25 Years of AI & Law
ICAIL 1987 - 2013

ICAIL 2013
Radboud Winkels
Outline

- Some data and some trends 1987-now
- Our own research 1988-now
- The research-practice paradox
- In search of the AI&Law challenge
The Wisdom of the ICAIL crowd?

Which country 1\textsuperscript{st} author most papers?
Countries of 1st Authors papers
ICAIL acceptance rates 2005-2013

Paper Acceptance Rate 17 of 53 submissions, 32%
Overall Acceptance Rate 85 of 245 submissions, 35%

<table>
<thead>
<tr>
<th>Year</th>
<th>Submitted</th>
<th>Accepted</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICAIL '05</td>
<td>66</td>
<td>28</td>
<td>42%</td>
</tr>
<tr>
<td>ICAIL '07</td>
<td>68</td>
<td>18</td>
<td>26%</td>
</tr>
<tr>
<td>ICAIL '09</td>
<td>58</td>
<td>22</td>
<td>38%</td>
</tr>
<tr>
<td>ICAIL '11</td>
<td>53</td>
<td>17</td>
<td>32%</td>
</tr>
<tr>
<td>Overall</td>
<td>245</td>
<td>85</td>
<td>35%</td>
</tr>
</tbody>
</table>

ICAIL '13  53  17  32%
The Wisdom of the ICAIL crowd?

Which Author most papers?
Most ICAIL Papers as (Co-) Author
LESS

1987

knowledge
system
legal

2007

LEGAL
system

2013

LEARNING
Observations 1987-2013

- *Knowledge* and *expertise* less important and gone (2013)
- *Documents* and *data* appear (1997)
- *Building Systems* less important
- *Legal Argumention* more important

(similar observations JURIX except for Agents appearing)
“SUPERIOR TO MAN”

“One is enough for deriving everything from nothing”
“This could be the discovery of the century. Depending, of course, on how far down it goes.”
Or Start at the Bottom?

"I hate this hole."
Building Legal Knowledge Systems

Sources

Case law on legislation

Case law on doctrine

Formal Models

\{ p_1, p_2, \ldots \}

\{ q_1, q_2, \ldots \}

\{ O(\alpha \ I \ \beta) \}

concepts

norms

Task of reasoning

Meta-knowledge

Applications

Term: This means that and has relations with those

\[ O(\alpha \ I \ \beta) \]

\[ p_1, p_2, \ldots \]

\[ q_1, q_2, \ldots \]

\[ p_1, p_2, \ldots \]

\[ q_1, q_2, \ldots \]

\[ O(\alpha \ I \ \beta) \]

\[ p_1, p_2, \ldots \]

\[ q_1, q_2, \ldots \]

\[ O(\alpha \ I \ \beta) \]

\[ p_1, p_2, \ldots \]

\[ q_1, q_2, \ldots \]

\[ O(\alpha \ I \ \beta) \]
A Knowledge Engineering Perspective

- Traffic Regulations (1989-)
- World vs Normative Knowledge (ICAIL91)
- TRACS (de Haan e.a.)
More Kinds of Knowledge: ON-LINE (Valente et al. ICAIL95)
CLIME (1998-2001)

- Very large domain of ship classification
- Incremental Modelling of
  - Domain: Extended Conceptual Retrieval (JURIX2002)
  - Norms: Generating Exception Structures (ICAIL99)
- Legal Information Serving
  - Assess case with possible exceptions!
- cf. HARNESS (2008)
**Example**

N1: Ships are *not* allowed to have only 1 pump.

N2: A cargo ship *may* have only 1 pump.

Q1: The bulk carrier ‘Victoria’ has 1 pump. Is that allowed?

N1: $F\{\text{ship}(X) \land \text{pumps}(X, 1)\}$

N2: $P\{\text{cargo-ship}(X) \land \text{pumps}(X, 1)\}$

Tw: $\text{cargo-ship}(X) \rightarrow \text{ship}(X)$

$\text{bulk-}\text{carrier}(X) \rightarrow \text{cargo-}\text{ship}(X)$

Q1: $\{\text{bulk-}\text{carrier}(\text{’Victoria’}) \land \text{pumps}(\text{’Victoria’}, 1)\}$

Q1 matches ‘generic case’ of N1 → disallowed

Q1 matches ‘generic case’ of N2 → allowed

N2 is more specific than N1 → allowed
N1: Ships are *not* allowed to have only 1 pump.

N2: A cargo ship *may* have only 1 pump.

Q1: The *ship* ‘Victoria’ has 1 pump. Is that allowed?

Q1 matches ‘generic case’ of N1 → disallowed

Correct, but co-operative?

