Law ? Computation

Michael J. Bommarito II
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April 22, 2011

M.S.E. Financial Engineering, M.S. Political Science, University of Michigan.
Currently a hedge fund quant $\Rightarrow$ This is my own work and in no way represents my employer.
Presentation online: http://bit.ly/gcBKqA

Hey stupid, your title is broken.

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Or is it?

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- Law $\subset$ Computation

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So let's try this again.

Law ? Computation

The past, present, and future relationship

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Outline

Definitions

Hang on, what do you mean by *law* or *computation* anyway?

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What I mean: Manipulating symbols and evaluating statements in a systematic and well-defined way.

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OK, let's actually get started.

Not a new idea.

> *Those long chains of reasoning, simple and easy as they are, of which geometricians make use in order to arrive at the most difficult demonstrations, had caused me to imagine that all those things which fall under the cognizance of man might very likely be mutually related in the same fashion.*

Descartes. McCrae, The Unity of the Sciences: Bacon, Descartes, and Leibniz, 18 *J. Hist. Ideas* 27 (1957)

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Descartes, along with Bacon and Leibniz, didn't draw a strong distinction between law and natural science.

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Leibniz Center for Law at the University of Amsterdam

In particular, Leibniz viewed the recently rediscovered work of Roman jurists as equal to Greek geometricians.

See Hoeflich, Law & Geometry: Legal Science from Leibniz to Langdell, Amer. J. Legal Hist., 30:2 (1986) for more.

Law as Computation

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    - Common law

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- State an argument, which consists of a set of observed or hypothetical facts.

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- State an argument, which consists of a set of observed or hypothetical facts.
- Deduce the consequence of the argument.

These consequences are either rulings or new, "derived" laws.

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We'll get to these last two later.

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But, to be honest, this isn't my cup of tea.

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Artificial intelligence and law, where we think about how to represent and evaluate computation in a legal system.

Philosophy and law, where we use logical computations to create or examine legal systems.

Law as computation *tomorrow*

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- Structured, machine-readable laws

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While many treat automated reasoning as the holy grail, I think the inverse or optimization problem will provide more benefit to society.

Examples of tomorrow, today - Hammurabi

Source Commits Network Pull Requests (0) Issues (0) **Wiki (12)** Graphs Branch: master

Home Pages Wiki History Git Access

The Hammurabi Project

Page History

Welcome to the home of The Hammurabi Project.

The Hammurabi Project is an experiment in codifying U.S. law - such as the U.S. Code, the Code of Federal Regulations, state laws, etc. - in the C# programming language.

It has two basic components:

1. Core library - functions to support legal knowledge engineering
2. Parallel legal corpus - a machine executable version of U.S. legal provisions

Other things you may be curious about:

- Project rationale
- Basic concept
- What the law looks like when codified in C#
- Scope and granularity of the project
- Syntax reference
- Installing and using Hammurabi
- Buzz

The project is affiliated with Stanford University's CodeX Center for Computers and Law. For more information, contact Michael Poulshock at michael.poulshock@gmail.com.

Hammurabi (Michael Poulshock)

Examples of tomorrow, today - Hammurabi

Around the world, there are millions of pages of law - constitutions, statutes, regulations, case law, and interpretive decisions - with which societies are expected to comply. This mass of material is logically complicated, referentially byzantine, terminologically inaccessible, difficult to contextualize, and sometimes vague and ambiguous. Aside from the ethical issues caused by this complexity, it is grossly inefficient as an information system. The capital required for an actor to understand a legal right or obligation is a wasted resource that creates drag on individual, corporate, and social progress.

Though not often thought of this way, law is inherently computational. It is a set of algorithms that prescribe how various computations are to be carried out. What is my standard (tax) deduction? Am I eligible for family and medical leave? On what day did I become liable for unemployment taxes? Determinations such as these are like mathematical functions: given various inputs, they produce corresponding outputs.

The Hammurabi Project provides a vehicle for representing portions of the law in an executable format, so that the process of logical inference can be offloaded from human to machine. Once executable, it can be embedded into our computing infrastructure where it can drive other applications.

From the Hammurabi rationale.

