How research in AI and Law is automating legal work

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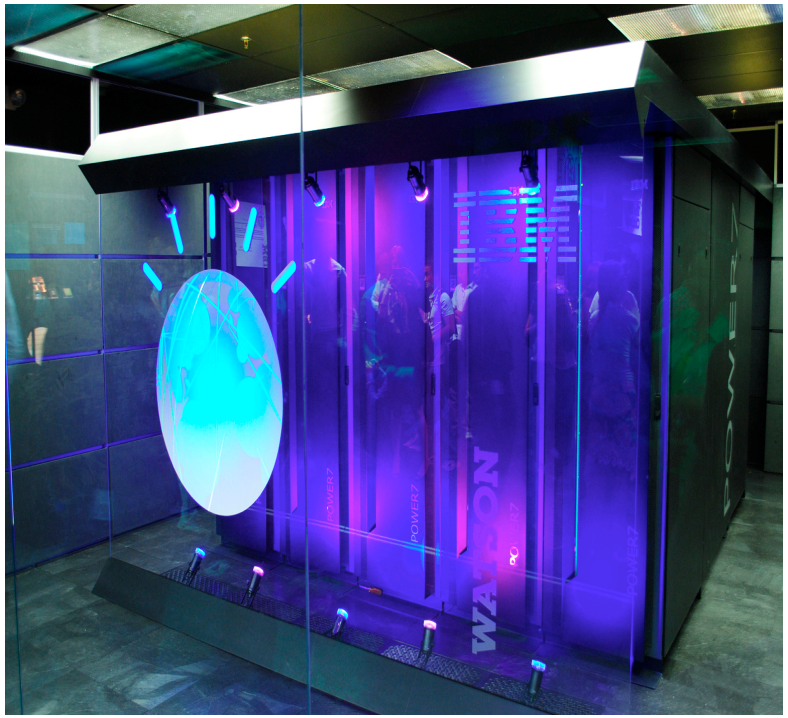
Overview

- Insights into the academic field of AI and Law
- An example application for a specific legal problem
  - Modelling reasoning about legal cases
- Current topics of focus in AI and Law

We all know that AI is making the headlines



IBM's Watson

Google DeepMind's AlphaGo

Next step: apply general AI solutions to specific domains

AI tackles problem solving

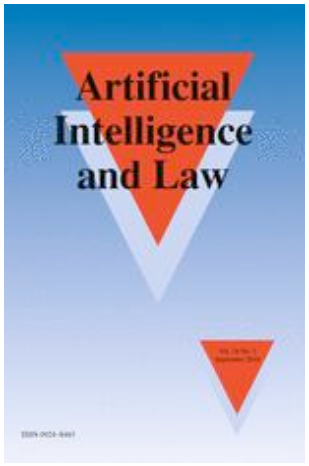
- We can view legal problems through this lens
  - Who should win the case?
  - What are the consequences of the contract?
  - What does the evidence tell us?
  - What should the financial settlement be?

…

AI and Law is a research area in itself

The landscape of AI and Law research

- The International Conference on AI and Law (ICAIL) has been running biennially since 1987
  - Coming to London in June 2017
  - Supported by the International Association for AI and Law
- The journal Artificial Intelligence and Law has been publishing research on the topic since 1992



So what has this community been working on for the past 30 years?

A History of AI and Law in 50 papers:

25 Years of the International Conference on AI and Law

Trevor Bench-Capon · Michał Araszkiewicz · Kevin Ashley · Katie Atkinson · Floris Bex · Filipe Borges · Daniele Bourcier · Paul Bourgine · Jack G. Conrad · Enrico Francesconi · Thomas F. Gordon · Guido Governatori · Jochen L. Leidner · David D. Lewis · Ronald P. Loui · L. Thorne McCarty · Henry Prakken · Frank Schilder · Erich Schweighofer · Paul Thompson · Alex Tyrrell · Bart Verheij · Douglas N. Walton · Adam Z. Wyner

