Using OpenWordnet-PT for Question Answering on Legal Domain

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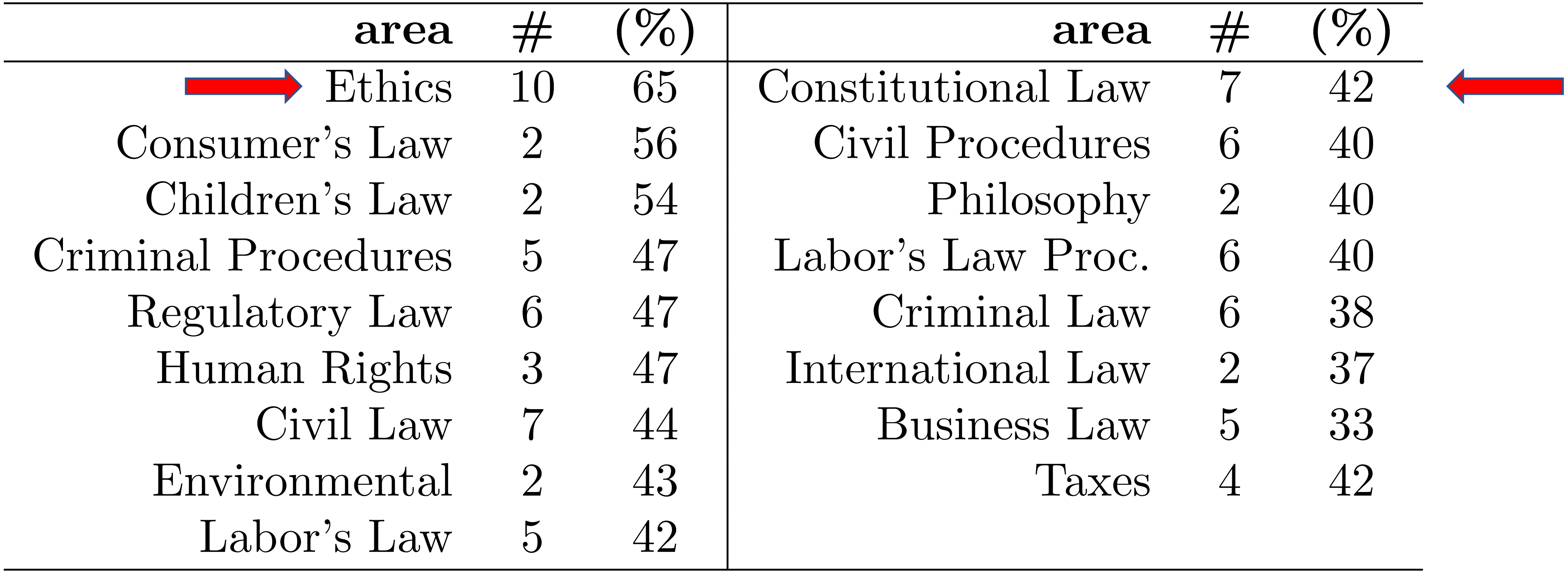
The Problem

- The OAB (Ordem dos Advogados do Brasil) Exam is the BAR Exam in Brazil
- The OAB exams provide an excellent benchmark for the performance of legal information systems, passing the exam would signal capacity of legal reasoning comparable to human lawyers.
- Interesting problem for explore NLU (Natural Language Understanding) techniques.
- The current (shallow) processing is just an starting point for further “deep” language processing. Mainly results so far: data exploration and curation!
- No ML approach! KB and reasoning! We really want to understand the problem and explain the results using GOFAI.

The OAB Exam

- Only in 2010 were the exams nationally unified.
- Two stages. We are working on the first stage, multiple choice questions.
- 80 multiple choice questions and each question has 4 options. In order to be approved, candidates need at least a 50% performance.
- Every year, there are 3 applications of the exam in the country.
- The exam has a global 80% failure rate. The most recent exam, July 2017, had the highest failure rate: 86% of the candidates failed.

