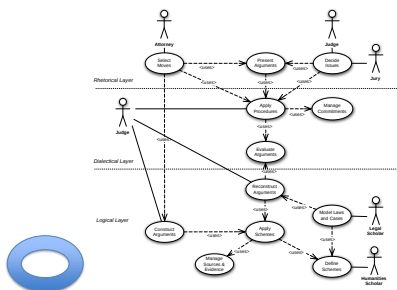


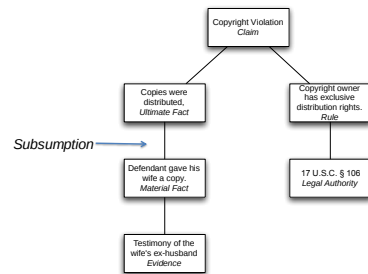
Tools for Legal Argumentation: Current State of the Art

Tom Gordon
Fraunhofer FOKUS /
University of Potsdam

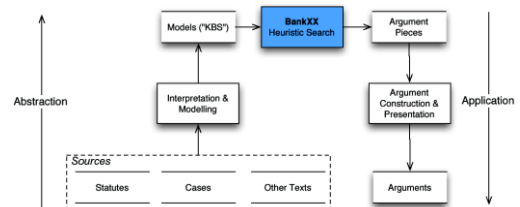
Legal Argumentation Tasks



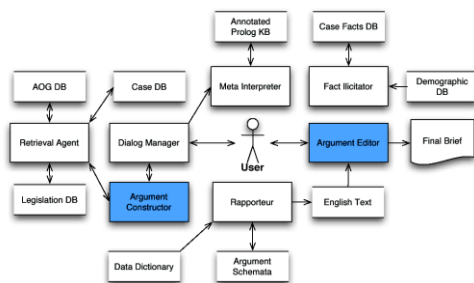
Factual and Legal Issues



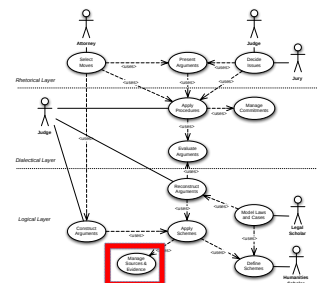
Bank XX (1993/96) Rissland, Skalak & Friedman



PLAID (1995) Bench-Capon & Staniford



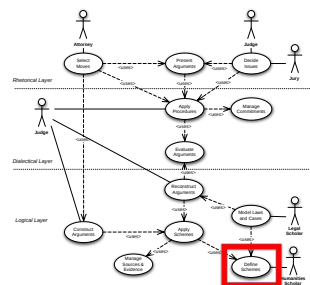
Legal Argumentation Tasks



Managing Sources and Evidence

- Legal Research Services
 - Google Scholar
 - LexisNexis
 - WestLaw
- Content, Knowledge and Case Management Systems
 - Alfresco
 - Drupal
 - Plone
- Markup and Metadata
 - CEN MetaLex
 - Akoma Ntoso
 - OASIS Legal Document XML

Legal Argumentation Tasks



Computational Models of Argumentation Schemes

- Argument from Cases (CBR) [McCarty, Ashley, Rissland, Branting, Skalak, Aleven, Roth]
- Argument from Rules and Cases [Gardner, Branting, Skalak, Nitta, Prakken, Sartor, Bench-Capon]
- Argument from Rules with Priorities [Hage, Verheij, Gordon, Prakken, Sartor]
- Argument from Rationales [Loui, Norman, Roth]
- Argument from Principles [Hage, Prakken, Gordon, Loui]
- Argument from Values, Purpose and Policy [Berman, Hafner, Bench-Capon, Sartor]
- Argument from Goals [Atkinson, Bench-Capon]
- Argument from Evidence [Prakken, Walton]

Argumentation Scheme Languages

Araucaria

```

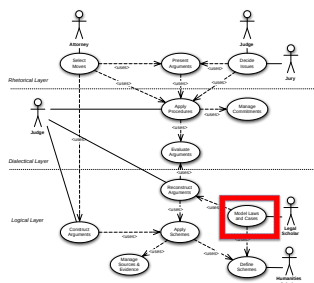
<SCHEME>
<NAME> Argument from Expert Opinion / NAME
<FORM>
<PREMISE> E is an expert in domain D / <PREMISE>
<PREMISE> A asserts that A is known to be true / <PREMISE>
<PREMISE> A is within D / <PREMISE>
<CONCLUSION> A may (plausibly) be taken to be true / <CONCLUSION>
<FORM>
<CD> E is a genuine expert in D / <CD>
<CD> E is really an expert that A is known to be true / <CD>
<CD> E is the expert's pronouncement directly quoted? If not, is a reference to the original source given? Can it be checked?
<CD>
<CD> If the expert advice is not quoted, does it look like important information or qualifications may have been left out? / <CD>
<CD> If more than one expert source has been cited, is each authority quoted separately? Could there be disagreements among the cited authorities? / <CD>
<CD> What the authority said clear? Are there technical terms used that are not explained clearly? If the advice is in layman's terms, could this be an indication that it has been translated from some other form of expression given by the expert? / <CD>
<CD> A relevant to domain D / <CD>
<CD> A consistent with what other experts in D say / <CD>
<CD> A consistent with known evidence in D / <CD>
</SCHEME>
  