Let's look at a few highlights…

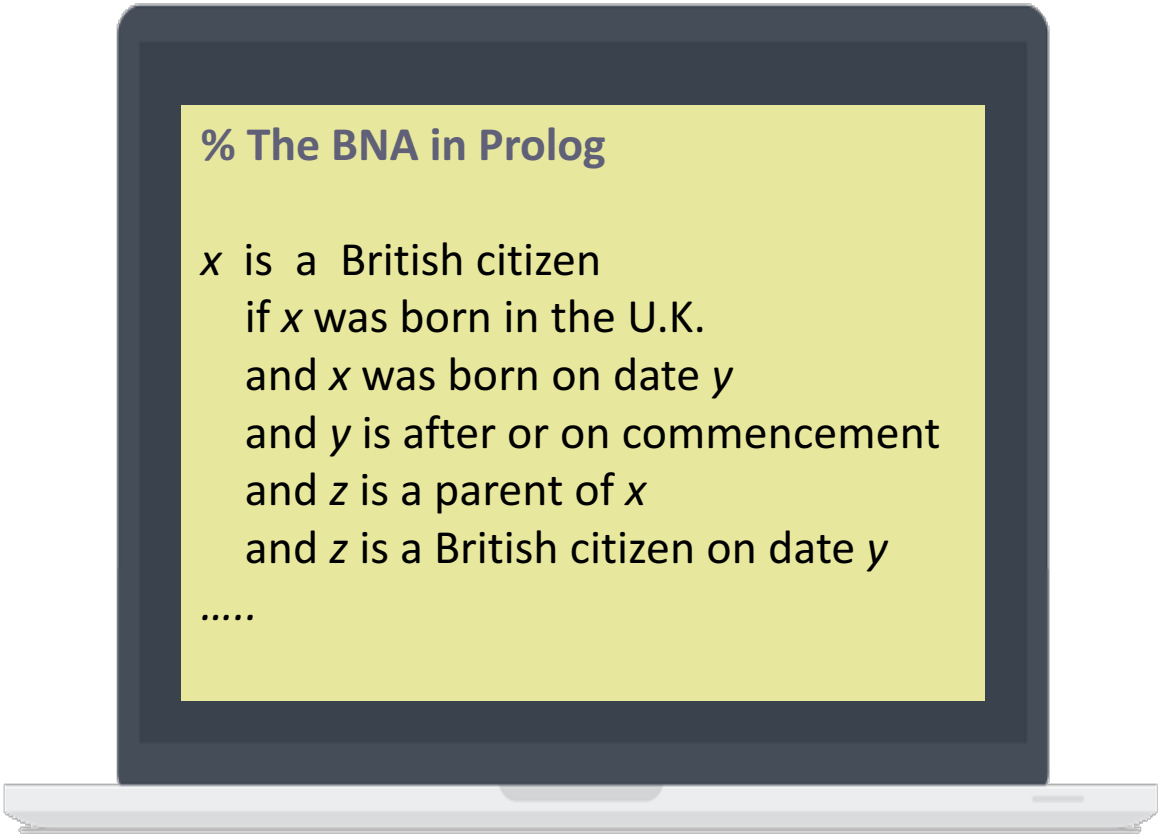
Search and information retrieval

Lessons from general AI, but solutions specifically for the legal domain through established products

LexisNexis™

Law as executable logic programs

- An early landmark example:
  The British Nationality Act as a Logic Program



Policy and legislation as executable business rules

- ICAIL 1991: “Legislative knowledge base systems for public administration: some practical issues”

- SoftLaw → Haley Systems → RuleBurst → Oracle

Machine-readable languages for e-justice

- Recent EU project “Building Interoperability for European Civil Proceedings Online”

e-CODEX | making justice faster.eu

- At ICAIL 2015: “Machine Learning for Readability of Legislative Sentences”

- Codex Center’s “Computational Law” project

CODEX
The Stanford Center for Legal Informatics

Machine Learning

Supervised Learning

Unsupervised Learning

Reinforcement Learning

Recent example in AI and Law: “Tax non-compliance detection using co-evolution of tax evasion risk and audit likelihood” (ICAIL 2015)