Questions per subject area and their performance rates



area	#	(%)	**area**	#	(%)
Ethics	10	65	Constitutional Law	7	42
Consumer's Law	2	56	Civil Procedures	6	40
Children's Law	2	54	Philosophy	2	40
Criminal Procedures	5	47	Labor's Law Proc.	6	40
Regulatory Law	6	47	Criminal Law	6	38
Human Rights	3	47	International Law	2	37
Civil Law	7	44	Business Law	5	33
Environmental	2	43	Taxes	4	42
Labor's Law	5	42			

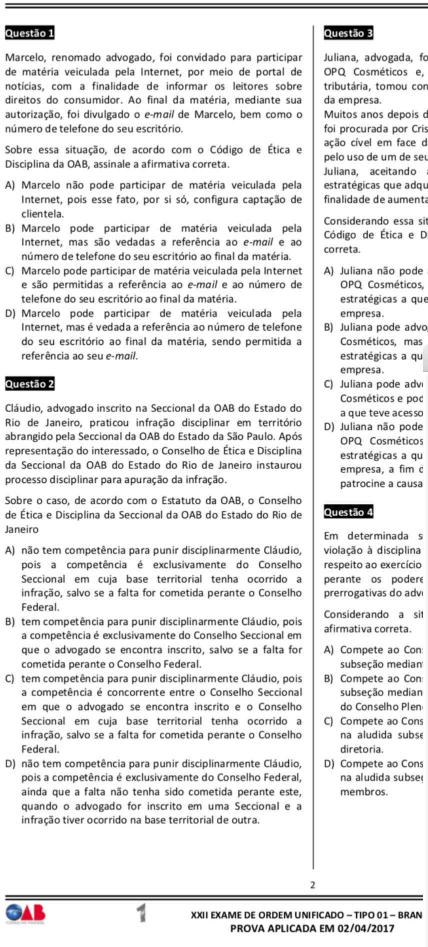
The OAB Exam: ethics

- In the exam, Ethics means questions about the rights, the duties and the responsibilities of the lawyer. Ethics questions also have a high performance rate.
- This is the simplest part of the exam with respect to the legal foundation of the questions.
  - Almost all the questions on Ethics are based on the **Federal law 8906 from 1994** (89 articles) and well designed normative document.
  - A minor part of the questions on Ethics is related to two other norms: (i) **OAB General Regulation** (169 articles) and (ii) **OAB ethics code** (66 articles).
- It is important to note that these two norms are neither legislative nor executive norms. Indeed, they are norms created by OAB itself.

Data preparation

- Exams in PDF files.
- From PDF to text using Apache Tika.
- Manually revised the obtained text, and introduced markup to signal the beginning of questions, alternatives and some meta data about them.
- Simple Parser to XML
- The final data comprises 25 exams totaling 2061 questions.
- **Making experiments reproducible!**

https://github.com/own-pt/oab-exams



Questão 1

Marcelo, renomado advogado, foi convidado para participar de matéria veiculada pela Internet, por meio de portal de notícias, com a finalidade de informar os leitores sobre direitos do consumidor. Ao final da matéria, mediante sua autorização, foi divulgado o *e-mail* de Marcelo, bem como o número de telefone do seu escritório.

Sobre essa situação, de acordo com o Código de Ética e Disciplina da OAB, assinale a afirmativa correta.

A) Marcelo não pode participar de matéria veiculada pela Internet, pois esse fato, por si só, configura captação de clientela.
B) Marcelo pode participar de matéria veiculada pela Internet, mas são vedadas a referência ao *e-mail* e ao número de telefone do seu escritório ao final da matéria.
C) Marcelo pode participar de matéria veiculada pela Internet e são permitidas a referência ao *e-mail* e ao número de telefone do seu escritório ao final da matéria.
D) Marcelo pode participar de matéria veiculada pela Internet, mas é vedada a referência ao número de telefone do seu escritório ao final da matéria, sendo permitida a referência ao seu *e-mail*.

Questão 2

Cláudio, advogado inscrito na Seccional da OAB do Estado do Rio de Janeiro, praticou infração disciplinar em território abrangido pela Seccional da OAB do Estado da São Paulo. Após representação do interessado, o Conselho de Ética e Disciplina da Seccional da OAB do Estado do Rio de Janeiro instaurou processo disciplinar para apuração da infração.

Sobre o caso, de acordo com o Estatuto da OAB, o Conselho de Ética e Disciplina da Seccional da OAB do Estado do Rio de Janeiro

A) não tem competência para punir disciplinarmente Cláudio, pois a competência é exclusivamente do Conselho Seccional em cuja base territorial tenha ocorrido a infração, salvo se a falta for cometida perante o Conselho Federal.
B) tem competência para punir disciplinarmente Cláudio, pois a competência é exclusivamente do Conselho Seccional em que o advogado se encontra inscrito, salvo se a falta for cometida perante o Conselho Federal.
C) tem competência para punir disciplinarmente Cláudio, pois a competência é concorrente entre o Conselho Seccional em que o advogado se encontra inscrito e o Conselho Seccional em cuja base territorial tenha ocorrido a infração, salvo se a falta for cometida perante o Conselho Federal.
D) não tem competência para punir disciplinarmente Cláudio, pois a competência é exclusivamente do Conselho Federal, ainda que a falta não tenha sido cometida perante este, quando o advogado for inscrito em uma Seccional e a infração tiver ocorrido na base territorial de outra.