Disallowed, unless your ship is a cargo ship…
Exception Structures

\[ \text{Exception Structures} \]

\[
\begin{align*}
\text{F}_{GC1} & \\
\text{O}_{GC2} & \quad \text{P}_{GC3} & \quad \text{F}_{GC9} \\
\text{P}_{GC4} & \quad \text{F}_{GC5} & \quad \text{F}_{GC6} & \quad \text{F}_{GC7} & \quad \text{P}_{GC10} & \quad \text{P}_{GC11}
\end{align*}
\]

- Normative intent of law
- *Generate paraphrases* or alternative codifications
- Exception structures
- Useful for legal comparison and drafting
- Winkels & de Haan (ICAIL95)
Alternative Codifications

$W_p$ all "physically possible" behaviour in the world to be regulated

$W_d$ desired behaviour

Prohibited by rule 1

Permitted/obliged by rule 1

Permitted by rule 2

Prohibited by rule 2

Prohibited by rule 3

Permitted by rule 3
Causal/responsibility Reasoning in Law (Lehmann e.a.)

What has happened?
Who did what?
Who is to be blamed?

META-LEGAL KNOWLEDGE

legally qualified behaviour description

NORMATIVE KNOWLEDGE

classified behaviour (allowed/disallowed)

RESPONSIBILITY KNOWLEDGE

agent(s) that caused the behaviour

agent(s) that are responsible for the behaviour

CREATIVE KNOWLEDGE

abstract legal agency

LEGAL SYSTEM

legal reaction

LESIONING KNOWLEDGE

CAUSAL KNOWLEDGE

WORLD KNOWLEDGE

(Legal Abstract Model)

DEFINITIONAL KNOWLEDGE

COMMONSENSE KNOWLEDGE

SOCIETY

social behaviour (states of affairs, stories)

PHILIPS B.V.

UNIVERSITY OF AMSTERDAM

MINISTRY OF EDUCATION

JOOST BREUKER
Lots of Problems and Much Effort in World Knowledge

META-LEGAL KNOWLEDGE

Legally qualified behaviour description

NORMATIVE KNOWLEDGE

classified behaviour (allowed/disallowed)

RESPONSIBILITY KNOWLEDGE

agent(s) that caused the behaviour

agent(s) that are responsible for the behaviour

REACTIVE KNOWLEDGE

LEGAL SYSTEM

LEGAL KNOWLEDGE

abstract legal agency

CREATIVE KNOWLEDGE

legal reaction

WORLD KNOWLEDGE (Legal Abstract Model)

DEFINITIONAL KNOWLEDGE

CAUSAL KNOWLEDGE

COMMONSENSE KNOWLEDGE

social behaviour (states of affairs, stories)

PHILIPS B.V.

UNIVERSITY OF AMSTERDAM

MINISTRY OF EDUCATION

JOOST BREUKER

SOCIETY
Legal (Core) Ontologies

- LRI- and LKIF Core Ontology (Hoekstra e.a.)

Legal core ontology

<table>
<thead>
<tr>
<th>Action</th>
<th>Document</th>
<th>Agent</th>
<th>Norm</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Legal action</td>
<td>Legal code</td>
<td>Legal person</td>
<td>Legally valid norm</td>
<td>Judge</td>
</tr>
<tr>
<td>Legal domain ontology:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Dutch) criminal law</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Automatic support:

- Increase quality models and efficiency process
- Increase inter-coder reliability

Diagram:

- **NL text** → **Structured text with explicit and typed refs** → **Model of individual provisions** → **Integrated model of meaning** →
  - **Recognizing and classifying**
  - **Model fragment suggestions**
- Doable with patterns and CFG
- 80-99% accuracy for Dutch laws
- Is that *enough*?
Doable with patterns plus full *dependency parser* plus *manual* selection of parse tree

**Worthwhile?**

- NL text
- Structured text with explicit and typed refs
- Model of individual provisions
- Integrated model of meaning
- Recognizing and classifying
- Model fragment suggestions
From Sources of Law to Formal Models (AGILE)

- The bigger problem
- Context of Task (Agent perspective)
- Tools plus methodology!

- NL text → Structured text with explicit and typed refs → Model of individual provisions → Integrated model of meaning
- Recognizing and classifying
- Model fragment suggestions
From Knowledge to (Linked) Data

- Interesting results and progress but
  - Still very costly
  - Validation and maintenance issues
- Hard to find business cases for LKBS
  - Much *(money)* at stake in specific domain
  - Huge case load in short time
- 'Simpler', prerequisite needs
  - Information management
    - Relevant sources of law in context
    - Concepts and definitions *(Winkels & Hoekstra, 2012)*
    - Impact analysis of change
Network Analysis of Dutch Case law (Winkels e.a. 2011)
Research – Practice Paradox
Focus on legally interesting in stead of practically interesting problems

Lack of proof (in realistic settings)
  - Not much evaluation
    (cf. Conrad & Zeleznikow, ICAIL 2013)

Problem of **Golden Standard**
especially in legally interesting cases
In Search of the AI&Law Challenge
What would be a/the AI&Law Challenge?

- Beat the Judge? (cf. vd Herik)
- Predict future developments? (cf. Surdeanu e.a. ICAIL2011; Whalen, NaiL2013?)
- Argumentation Game against humans?
- Story interpretation challenge?
- ...
YOUR IDEAS?