Natural Language Processing

In Abbott Laboratories v. Norse Chemical Corp., 33 Wis. 2d 445, 147 N.W.2d 529 (1967), our supreme court considered the following six factors as being relevant in determining whether the material sought to be protected is a trade secret:

". . . Some factors to be considered in determining whether given information is one's trade secret are: (1) the extent to which the information is known outside of *249 his business; (2) the extent to which it is known by employees and others involved in his business; (3) the extent of measures taken by him to guard the secrecy of the information; (4) the value of the information to him and to his competitors; (5) the amount of effort or money expended by him in developing the information; (6) the ease or difficulty with which the information could be properly acquired or duplicated by others." Id. at 463-64, 147 N.W.2d at 538-39 (quoting Restatement (First) of Torts § 757, comment b (1939)).

[1]

The question of whether the evidence in this case fulfills the criteria necessary to constitute a trade secret is a question of law.

Example from **M. Bryce & Associates, Inc. v. Gladstone**:

http://law.justia.com/cases/wisconsin/court-of-appeals/1982/80-1935-6.html

Artificial intelligence 'judge' developed by UCL computer scientists

Software program can weigh up legal evidence and moral questions of right and wrong to predict the outcome of trials

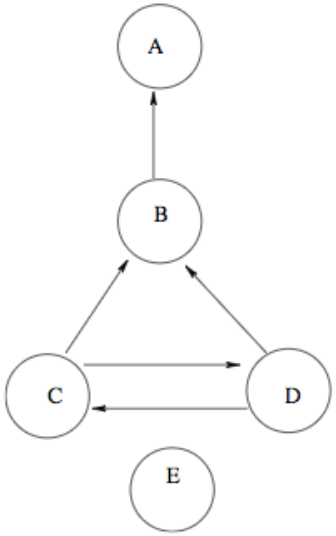
The algorithm examined English language data sets for 584 cases relating to torture and degrading treatment, fair trials and privacy. Photograph: Cultura/Rex/Shutterstock

The Guardian: 2016-10-04

Computational Models of Argument

- Argumentation: the exchange of arguments concerning matters of belief or matters of action

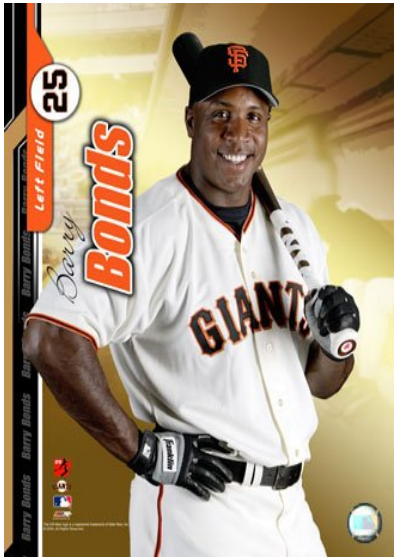
- Computational models of argument used to model debates involving competing arguments; applications in a number of domains



- Many facets in law: legal pleadings, burden of proof, judicial reasoning, hypothetical reasoning, …

Popov v. Hayashi

- Baseball player Barry Bonds hit a record-breaking 73rd home run in the 2001 season
- Mr Popov caught it in the upper part of the webbing of his baseball glove – a snowcone catch
- But a mob threw Popov to the ground, the ball dislodged from his glove and was picked up by Mr Hayashi



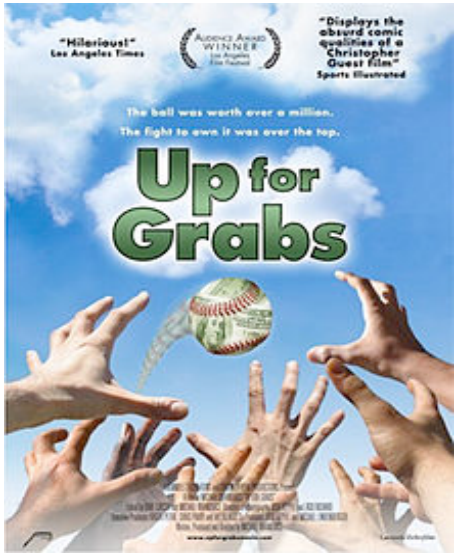
www.sports-central.org

www.supercow.com

Who owns the baseball?