Questão 3

Juliana, advogada, foi empregada da sociedade empresária OPQ Cosméticos e, em razão da sua atuação na área tributária, tomou conhecimento de informações estratégicas da empresa.
Muitos anos depois de ter deixado de trabalhar na empresa, foi procurada por Cristina, consumidora que pretendia ajuizar ação cível em face da OPQ Cosméticos por danos causados pelo uso de um de seus produtos.
Juliana, aceitando a causa, utiliza-se das informações estratégicas que adquirira como argumento de reforço, com a finalidade de aumentar a probabilidade de êxito da demanda.

Considerando essa situação, segundo o Estatuto da OAB e o Código de Ética e Disciplina da OAB, assinale a afirmativa correta.

A) Juliana não pode advogar contra a sociedade empresária OPQ Cosméticos, tampouco se utilizar das informações estratégicas a que teve acesso quando foi empregada da empresa.
B) Juliana pode advogar contra a sociedade empresária OPQ Cosméticos, mas não pode se utilizar das informações
estratégicas a qu
empresa.
C) Juliana pode adv
Cosméticos e pod
a que teve acesso
D) Juliana não pode
OPQ Cosméticos
estratégicas a qu
empresa, a fim d
patrocine a causa

Questão 4

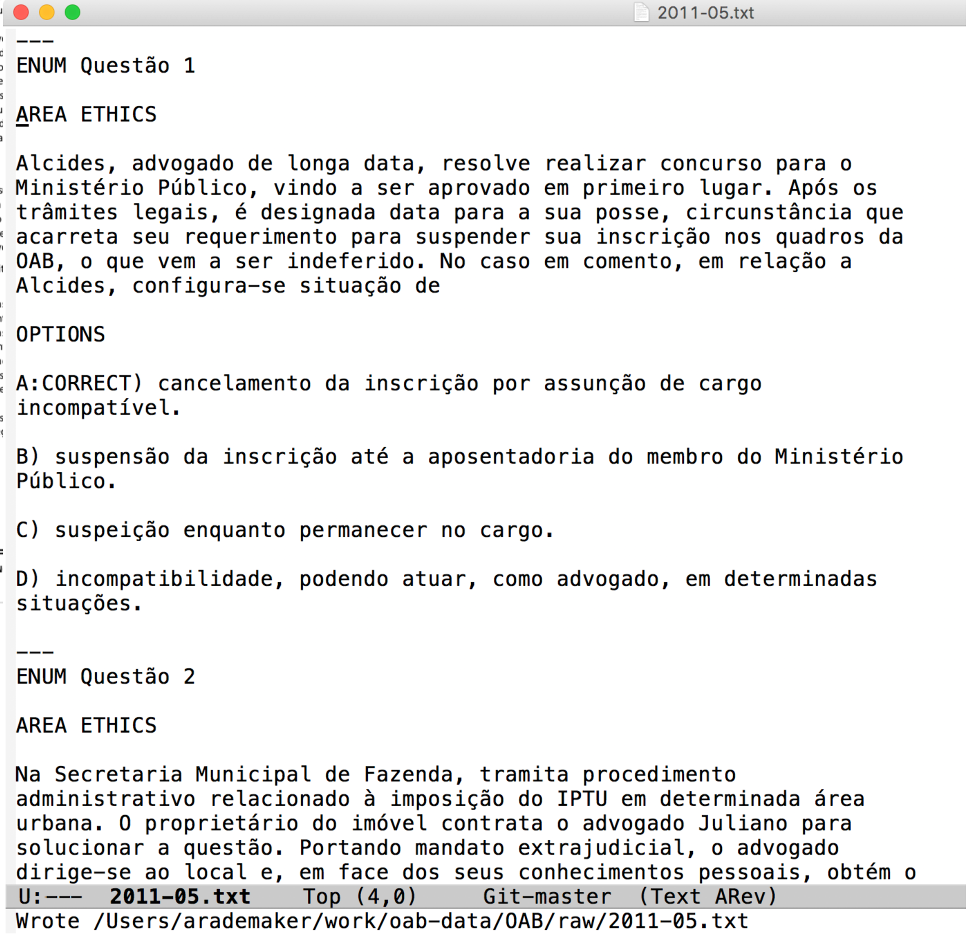
Em determinada s
violação à disciplina
respeito ao exercício
perante os podere
prerrogativas do adv

Considerando a sit
afirmativa correta.

