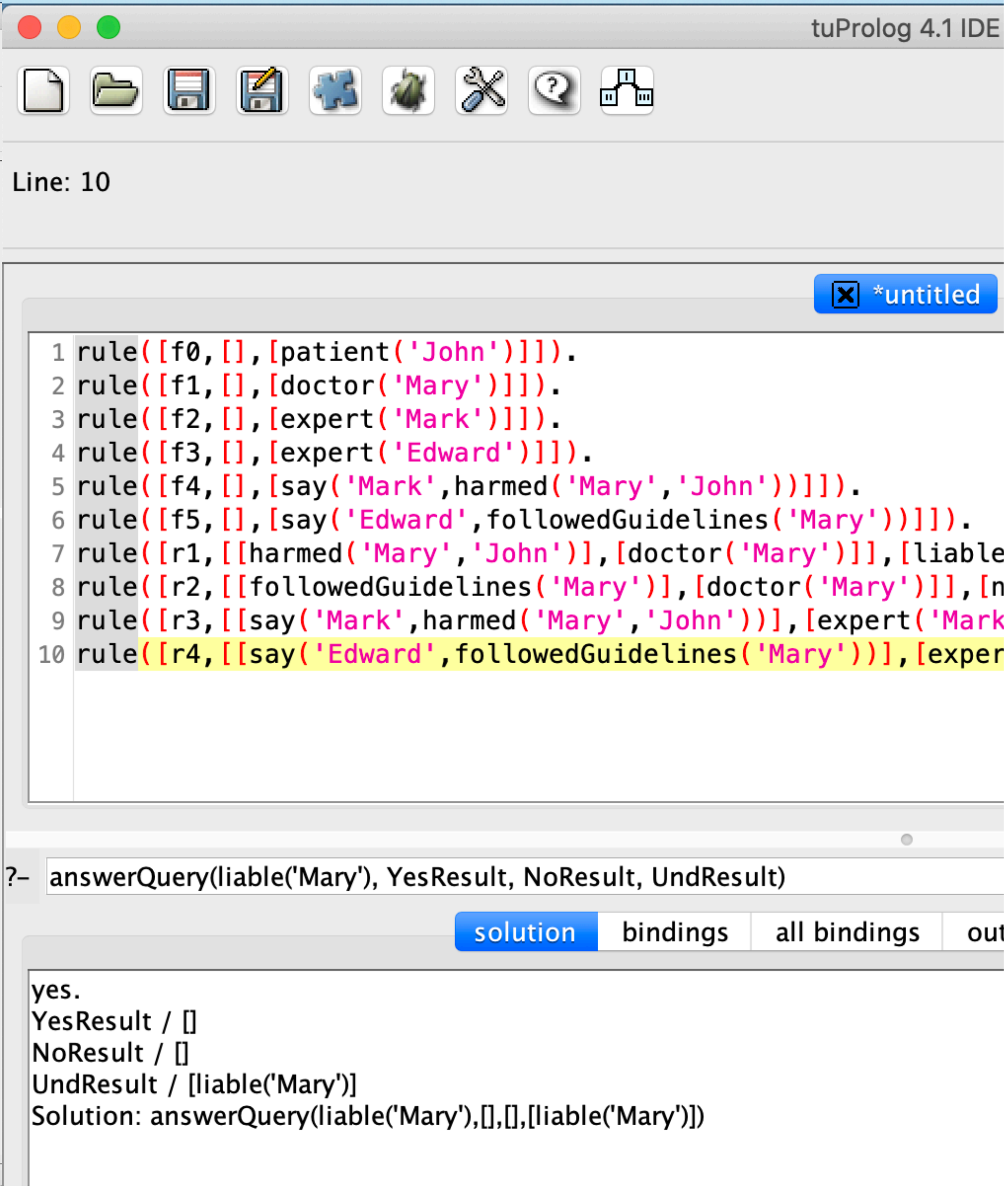
- Extraction of some *nice to have* abstraction
- **Arg2P** argumentation engine prototype implementation



```
rule([f0,[],[patient('John')]]).
rule([f1,[],[doctor('Mary')]]).
rule([f2,[],[expert('Mark')]]).
rule([f3,[],[expert('Edward')]]).
rule([f4,[],[say('Mark',harmed('Mary','John'))]]).
rule([f5,[],[say('Edward',followedGuidelines('Mary'))]]).
rule([r1,[[harmed('Mary','John')],[doctor('Mary')]],[liable('Mary')]]).
rule([r2,[[followedGuidelines('Mary')],[doctor('Mary')]],[neg,liable('Mary')]]).
rule([r3,[[say('Mark',harmed('Mary','John'))],[expert('Mark')]],[harmed('Mary','John')]]).
rule([r4,[[say('Edward',followedGuidelines('Mary'))],[expert('Edward')]],[followedGuidelines('Mary')]]).
```

```
?- buildLabelSets ([In, No, Und]).
```

```
yes.
In / [[followedGuidelines('Mary')],[harmed('Mary','John')],[say('Edward',followedGuidelines('Mary'))],[say('Mark',harmed('Mary','John'))],[expert('Edv
No / []
Und / [[neg,liable('Mary')],[liable('Mary')]]
Solution:
buildLabelSets([[[followedGuidelines('Mary')],[harmed('Mary','John')],[say('Edward',followedGuidelines('Mary'))],[say('Mark',harmed('Mary','John'))]
```



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rule([r3,[[say('Mark',harmed('Mary','John'))],[expert('Mark
rule([r4,[[say('Edward',followedGuidelines('Mary'))],[exper
```

```
?- answerQuery(liable('Mary'), YesResult, NoResult, UndResult)
```

```
yes.
YesResult / []
NoResult / []
UndResult / [liable('Mary')]
Solution: answerQuery(liable('Mary'),[],[],[liable('Mary')])
```

COMPU LAW

European University Institute

DEPARTMENT OF LAW

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European Research Council

Established by the European Commission

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