- The Honourable Kevin M. McCarthy decided in the California Superior Court

- A film was also made about the case: *Up for Grabs*
  - See trailer on YouTube



- Can an AI program come to the same decision as the judge did?

Representing Popov v. Hayashi

- The case as a computational model of argument

- Can make use of a number of different types of argument. Examples include:
  - *Argument from Witness Testimony (WT)*: Seventeen witnesses testified in the case, including Popov and Hayashi.
  - *Argument from Video Tape (VT)*: The video tape was used as evidence, and McCarthy relied on it at several points.
  - *Argument From Purpose (AP)*: McCarthy uses teleological reasoning in reaching his decision.

Establishing the Facts – Popov's Snowcone Catch

- WT and VT establish the facts concerning Popov's initial contact with the ball:

  F1: Popov stopped the forward motion of the baseball.

  F2: The baseball was in the glove of Popov.

  F3: Popov was in motion.

- McCarthy states that the evidence does not clearly conclude that the ball was secure, as Popov "*had to reach for the ball, and in doing so may have lost his balance*"

Establishing the Facts – The Assault

F4: Unknown persons assaulted Popov.

F4a: NOT (Hayashi assaulted Popov).

F5: Popov lost contact with the baseball.

- VT establishes F4 that "*this was an out of control mob engaged in violent, illegal behaviour*"

- Hayashi was also thrown to the ground, but, importantly, he was found to have committed "*no wrongful act*"
  - This renders him blameless in the overall picture.
  - He was accused of biting a Mr. Shepard on the leg, though this claim was unsubstantiated by the evidence and subsequently rejected.

Establishing the Facts – Hayashi's Retrieval

- Finally, concerning Hayashi's retrieval of the ball:

  F6: Hayashi retrieved the baseball.

- F1 - F6 establish the main facts.
- Conclusions were also drawn concerning what could not be shown by the evidence:

  1) The two sources of evidence do not establish when or exactly how Popov lost the ball.

  2) The facts cannot tell us whether Popov *would* have been able to retain control of the ball had the mob not interfered with his efforts.
  - McCarthy says resolution of this question is "*the work of a psychic, not a judge*"

Image: telegraph.co.uk

Legal Analysis – `Catching' the Ball

- McCarthy states the following general principle:
- GP1: For at least the last eighty years, almost all fans attending professional baseball games in the United States have assumed they have a right to take home any balls they catch or retrieve in the stands.

