Assessment Tools for Enhancing the Quality and Retrieval Efficiency of Arabic Web Content

by

Adnan Yahya

(joint work with Ali Salhi)

Birzeit University, Palestine

iArabic2014
Birzeit University, Palestine

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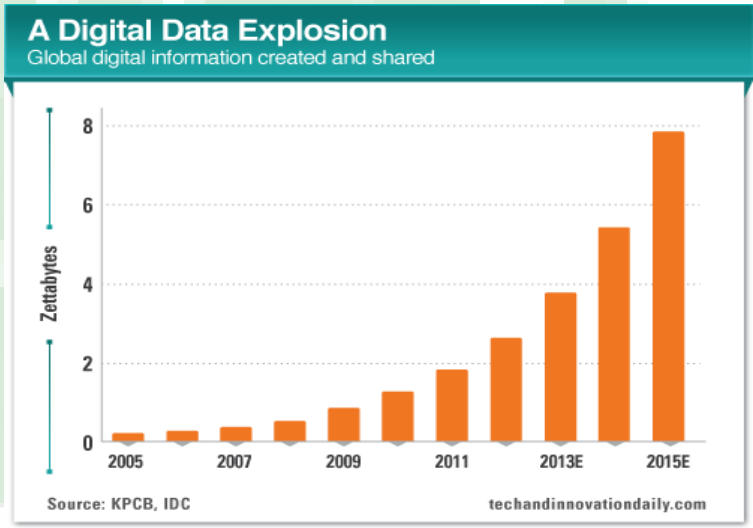
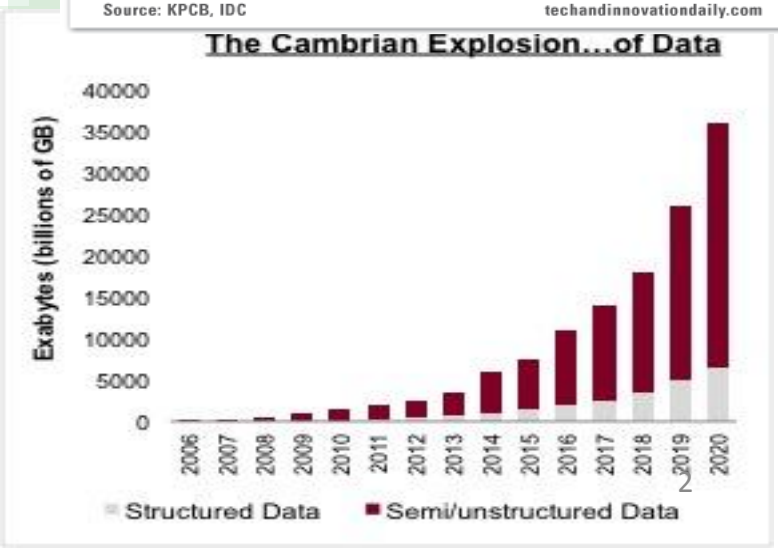
Outline

- Motivation and Introduction.
- Quality metrics.
- Similarity Measures
- Putting it together
- Next Steps.





Motivation and Introduction

Introduction

- Web content is increasing at a fast pace, more so for Arabic
- Content generated by humans, machines and jointly
- Still, Arabic is comparatively small relative to population size
- Large variance in quality: from Encyclopedia to Social Media
- A variety of language vehicles: form MSA to Dialects
- Lots of media: text, voice, pictures and video. ***We deal with text***
- Subject to study by many, mainly in industrial nations (Googles, IBMs, BBNs and more)
- Much work for English but much less for Arabic (Why?)

Motivation and Introduction

- Given a text ***T,*** estimate its quality and make it known to the user
- Allow the user to access material in Arabic or other languages that may satisfy *information need* by returning material ***similar*** to need in multiple languages (without translation!)
- The user may opt to use the results to:
  - Improve article quality if current quality is below needed
  - Have access to good quality foreign material with a chance to translate
  - Detect duplicate material even Cross Languages (CL plagiarism detection)
  - Quality augmented/driven Information Retrieval (IR)

Motivation and Introduction

The story line

We have the following story line:

- For a search we need to return (high) **quality** content:

  we talk about how to measure text quality for Arabic content

- The user may gain even if **only** low quality content is found:

  less reliance on such content (a grain of salt!)