```

Carneades

```

(make-scheme
 id "expert opinion"
 header (make-metadata
 title "Argument from Expert Opinion"
 source "Douglas Walton, Legal Argumentation and Evidence, The Pennsylvania State University Press, University Park, 2002, pp. 49-50. Douglas Walton, Appeal to Expert Opinion, The Pennsylvania University Press, University Park, Albany, 1997, p. 211-225.")
 conclusion TA
 premises [(make-premise
 role "major"
 statement "[expert TE TS])
 (make-premise
 role "domain"
 statement "[in-domain TA TS])
 (make-premise
 role "minor"
 statement "[asserts TE TA])]
 ;; Critical Questions
 exceptions [(make-premise
 role "CQ1"
 statement "[untrustworthy TE])
 (make-premise
 role "CQ2"
 statement "[inconsistent with other experts TA])]
 assumptions [(make-premise
 role "CQ3"
 statement "[based-on-evidence TA])]
  
```

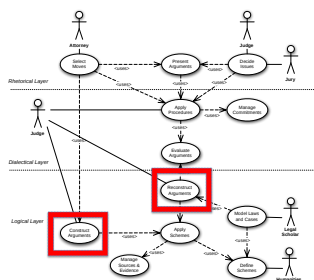
Legal Argumentation Tasks



Modelling Laws

- Isomorphism
- Reification
- Defeasibility
- Contraposition
- Case-Based Reasoning
- Rule Validity
- Modalities

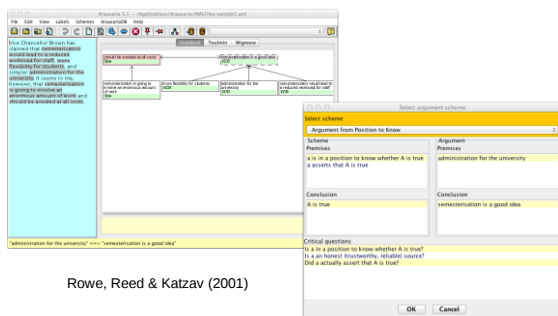
Legal Argumentation Tasks



Constructing and Reconstructing Arguments

- Compared
 - Construction: creating original arguments by instantiating argumentation schemes
 - Reconstruction: using argument schemes to interpret existing arguments in natural language texts (e.g. court opinions)
- Kinds of Tools
 - Interactive software tools
 - Fully automatic, using models of, e.g., facts, ontologies, rules and cases

Interactive Argument Reconstruction with Araucaria



Rowe, Reed & Katzav (2001)

Argument Mining: Automatic Argument Reconstruction

$$\begin{aligned}
 T &\Rightarrow A^*D \\
 A &\Rightarrow \{A^*C\}A^*Cn[P^*]Cn[A^*w_rC[P^*]] \\
 D &\Rightarrow r_i f[n, s, i]^+ \\
 P &\Rightarrow \{P_{next}, P_{prev}, PP_{next}, PP_{prev}, AP_{next}, AP_{prev}\} \\
 P_{next} &= SP_{prev} \\
 P_{prev} &= SP_{next} \\
 P_{next} &= \{r_i\} \{s\} \{P_{next}\} \{P_{prev}\} \{P_{next}\} \\
 P_{prev} &= \{r_i\} \{s\} \{P_{prev}\} \{P_{next}\} \{P_{prev}\} \\
 C &= \{r_i\} \{r_j\} \{s\} \{C\} \{r_i, P_{next}\} \\
 C &= s^* \{s, s\}
 \end{aligned}$$

Figure 4: Context-free grammar used for argument structure detection and proposition classification



Figure 5: Tree structure of an argument

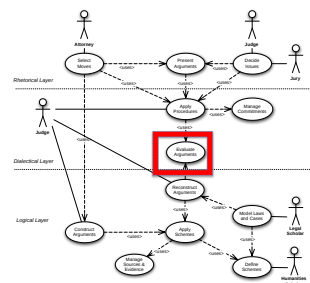
Palau, Raquel Mochales, and Marie-Francine Moens. "Argumentation mining: the detection, classification and structure of arguments in text." Proceedings of the 12th international conference on artificial intelligence and law. ACM, 2009.