A) Compete ao Con
subseção median
B) Compete ao Con
subseção median
do Conselho Plen
C) Compete ao Cons
na aludida subse
diretoria.
D) Compete ao Cons
na aludida subse
membros.

2

XXII EXAME DE ORDEM UNIFICADO – TIPO 01 – BRAN
PROVA APLICADA EM 02/04/2017



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ENUM Questão 1

AREA ETHICS

Alcides, advogado de longa data, resolve realizar concurso para o
Ministério Público, vindo a ser aprovado em primeiro lugar. Após os
trâmites legais, é designada data para a sua posse, circunstância que
acarreta seu requerimento para suspender sua inscrição nos quadros da
OAB, o que vem a ser indeferido. No caso em comento, em relação a
Alcides, configura-se situação de

OPTIONS

A:CORRECT) cancelamento da inscrição por assunção de cargo
incompatível.

B) suspensão da inscrição até a aposentadoria do membro do Ministério
Público.

C) suspeição enquanto permanecer no cargo.

D) incompatibilidade, podendo atuar, como advogado, em determinadas
situações.

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ENUM Questão 2

AREA ETHICS

Na Secretaria Municipal de Fazenda, tramita procedimento
administrativo relacionado à imposição do IPTU em determinada área
urbana. O proprietário do imóvel contrata o advogado Juliano para
solucionar a questão. Portando mandato extrajudicial, o advogado
dirige-se ao local e, em face dos seus conhecimentos pessoais, obtém o
U:---  2011-05.txt    Top (4,0)     Git-master  (Text ARev)
Wrote /Users/arademaker/work/oab-data/OAB/raw/2011-05.txt
```

Norms preparation

- How to encode the norms related with the golden set ? Federal law 8906 from 1994, the OAB general regulation and the OAB ethics code.
- The LexML is a joint initiative of the Civil Law legal system countries seeking to establish open standards for the interchange, identification and structuring of legislative and court information.
- We used the LexML (XML schema called "LexML Brasil"). Also related to Akoma Ntoso and EUR-Lex schemas.

● Tudo ○ Legislação ○ Jurisprudência ○ Proposições Legislativas ○ Doutrina

Pesquisa Avançada | Acervo | Sobre o LexML (English, Français, Español) | FAQ | Manual (Novo!)

https://github.com/lexml (parser from docx to XML) and http://www.lexml.gov.br

Golden Set

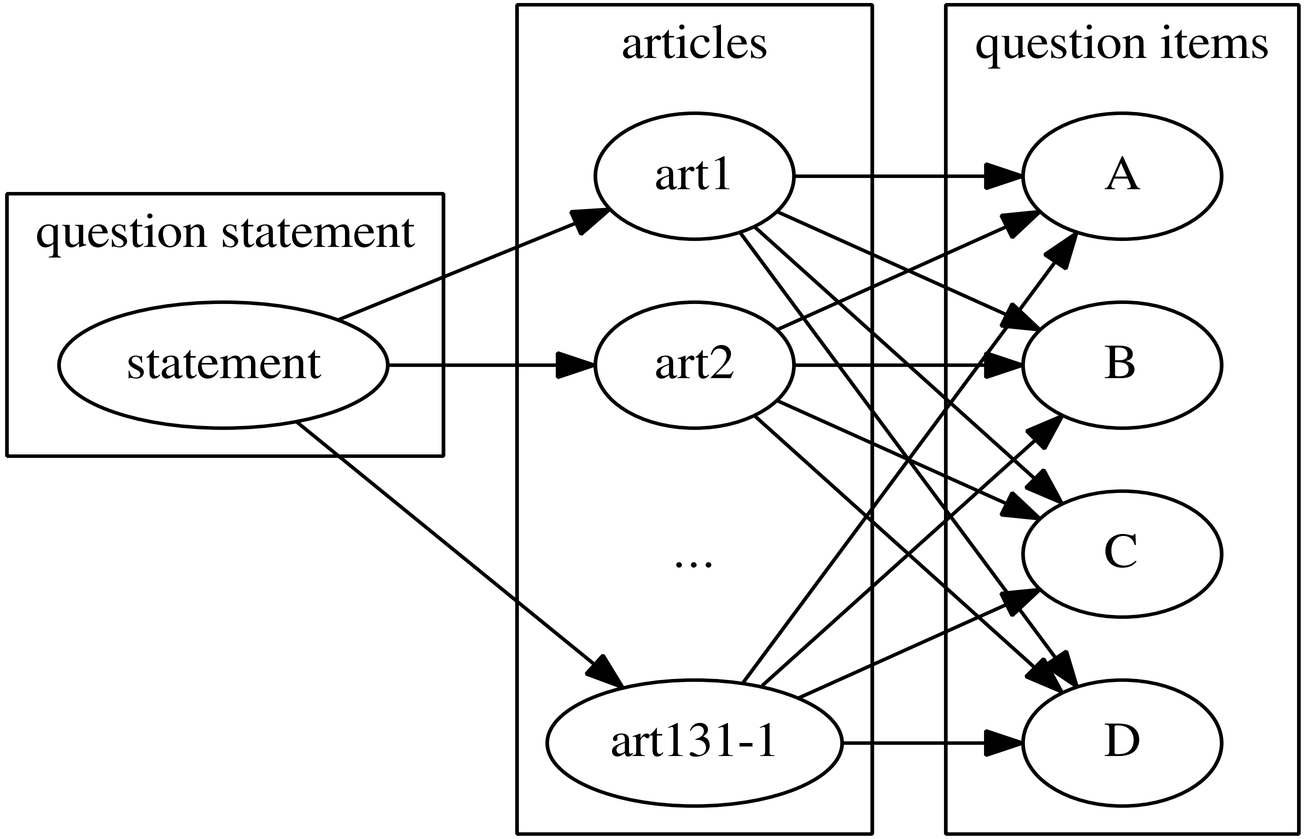
- We sampled 30 questions on Ethics for analysis (from the 210 questions in all exams)
- one of the authors manually identified the articles in the laws that justify the answer, creating our golden data set.
- usually, one article on the federal law 8906 was enough to justify the answer to the questions (15 questions).
- Less often, the justification is in OAB General Regulation (3 questions), or on the OAB Ethics Code (8 questions).
- 3 questions were justified by two articles in law 8906, and another in a jurisprudence from the Superior Court of Justice about an article from the law 8906.

Experiments: previous work (Jurix, Dec 2017)

Main simplification: a question is justifiable by one article.

1. The system receive a question statement and its multiple alternatives, and we wanted it to retrieve the right answer along with its justification in a given legal norm.
2. Given a question and its correct answer find the article that justify it in a given norm.
