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software solutions

Legal Tech: Advanced Analytics Applied To Legal Domain

13 Dec 2016
Version: Ver 0.4

The Difference

Same workflows but different and more relevant solutions

Finding Relevant Documents

Current Search

- Text based
- A “word” is searched through all documents and ANY document containing the “word” is presented

Current Outcome

- Slow, mostly manual processing
- Brings many un-important results
- Weeding through them takes time

Improved Search

- Theme based
- Documents are pre-populated with themes, which are matched with the query “word”

Improved Outcome

- Faster
- Results based on ranked importance
- The top results are most relevant

Finding Similar Documents

Current Method

- Search based, mostly manual
- A “word” is searched through all documents and ANY document containing the “word” is presented

Current Outcome

- Slow
- Bring many un-important results
- Weeding through them takes time

Improved Similarity

- All documents are pre-populated with pair-wise similarity scores
- For a given document, similar documents list is readily available

Improved Outcome

- Faster
- Results based on ranked importance
- The top results are most relevant

Finding Summary of a Document

Current Method

- Summary prepared by Experts
- “Head Notes” of a judgement

Current Outcome

- Slow
- Not scalable
- Expensive and subjective

Improved Summary

- Sentences are extracted, ranked, ordered and presented
- Domain knowledge is incorporated

Improved Outcome

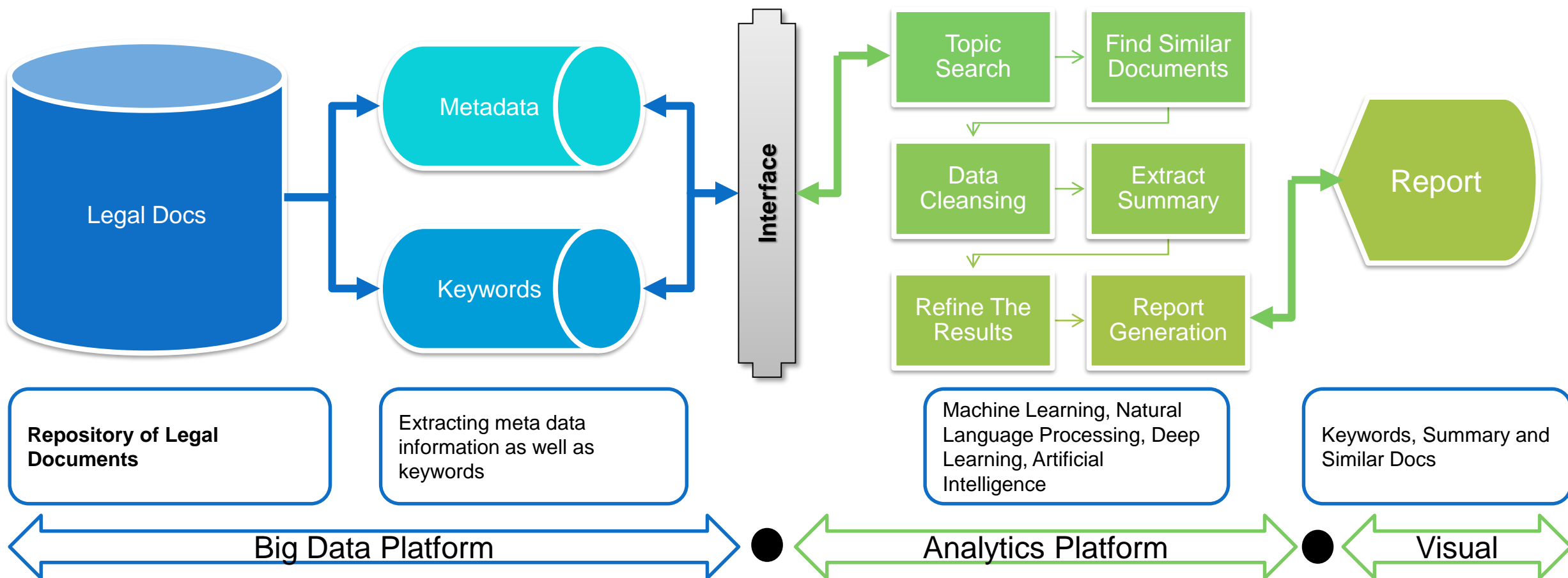
- Faster
- Highly scalable
- Consistent and customizable