- GP1 gives us two ways in which a fan may take possession of the ball

  R1: X caught the baseball → X has possession of the baseball

  R2: X retrieved the baseball → X has possession of the baseball

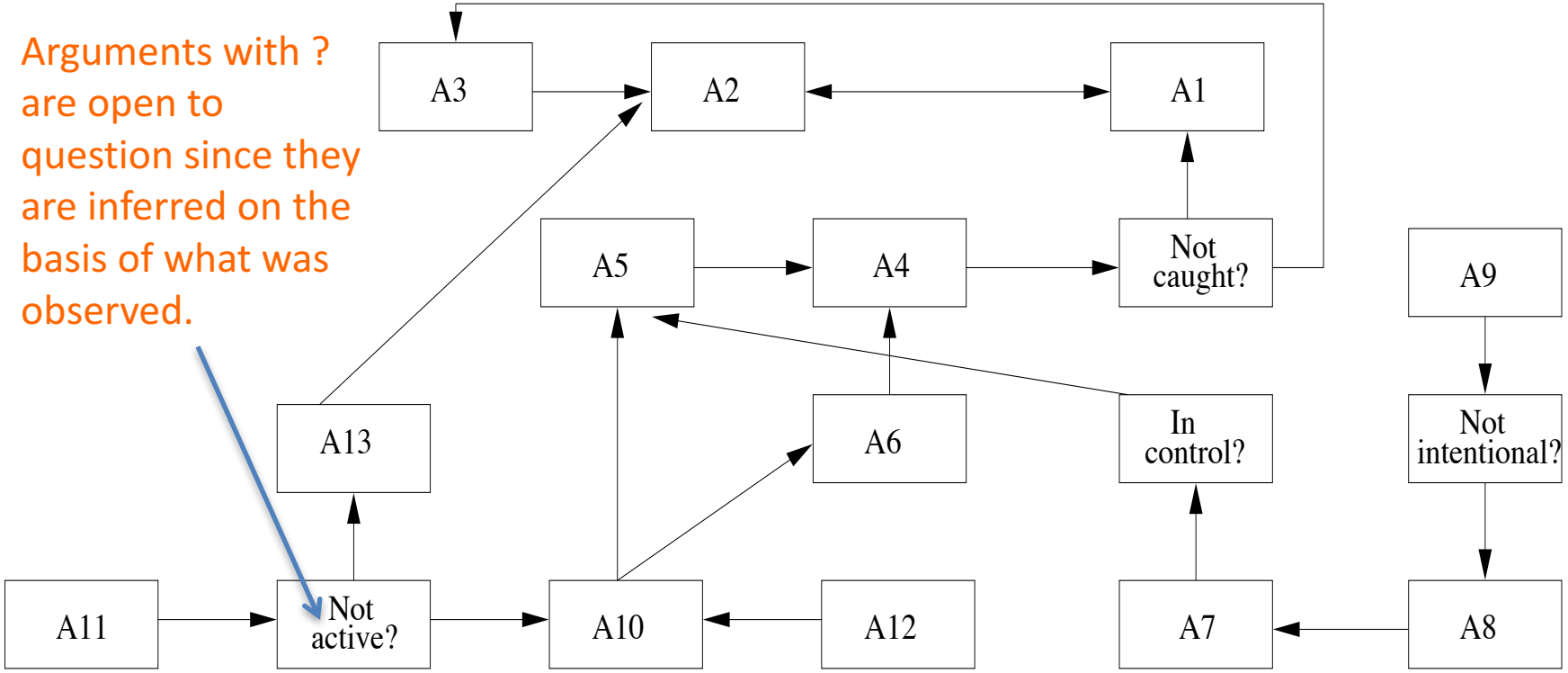
  R3: X caught the baseball → NOT (R2)

  Once a ball is caught, retrieval is not possible.

The full analysis goes on to considers many more aspects

Argumentation Framework

Arguments with ? are open to question since they are inferred on the basis of what was observed.



Evaluation

- All arguments and attacks between them are evaluated.
- Judge McCarthy concludes that Popov has not caught the ball, but his attempt to do so is enough to establish a "*legally cognizable pre-possessory interest*" in the ball.
- This interest precludes Hayashi from establishing control by retrieving the ball.
- But, one of them must own it…

Evaluation

- So who owns the ball?
- McCarthy tries to come to a decision that is fair to both parties, invoking arguments from purpose.
- The result: McCarthy can decide neither for Popov nor for Hayashi.
- His final decision: the ball should be sold and the proceeds divided between the two.