3. Given a question, find the correct answer and the article that justify it in all norms.

Experiments: previous work



Experiments: previous work

- legal norms are preprocesses them performing tasks such as converting text to lower case, eliminating punctuation and numbers and, optionally, removing stop-words.
- After that, the articles of the norms are represented as TF-IDF vectors in a Vector Space Model (VSM)
- Every document d is represented by a vector whose size is the vocabulary size of the corpus D. The value of each component t of the vector corresponding to d is given by Equation

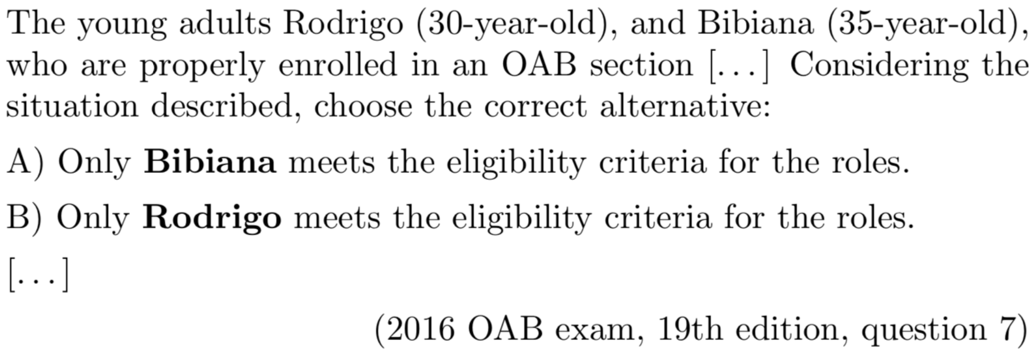
$$\mathrm{TFIDF}_{t,d} = \frac{f_{t,d}}{\sum_{t' \in d} f_{t',d}} \log\left(\frac{|D|}{|d \in D : t \in d|}\right)$$

Experiments: previous work

- A **directed graph with a node for each article of a norm in the corpus**.
- When provided a question-answer pair, our system preprocesses the question statement and the alternatives in the same way as it does to the articles in the base graph, turns them into TF-IDF vectors using IDF values from the document corpus.
- The statement node is connected to every article node, and each article node is then connected to every alternative node.
- The edges are given weights whose value is the inverse cosine similarity between the connected nodes' TF-IDF vectors.
- The system then calculates the **shortest path between question statement and answer item using Dijkstra's algorithm**
- and returns the article that connects them as the answer justification.
- our graph structure does not allow for more than one node connecting statement and alternative => **our simplification**!

Experiment 1 results

- Find the correct answer and its justification in a given norm.
- Although it chose the correct alternative 10 times (out of 30), it only provided the correct justification for 8 of these.
- Numbers are not important, we are trying to create a baseline for further processing.



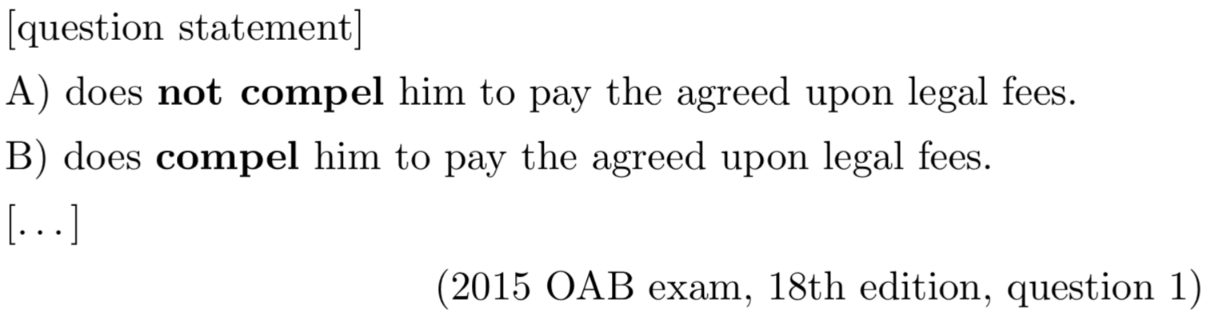
The young adults Rodrigo (30-year-old), and Bibiana (35-year-old), who are properly enrolled in an OAB section [. . .] Considering the situation described, choose the correct alternative:

A) Only **Bibiana** meets the eligibility criteria for the roles.

B) Only **Rodrigo** meets the eligibility criteria for the roles.

[. . .]

(2016 OAB exam, 19th edition, question 7)



[question statement]

A) does **not compel** him to pay the agreed upon legal fees.

B) does **compel** him to pay the agreed upon legal fees.

[. . .]

(2015 OAB exam, 18th edition, question 1)

Experiments 2 and 3 results

- Experiment 2 (find the justification in a given norm) : the system retrieved the correct article in 21 out of 30 question-answer pairs.

- Experiment 3 (find justification in all 3 norms, all for the same topic, increasing the difficulty) : it scored the right article in 18 out of the 30 question-answer pairs.

Questions Types

- Following
  - P. Clark, P. Harrison, and N. Balasubramanian, “A Study of the Knowledge Base Requirements for Passing an Elementary Science Test,” presented at the AKBC, 2013, pp. 1–5.
  - B. Fawei, A. Z. Wyner, and J. Pan, “Passing a USA National Bar Exam: a First Corpus for Experimentation,” presented at the Language Resources and Evaluation, 2016, pp. 1–6.