Automatic Argument Construction from Rules and Ontologies



Gordon, T. F. Combining Rules and Ontologies with Carneades. In Proceedings of the 5th International RuleML2011@BRF Challenge (2011), pp. 103–110.

Legal Argumentation Tasks



Evaluating Arguments: Conceptions of Argument

- Single-step arguments: Instantiations of argumentation schemes
- Defeasible proofs (Pollock 1987; Prakken 2010)
- Minor premise (Pragma-Dialectics)
- Set of propositions (Bresnard & Hunter 2008)
- Argument graphs (Gordon, Prakken & Walton 2007)

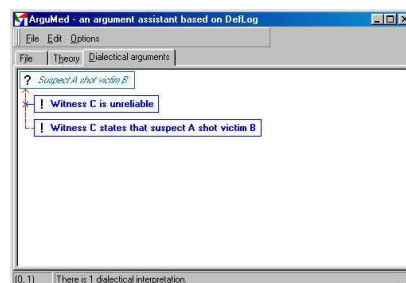
Evaluating Arguments: Procedure

1. Validate that each single-step argument properly instantiates its scheme. Check for missing premises.
2. From the perspective of the **audience** of interest, such as a judge or jury, label the statements which are accepted as true, or rejected as false, without argument, and weigh/order the single-step arguments.
3. **Narrower conception of evaluation:** Evaluate the defeasible proofs in the argument graph to determine which arguments are acceptable (in), not acceptable (out) or undecided. Use this information to then compute, analogously, which of the statements (claims) are acceptable (in), not acceptable (out) or undecided.
4. Use argumentation schemes to reveal and critically question any implicit premises and to construct counterarguments.

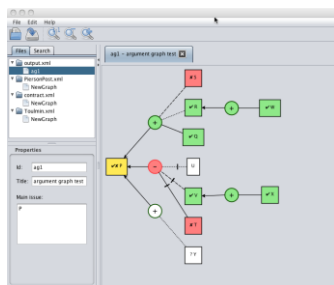
Computational Models of Argument Evaluation

- Narrow conception of evaluation
- Abstract Arguments
 - Abstract Argumentation Frameworks (Dung 1995)
 - Value-based Argumentation (Bench-Capon 2003)
 - Using arguments about preferences (Modgil 2009)
- Structured Arguments
 - DefLog (Verheij, 2003)
 - Using proof standards; Carneades (Gordon, Prakken & Walton 2007)
 - Defeasible proof trees; ASPIC+ (Prakken 2010)
 - Mapping Carneades to ASPIC+ (Gizjel & Prakken 2011)

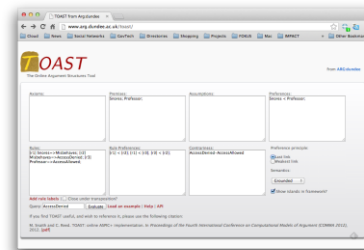
ArguMed 3 (2001) Verheij



Carneades 2011

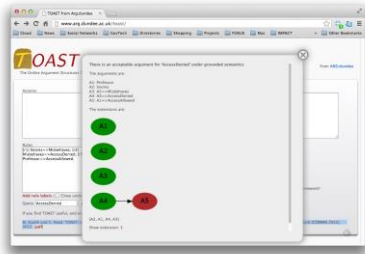


TOAST

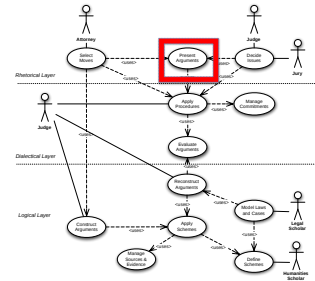


M. Snath and C. Reed. TOAST: online ASPIC+ implementation. In Proceedings of the Fourth International Conference on Computational Models of Argument (COMMA 2012), 2012.

TOAST



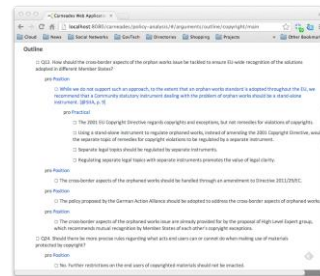
Legal Argumentation Tasks



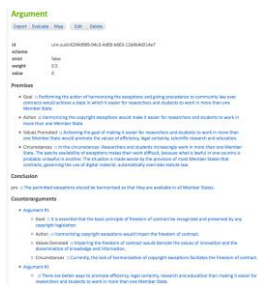
Presenting Arguments

- Textually
 - Outlines
 - Hypertext
 - Reports, using “document assembly” tools (e.g. HotDocs, Exari)
- Diagrams
 - Argument maps

Hypertext Outline Carneades Web App (2012)



Detailed Argument View Carneades Web App



Rationale (2003) Austhink