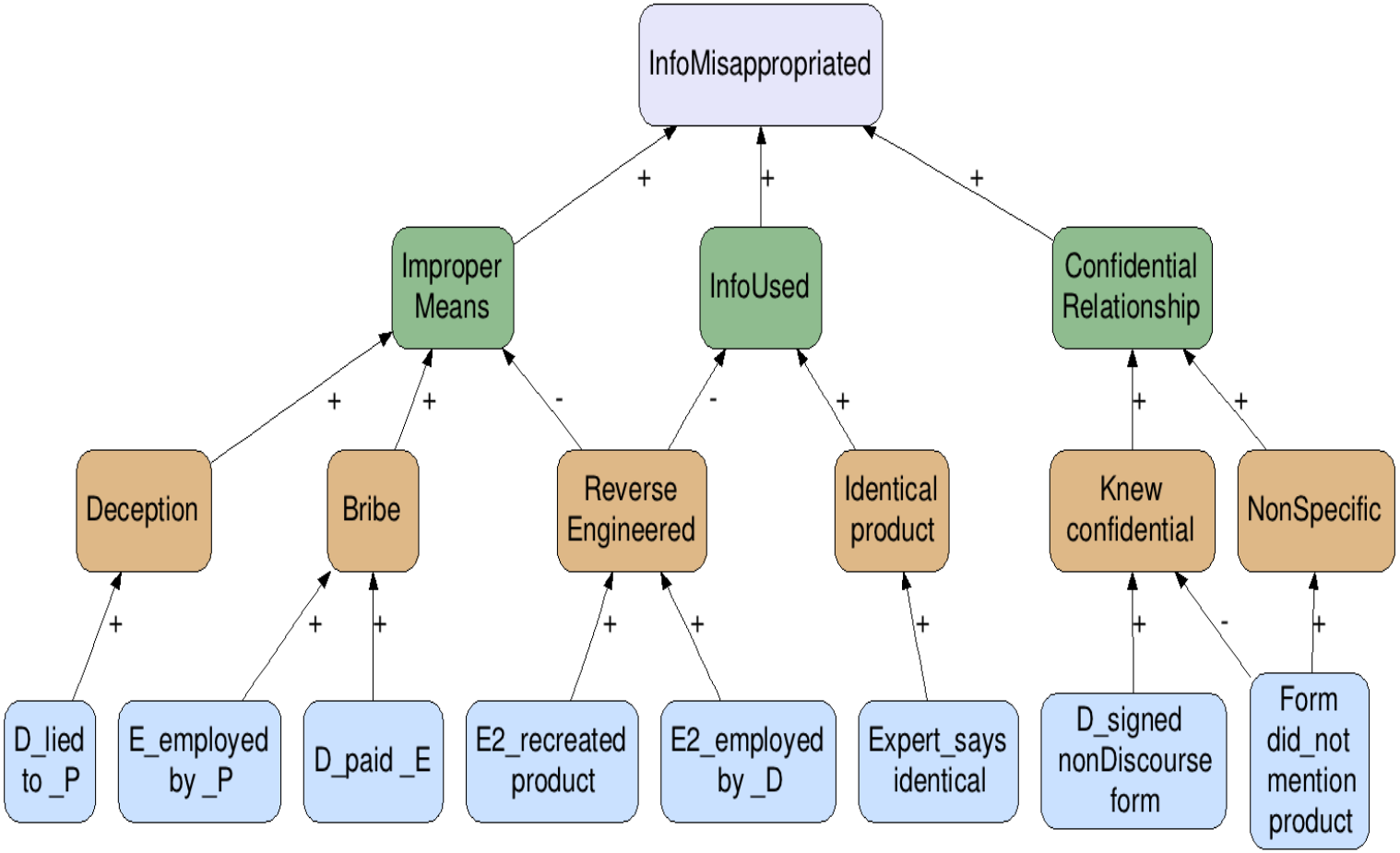
Photo: Wikipedia

Expanding to a body of case law

- More recent work has looked at deciding cases in a body of case law:
  1. 32 cases in the domain of US trade secrets
  2. 5 cases concerning wild animals
  3. 10 cases concerning the US automobile exception to the Fourth Amendment

- Results
  1. 31 out of 32 cases decided correctly
  2. 5 out of 5 cases decided correctly
  3. 9 out of 10 cases decided correctly

Sample visualisation of info captured in the program

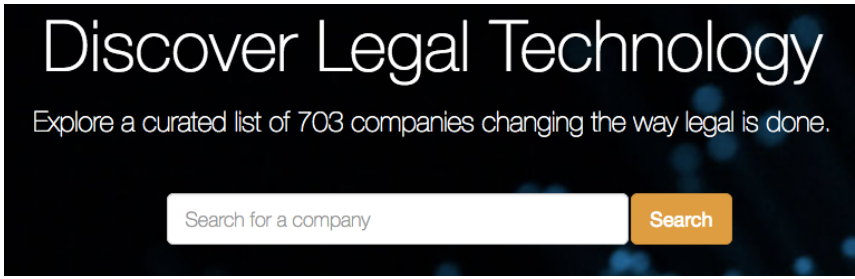


So how can this work be applied in practice?