  - C. Fierro, J. Pérez, M. Quezada, and C. Fuentes-Bravo, “200K+ Crowdsourced Political Arguments for a New Chilean Constitution.”, 23-Jul-2017.
  - A. Lally, J. M. Prager, M. C. McCord, B. K. Boguraev, S. Patwardhan, J. Fan, P. Fodor, and J. Chu-Carroll, “Question analysis: How Watson reads a clue,”*IBM J. Res.& Dev.*, vol. 56, no. 3, pp. 2–14, Mar. 2012.
- We start to identify the questions characteristics

Example of Question with a narrative and answers as full statements (google translation)

Paulo, a Bachelor of Laws, held relevant positions in the Executive Power of the three spheres of Government, acquiring in-depth knowledge of the internal activities of Public administration. After retiring, without requiring inscription in the tables of the OAB, establishes legal advice, having raised several clients from the opening of its activity.

According to the narrated and observed the norms statutory, mark the correct statement.

OPTIONS

A) The lawyer's exclusive activities include legal advice and legal advice, but not the consulting services.

B) The retired law bachelor has not prohibited any practice of legal activity, even if not entered in the tables of the OAB.

C) (CORRECT) The lawyer acts in the judicial activity struggling for the defense of the interests of its clients and in the legal

D) The private activities of the lawyer include advice juridical management, and the performance of special judges.

Question with a intro narrative but simple words as answers (google translation)

João postulated, through a lawyer's representation, an action conviction in the face of the company Cacos e Cacos Ltda. obtaining a favorable sentence, condemning the defendant to the payment of the amount of R $ 100,000.00, plus R$15,000.00 of attorney's fees. After the final decision of the judicial decision, João and his lawyer Pedro are scientists that society is bankrupt, and their credits must undergo an authorization procedure.

In that case, the nature of the claims corresponding to attorneys' fees, under the terms of the considered as

OPTIONS

A) unsecured.

B) real.

C) (CORRECT) privileged.

D) natural.

Simple text retrieval from Law texts with clue about the norm (google translation)

The following alternatives present some of the powers of the Federal Council of the Portuguese Bar Association of Brazil, with the exception of one. Check it out.

OPTIONS

A) To represent, in or out of court, the collective interests of the lawyers.

B) Ensuring the dignity, independence, prerogatives and valuation of advocacy.

C) (CORRECT) Represent, without exclusivity, Brazilian lawyers in international advocacy bodies and events.

D) To edit and amend the General Regulations, the Code of Ethics and Discipline, and any Proceedings deemed necessary.

Simple text retrieval from Law texts without clue about the norm (google translation)

The power to prosecute and originally judge Governor of State for common crime is

OPTIONS

A) Supreme Federal Court.
B) (CORRECT) Superior Court of Justice.
C) Special Body of the Court of Justice.
D) Criminal Court of the capital where the Court of Justice of the respective State.