- We may also need to return relevant info from other sources, even in other languages, need similarity checking: **how to measure the relatedness (semantic similarity) of two texts**

- So we may work with a single language or Cross Languages

Motivation and Introduction

The need for Automation

- Manual processing of content is out of the question due to SIZE
- So much can be gleaned from text, even when a human cannot see it! How does word usage change over time?
- Automation saves time and money, **manual seed** though!
- We need to ***quantify*** quality (have measures) and be able to detect similarity to ascertain that the found material is relevant

Motivation and Introduction

Some Relevant Properties of Arabic Writing

- Arabic is different in many ways: not all that is developed for other languages is applicable to Arabic *as is*
- Consider: absence of capitalization, absence of diacritics, tolerance of spelling errors (say Hamza), coexistence with dialects; writing rules: one word sentences, lax punctuation, writing directionality, and more
- However, it shares a medium size alphabet, better correspondence between the written and spoken, derivation rules, and more
- So: Methods developed for other languages will need to be adapted to Arabic: a focus here!

Motivation and Introduction

The Wikipedia

Content/Article quality changes:

The Wikipedia (Arabic and other) used intensively. WHY?

- Well annotated: categorized, tagged, edited, with edit history and linked to similar material. **We use most of these features**
- Language is reasonable. Article quality is subject to discussion: so no uniform quality here **(feature, good, random)**
- Multiple authors, topics, editors: one can study this as well.
- Large and growing. Statistically sound: in Arabic 240K, in English 3500K and growing
- Good coverage also by topic
- Other resources can be used/added (WordNet, Dictionaries,…)

Quality Metrics

Quality in Wikipedia and General Texts

- What defines Quality:
  - **Language** parameters and style: simple/sophisticated, punctuation usage, sectioning, …
  - **Contributor** Credibility: Author and Editor
  - **Supporting** materials: links (outbound and inbound), pictures, graphs,
  - **Currency**: updated when needed: though too many updates may mean "still developing" status
  - **Access** frequency and history
- A combination of all! But we don't need to be that accurate!
- Recall: *Wikipedia* is highly annotated: including on quality: Feature(**gold***), Good (**silver***), Random (300,300, 240K)

Quality Metrics

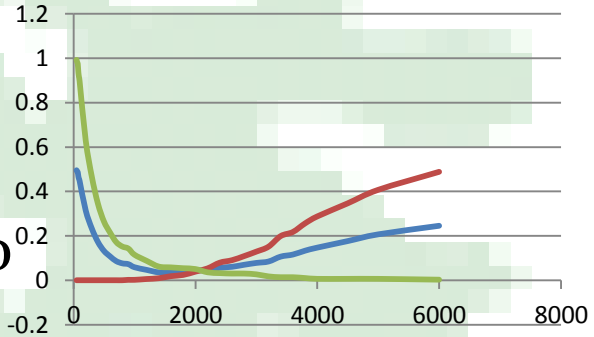
Language

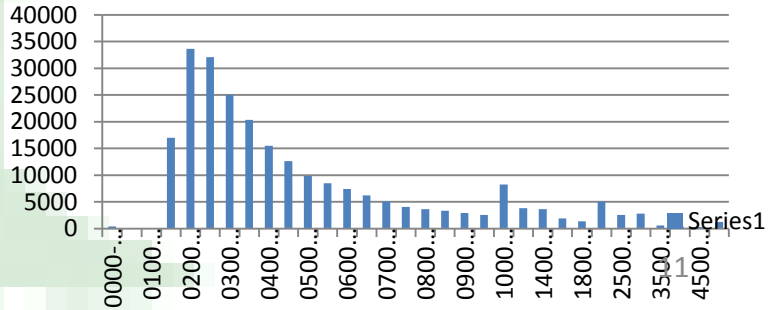
- General vs Specialized: can be determined by OOV words against a general (non-specialized) dictionary. Can use a general newswire corpus for the general dictionary
- Some phrases/terms are pointers to good quality:
  - Despite, not withstanding, respectively, ….
  - بالرغم من ذلك، محض صدفة، قياسا على،
  - Stylistic issues like punctuation, sentence length, vocabulary count, …
- The use of other languages (Monolinguality), including dialect
- Error Rate: ordinary and confusion letters (Hamza, Alef)
- Vocabulary: regular vs simple, regular vs children, …
- Diacritics: total or partial: usually none

Quality Metrics

Links and Length

- **Links:**
  - Links are important in page ranking
  - Both inbound and outbound links are of value
  - Links to good pages: more weight than link to average pages
- **Length:**
  - Short articles are not as good as short
  - One may ignore pages of less than 40-50 words: can't tell much in so many words
  - Different for other material (Multimedia)!