The Approach

Incorporating new technologies, algorithms and Deep Learning

Solution Design

Natural Language Processing (NLP) Pipeline applied to Legal-Tech



Searching

Matching not just a “word” but to the topics or themes of the document

Searches by Topics

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Searched Judgements

- supremecourt_7_.txt
- supremecourt_8_.txt
- supremecourt_12_.txt
- supremecourt_18_.txt
- supremecourt_19_.txt
- supremecourt_24_.txt

Similar Judgements

- supremecourt_8_.txt
- supremecourt_62_.txt
- supremecourt_38_.txt
- supremecourt_97_.txt
- supremecourt_72_.txt

Keywords : income rubber trees

Judgement

PETITIONER:THE COMMISSIONER OF AGRICULTURALINCOME-TAX Vs.RESPONDENT:THE CALVARY MOUNT ESTATES (PRIVATE)LTD.DATE OF JUDGMENT:15/12/1960BENCH:KAPUR, J.L.BENCH:KAPUR, J.L.HIDAYATULLAH, M.SHAH, J.C.CITATION: 1961 AIR 1099 1961 SCR (3) 285ACT:Agricultural Income Tax-Rubber Plantation-Expenditure onimmature trees-Whether permissible deduction-Madras Plan-tations Agricultural Income-tax Act, 1955 (Mad. V of 1955),s. 5(e).HEADNOTE:The assessee owned an Estate of 590 acres out of which 235acres were occupied by immature non-bearing rubber trees,for the maintenance and upkeep of which the respondentclaimed expenses from out of the income, which was allowedboth by the Agricultural Income Tax Tribunal and the HighCourt. The appellant came up by special leave.Held, that the provisions of s. 5(e) of the Madras Planta-tions Agricultural Income Tax Act, 1955 (Mad. V of 1955),applicable to the present case, and those of s. 5(1) of theTravancore-Cochin Agricultural Income Tax Act, 1950 (Tr.Co. XXII of 1950) being the same, the judgment in TravancoreRubber & Tea Co. Ltd. v. The Commissioner of AgriculturalIncome-tax, Kerala, in which the question of deductibilityof sums expended for purposes of forking, manuring etc. ofimmature rubber trees had been decided, will govern thiscase.Travancore Rubber & Tea Co. Ltd. v. The Commissioner ofAgricultural Income-tax, Kerala, [1961] 3 S.C.R. 279,applied.JUDGMENT:CIVIL APPELLATE JURISDICTION: Civil Appeal No, 145 of 1960.Appeal by special leave from the judgment and order datedMarch 18, 1958, of the Kerala High Court in Tax RevisionCase No. 12 of 1957.V.A. Seyid Muhamad and Sardar Bahadur, for the appellant.C.K. Daphtary, Solicitor-General of India, ThomasVellapally, S. N. Andley, J.

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Inplace of "for the purpose of the plantation" in the former,the words "for the purpose of287deriving the agricultural income" are used in the latter.If anything the words of the former Act are more favourableto the respondent.In

Theme

- If one wants to prepare a case on a particular theme, say "income", that keyword is entered, and "Search" is pressed.

Search Results

- Documents related to the search query are presented in the box called "Searched Judgments"

Topics by LDA (Latent Dirichlet Allocation)

- Aim: Discovering hidden topical patterns present across collection



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Foundation of Computer Science FCS, New York, USA
Volume 2-No 6, 2012 – www.ijais.org

- Input:

Doc 1: Income generated from Rent was not disclosed...

Doc 2: Present litigation does not come under Rent control act...

Doc 3: Appellant violated the Sales agreement...

Doc 4: Proceeds of the Sale of the Motor were shown as Income...

Doc 5: Sales and disclosed Income did not match...

- Process: Finding topics amongst documents by LDA

Topic 1: 30% Income, 15% Rent

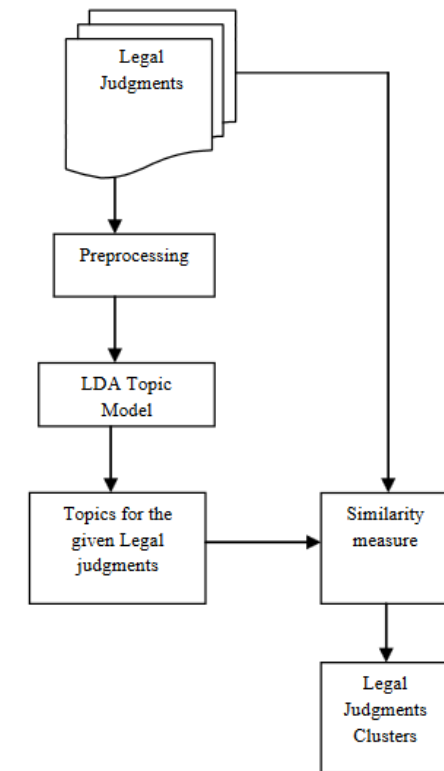
Topic 2: 10% Sales, 10% Motor, 5% Income