Negative answer (google translation)

In view of the recent popular demonstrations, reported on TV that certain state deputies of State of the Federation were using the money from the budget for health for their own benefit ... In attention to the disciplined in Law n. 4,717 / 65, which deals with the Popular Action, tick the **wrong alternative**.

OPTIONS

A) Marta, a Brazilian citizen, resident and domiciled in the same State, you can qualify as a litisconsorte of Marcos.

B) B: CORRECT) In the same line as the write of mandado de segurança, the right to sue her falls in 5 (five) years.

C) C) The State, in the opinion of its legal representative, in public interest, it could act along side of Marcos in the conduct of the action.

D) D) Being dismissed as unfounded the action brought by Marcos, may appeal, in addition to the Public Ministry and any other citizen.

The possibilities for WSD/WN

- Constitutive acts and contracts of legal persons, in order to be registered regarding the legal practice statute, must: [. . .]
  - C) contain the lawyer's [. . .] **signature (*visto*)**.

(17th ed. OAB exam, question 2)

- §2 The constitutive acts and contracts of legal persons can only be registered in the competent bodies, under a penalty of invalidity, when **signed (*visar*)** by lawyers.

(law no. 8906, article 1)

[00996485-v, *sign, subscribe*: *mark with one's signature*] and [06404582-n,*sig-nature*: *your name written in your own handwriting*] and the morphosemantic link "result".

UKB for WSD and OpenWordet-PT

- Freeling is an open source language processing library developed at the TALP research center.
- Freeling is a pipeline based library : tokenization, lemmatization (dict based, needed fixes), POS tagging etc. The WSD module is a UKB implementation.
- UKB applies random walks, e.g. Personalized PageRank, on the Knowledge Base (KB) graph to rank the vertices according to the given context.

  Graph-based WSD methods manage to exploit the interrelations among the senses in the given context. In this sense, they provide a principled solution to the exponential explosion problem, with excellent performance.
- For Portuguese, FL relies n OWN-PT, an open freely available wordnet for Portuguese.

Coverage of OpenWordnet-PT

- We did a survey on the coverage of OWN-PT for the OAB corpus
- The PWN synset [08441203-n,*law/jurisprudence*: *the collection of rules imposed by authority.*] is a general concept about law, and is linked to hundreds of synsets via the classifiesByTopic relation. Are them properly translated in OWN-PT? Legal jargon can be language and cultural dependant.
- We started from the most most common words.

OpenWordnet-PT changes

- New synsets : “cartório” (notary office)
- Missing words as in [06532763-n,*nulidade*: *nullity*].
- Other cases were those of relations that did not exist in OWN-PT; if present, these relations would improve the results of the UKB algorithm.
- The nominalization (morphosemantic link) between [00664276-v,*comprovar*: *authenticate*] and [06855035-n,*comprovação*:*authentication*].
- In the end, since we focused only on the possible improvements to our immediate purpose, we have added to OWN-PT 2 synsets, 8 semantic and lexical relations, and 25 lexical units.