- Potential for decision support tools to
  - Advise on strong/weak arguments in a case
  - Compare current case with previous cases
  - Assist in decisions on whether to take on a case
  - Train students
  - …

Now and next

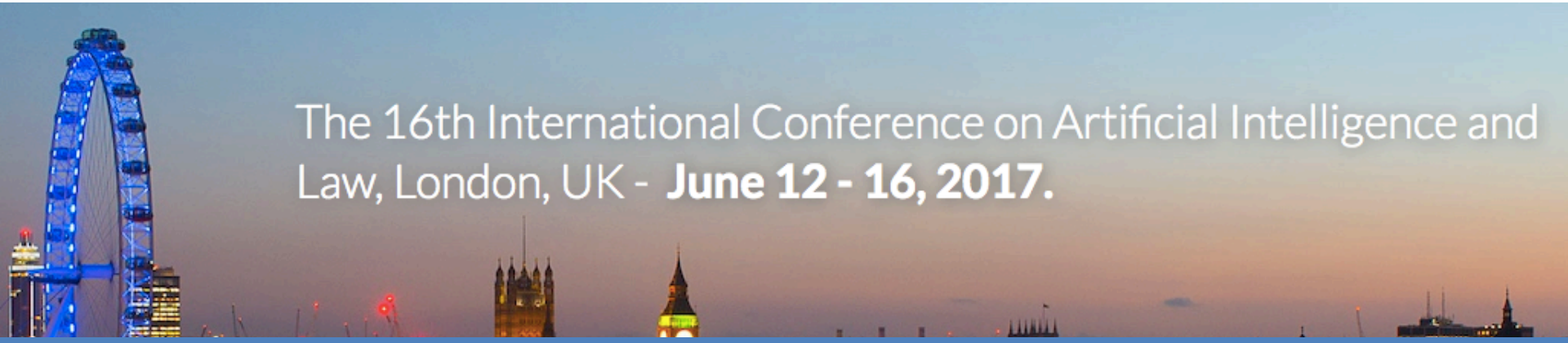
- Commercial products are becoming much more prevalent



- Academics and industry continue to tackle difficult challenges through blue sky research

- Governments are starting to get on board with LegalTech

Latest topics from the AI and Law community



- "CLIEL: Context-Based Information Extraction from Commercial Law Documents"
- "Towards a Legal Definition of Machine Intelligence: The Argument for Artificial Personhood in the age of Deep Learning"
- "Early Predictability of Asylum Court Decisions"
- "Effectiveness Results for Popular e-Discovery Algorithms"
- "On Making Autonomous Vehicles Respect Traffic Law: a Case Study for Dutch Law"

Acknowledgements

- Thanks to the following colleagues with whom I collaborate on work in AI and Law
  - Latifa Al-Abdulkarim, Trevor Bench-Capon, Danushka Bollegala, Frans Coenen, Adam Wyner
  - Riverview Law
  - Fletchers Solicitors

- Innovate UK part fund Knowledge Transfer Partnership (KTP) projects with Riverview Law and Fletchers Solicitors

Innovate UK

References

- *Up for Grabs* movie, produced by Michael Wranovics (2004). Trailer on YouTube at: https://www.youtube.com/watch?v=NP8j_X88bSI

- L. Al-Abdulkarim, K. Atkinson and T. Bench-Capon (2016): A methodology for designing systems to reason with legal cases using abstract dialectical frameworks. *Artificial Intelligence and Law.* Vol 24(1), pp. 1-49.

- International Association for AI and Law: www.iaail.org
- ICAIL 2017 conference: http://nms.kcl.ac.uk/icail2017/
- See also the AI and Law group on LinkedIn