Quality Metrics

Contributors: Authors and Editors

- Edit History: Preserved Completely!
  - Temporal: how frequently changes occur, how much changes in each edit, what survives edits
  - What is the "Quality" of the edit author: good authors do good edits and produce good articles and good articles are produced by good authors/editors
  - Good authors/editors share networks: work on same articles. Working with a good author improves your reputation. Author credibility is affected by his/her network
  - A way to estimate quality is to credit each word by its author reputation, and to define author reputation by the quality of words he/she contributed: the process is iterative
  - **Yes. It is a cycle. The process may be iterative!**

Similarity Measures

Semantic vs Syntactic Similarity

- How semantically similar/related articles are (meaning!)
- Complicated by *style*, *paraphrasing* and *synonyms*
- *Similar* if they are telling the same story? Well almost: similar stories, related stories: a continuum from 0 to 1
- *Categorization* has an element of *similarity*
- But our concern: similarity between articles: single language or Cross Lingual (CL)
- Useful in plagiarism detection, IR: retrieve documents similar to the ***Information Need*** (Query)
- For us: find candidates for display, translation, relevant

Similarity Measures

Approaches to measuring Similarity

- **Bag of words**: distance tells how similar documents are. Problem: synsets, doesn't work across languages; can't detect similarity of summaries to original; or document to a query: length matters
- **Explicit Semantic Association (ESA):**
  - Express texts in terms of ***concepts***: a fixed number of concepts.
  - Each word is represented by a concept vector,
  - Each text is represented by the sum of its words concept vectors
  - Text chunks: similar if they have close enough concept vectors
  - Size irrelevant. problem: cross language difficulties.
  - Cross Language (CL) ESA: have common concepts (and vectors)
- **Wikipedia** can be the link!

Similarity Measures

ESA:

- Each word is represented by a concept vector (of Wikipedia articles)
- Each text is represented by the sum of its word vectors
- Text size doesn't matter: all texts map to a vector
- Similarity is judged by distance between the "text" vectors

CL-ESA:

- Consider only parallel articles in the two Wikipedia (e.g. Ar, En)
- Each word is represented by a concept vector: Wikipedia articles in OWN language: same dimensionality: comparable cross languages
- Again, each text is represented by the sum of its word vectors
- Similarity is judged by distance between the two vectors
- Need enough of credible parallel articles: (100,000?)

Similarity Measures

Wikipedia can be *the link*

- ***Wikipedia*** is the anchor link through its article words: generate an inverted table: for a word ***w*** associate n-dimensional vector ***V(w)*** with w-frequency in the **n** articles as elements. **n** is the Wikipedia Size!

  -In ESA Wikipedia **Articles** are the ***concepts***

  -For CL ESA parallel articles alone are considered!

  Vectors in ***both*** languages have ***same*** dimensionality
- The infrastructure exists: have enough **parallel** articles between Arabic and English (need not be limited to EN)
- We use categories/synsets: Wikipedia still the connection
- Measures of success: retrieving similar articles from the Wikipedia, or *close enough* ordering of similar articles

Similarity Measures

ESA Example

The man caught stealing was sent to jail for years

The thief spent long time in prison

- Thief Vector= 9001007070100 Quite
- Steal Vector= 9000107081100 Similar
- Prison Vector= 7000004080100 Quite
- Jail Vector= 7001105070100 Similar
- Time Vector= 1001807161200 Quite
- Years Vector= 0000806081100 Similar
- Word frequencies count
- Imagine summing for both sentences: the sums (averages) should be close. The numbers represent the Concepts (articles, categories)
- Imagine the sentences in different languages: matters little (just limit vectors to parallel articles) قضى السارق خير سنوات عمره في السجن

Putting it Together

- The goal is to improve the quality of Arabic Web Content
- We evaluate current content and tag it and offer people the chance to improve
- When we have a better quality foreign article we offer it as a possible source and a *translation* candidate
- Text size independence allows the process to start from the specification of user *information need* (query)
- We can even offer possible ***terms/words*** for inclusion in a new/improved Arabic article
- Results apply to other language pairs with infrastructure
- One potential applications: Plagiarism Detection

Next Steps

- Done some testing but much more needs to be done
- So far, more results on Wikipedia Article quality and less on similarity measures: that's the focus
- The integration of the components is as important
- Extension to other types of texts including short posts or user need specifications: we want to be able to move from a query (or a query stream) to the suggestion of translation(Foreign) /improvement (Arabic)articles
- The tools don't require deep understanding, though understanding helps developing heuristics and fine-tuning
- The good part is: mostly automated

Thanks