- UKB mistakes are at least consistent : [06532095-n,*ato*:*legal act*] was assigned to the [00037396-n,*act*: *as in action*]

Experiments adaptations

- The WSD modules to assign OWN-PT synsets, with a weight value (normalized in order to sum 1), to each token or sequence of tokens.
- For an input text we have a list of key-value pairs (s,w) with a sense key and a weight value, in contrast to a simple list of tokens, as we had in the previous experiment.

Experiments adaptations

- $f_{s,w}$ is the sum of each occurrence of sense **s** weighted by **w**.
- TF : we count the weighted occurrence as a “continuous occurrence”, instead of boolean, where the degree of occurrence is the weight of the sense.
- IDF: if the sum in a document is higher than 1, it counts as an occurrence, which is counted only once. Otherwise, it counts only according to the weight received.

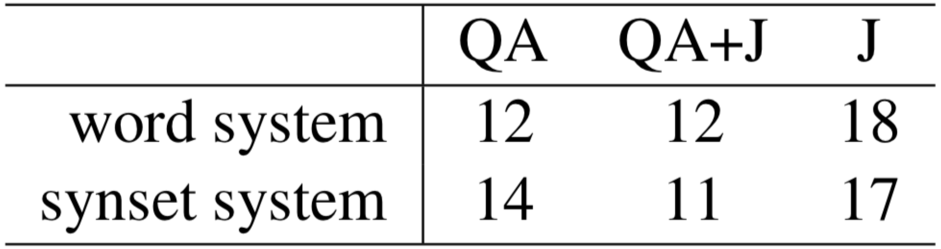
$$\mathrm{TFIDF}_{s,w,d} = \mathrm{TF}_{s,w,d}\mathrm{IDF}_{s,w,D}$$

$$\mathrm{TF}_{s,w,d} = \frac{f_{s,w,d}}{\sum_{s' \in d} f_{s',w',d}}$$

$$\mathrm{IDF}_{s,w,D} = \log\left(\frac{|D|}{\sum_{d \in D} w^{\mathbb{1}_{(w<1)}}\,\mathbb{1}_{(s \in d)}}\right)$$

Results

- 30 questions/answers and justifications
- Comparing previous results with WSD based results
- (QA): choosing the right answer at the multiple choice problem, given the questions and the laws (all three normative documents related to thelegal ethics area).
- not only correct answer, but a correct justification as well, experiment (QA+J)
- (J) the system's task was to determine which article (considered every law it has seen) justified the (already given) answer.



	QA	QA+J	J
word system	12	12	18
synset system	14	11	17

Cases

- Concerning the expiration of punitive disciplinary infractions, choose the right alternative. [. . .] A) The punitive aim in regard to disciplinary infractions expires after **five** years [. . .] B) The punitive aim in regard to disciplinary infractions expires after **three** years [. . .]

(15th ed. OAB exam, question 4)

Fail to find the right answer, shorted-paths are almost the same. WSD of the surround words would not be affected, both hyponomous of digits.

Cases

- [question statement] [...] A) does **not compel** him to pay the agreed upon legal fees. [...] B)does **compel** him to pay the agreed upon legal fees. [. . .]

(18th ed. OAB exam, question 1)

No improvement with WSD! No bag-of-words model will suffice.

conclusions

- We presented few simples experiments aimed to explore the data about OAB Exams.
- We have already learned some patterns of questions types
- Further work on “deep” natural language processing (semantic representations)
- TF-IDF does not solve important difficulties, such as compositional understanding, pragmatics, etc. Nevertheless, the contributions to OWN-PT can be seen as a benefit by itself and will be valuable in the future planned experiments.
- Further work with LexML for represent other legal documents, increase the corpus.
- Logic approach and the translation from syntax to predicate/arguments to semantic representation.

Obrigado! Thanks!

Full paper submitted to the http://arxiv.org

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