Examples of tomorrow, today - Estrella

Estrella

Examples of tomorrow, today - MetaLex

CEN MetaLex

Website of the Workshop on an Open XML Interchange Format for Legal and Legislative Resources

Search

About | News | Specification | Workshop

About

Sunday, 11. 11. 2007

The *CEN Workshop on an Open XML Interchange Format for Legal and Legislative Resources* (MetaLex), declares, by way of its title, an interest in legal and legislative resources. CEN MetaLex aims to standardize the way in which sources of law and references to sources of law are to be represented in XML.

The standard will enable public administrations to link legal information from various levels of authority and different countries and languages. Moreover, the standard will enable companies that are active in the field of legal knowledge systems to connect to and use legal content in their applications, which allows them to support a much larger market. An open interchange format will also protect customers of such companies from vendor lock in. Finally, the standard will help to improve transparency and accessibility of legal content for citizens and businesses.

CEN MetaLex is an **interchange format**, a lowest common denominator for other standards, intended not to replace jurisdiction-specific standards and vendor-specific formats in the publications process but to impose a standardized view on legal documents for the purposes of **information exchange** and **interoperability** in the context of software development.

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

RDFa OWL

RECENT NEWS

- CEN MetaLex metadata and UK linked open data.
- Proposal is final: 2010 agreement published

DOWNLOAD

- Latest Agreement
- Latest Proposal
- OWL Schema
- SVN Repository
- XML Schema

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- Norme In Rete
- Official CEN Workshop

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- Log in
- Entries RSS
- Comments RSS
- WordPress.org

CEN MetaLex

Summary

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Code is law (is code).
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While computation may be involved in these processes, computation alone cannot explain observed outcomes.

The "Law and . . ." movements

What happens when social science scholars try to explain these outcomes?

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These are questions about the design of economic rules and institutions.

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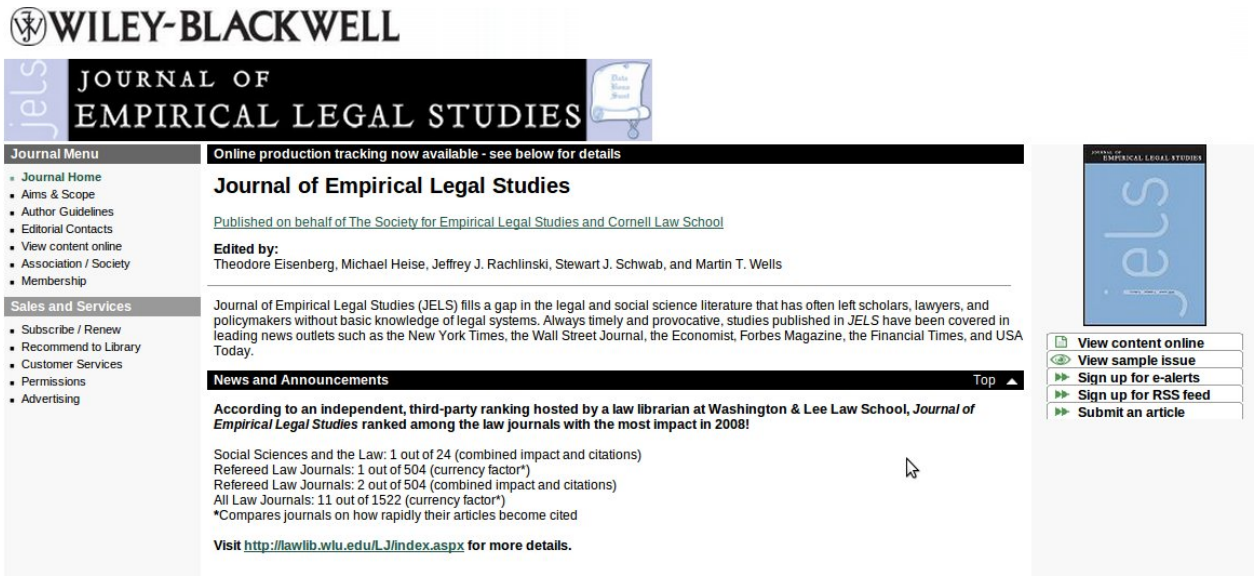
For the seminal work and a good review, see Priest & Klein, The Selection of Disputes for Litigation and Daughety & Reinganum, Economic Theories of Settlement Bargaining.