- Output

Docs 1 and 2: 100% Topic 1

Docs 3 and 4: 100% Topic 2

Doc 5: 70% Topic 1, 30% Topic 2



Topics extraction – presented as keywords

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income Search

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Keywords

- When a document from search results is selected, salient keywords/themes/topics are displayed as "Keywords"

Full Document

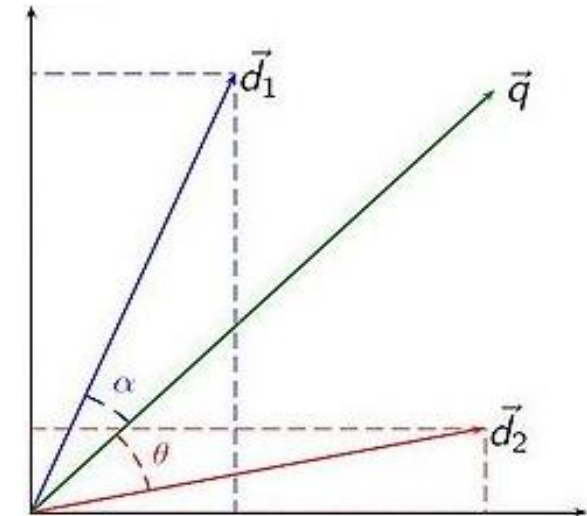
- Full content of the selected document are displayed under "Judgement" area.

Document Similarity

Preparing pair-wise similarity scores

Similarity by TF-IDF and Cosine

- Aim : To find similarity score by TF-IDF (Term Frequency Inverse Document Frequency)
- Input: Set of documents, each Vectorised by TFIDF
- Process:
 - Similarity between documents d_1 and d_2 is angle between them
 - If angle is 0, they are similar (exact)
 - If angle is 90 they are different.
 - Query q can also be evaluated to see if its closer to d_1 or d_2 then return the closer one.
- Output:
 - Similarity score between d_1 and d_2



Pair-wise Similarity Result

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Similarity

- When a document from search results is selected, documents similar to it are displayed as "Similar Judgements"

Theme based

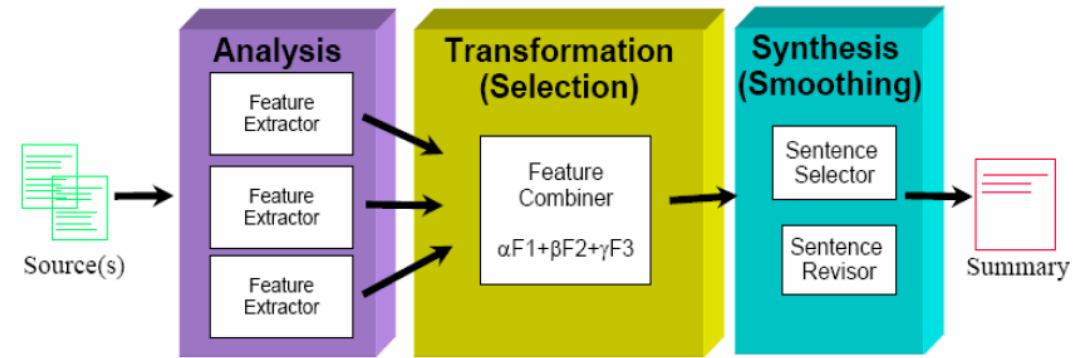
- The similarity is based on matching theme and not just plain text search

Documents Summarization

Judgements to Headnotes, Case reports to abstracts

Extractive Rank-based Summarization

- Aim: To condense source text into a shorter version preserving its information content is called summarization.
- Input: Single Document
- Process: Text features are extracted and ranked.
- Output: Top 'n' sentences are the summary



Rank-based Extractive Summarization

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income Search

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Summary

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Rank based

- The summary is based on ranking text features representing the gist of the content

The Road ahead

Challenges to get to the target

Challenges

- Training Data: Input-output are needed to train the Deep Learning model.
- Parsing Text : Finding citations, rules, decisions, issues, meta data like dates, judges – appellant - respondent names, etc. Formats vary thus extraction becomes complex.
- Algorithmic complexities: Need expertise to build more optimized searches, theme extraction, Deep Learning model development, etc.



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 Thank you!