Empirical Legal Studies

Often referred to pejoratively as "law and regression."



Journal of Empirical Legal Studies

Empirical Legal Studies

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It is easy to lie with statistics, but it is easier to lie without them.
Fred Mosteller

Criticism of "Law and . . ." research

Balkinization

Wednesday, January 16, 2008

Why the Interdisciplinary Movement in Legal Academia Might be a Bad Idea (For Most Law Schools)

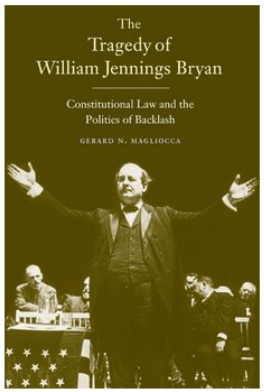
Brian Tamanaha

Interdisciplinary studies are currently the rage in legal academia. An increasing number of law schools are touting their interdisciplinary programs, which include offering courses from other academic disciplines (economics, statistics, anthropology, etc.) in the law school curriculum, creating law and social science institutes of various sorts within the law school, offering joint JD/PhD programs, and hiring JD/ PhD faculty.

It seems like an irresistible movement with the potential to transform legal academia. But based upon the historical evidence and the nature of legal practice, I'm skeptical.

First the historical evidence: this idea has been tried before with no evident success.

Books by Balkinization Bloggers



Balkinization, Jan 16, 2008

Computation on Law *tomorrow*

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Summary

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The results of these inquiries may or may not be useful to lawyers or legal professionals.

Law and computation

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- Public domain data
- Open source, easily-licensed software
- Useful
- Easily extended

Building a better legal search engine

- Data: U.S. Code (LRC XHTML)

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- Software: Java, Apache Lucene, HTMLParser

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```
$ wc -l src/main/java/org/mjb/*Code*
425 src/main/java/org/mjb/buildCodeIndex.java
86 src/main/java/org/mjb/searchCodeIndex.java
511 total
```

Building a better legal search engine

```
// Create document.
Document doc = new Document();
doc.add(new Field("documentid", documentID, Field.Store.YES,
  Field.Index.NOT_ANALYZED));
doc.add(new Field("usckey", uscKey, Field.Store.YES,
  Field.Index.NOT_ANALYZED));
doc.add(new Field("currentthrough", currentThrough, Field.Store.YES,
  Field.Index.NOT_ANALYZED));
doc.add(new Field("itempath", itemPath, Field.Store.YES,
  Field.Index.ANALYZED));
doc.add(new Field("head", head, Field.Store.YES, Field.Index.ANALYZED,
  Field.TermVector.YES));
doc.add(new Field("text", text, Field.Store.NO, Field.Index.ANALYZED,
  Field.TermVector.YES));

// Write into index.
indexWriter.addDocument(doc);
```

Results

```
$ mvn -q exec:java -Dexec.mainClass="org.mjb.searchCodeIndex" \
  -Dexec.args="text swap"

documentid:7 U.S.C. 6s
currentthrough:20110107
score:2.2053032
itempath:
Title 7
CHAPTER 1
> 6s. Registration and regulation of swap dealers and major swap participants

documentid:7 U.S.C. 6r
currentthrough:20110107
score:2.0396917
itempath:
Title 7
CHAPTER 1
> 6r. Reporting and recordkeeping for uncleared swaps

documentid:7 U.S.C. 7b-3
currentthrough:20110107
score:1.7781076
itempath:
Title 7
CHAPTER 1
> 7b 3. Swap execution facilities
...
```

Building a better legal search engine - extensions

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http://localhost:8080/solrdev/browse?q=swap

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- Learning and classification to aid legal research
- Learning and classification for prediction of legal outcomes

Conclusion

Thanks for listening!

. . . and an even bigger thanks to Seth for organizing this.

http://michaelbommarito.com