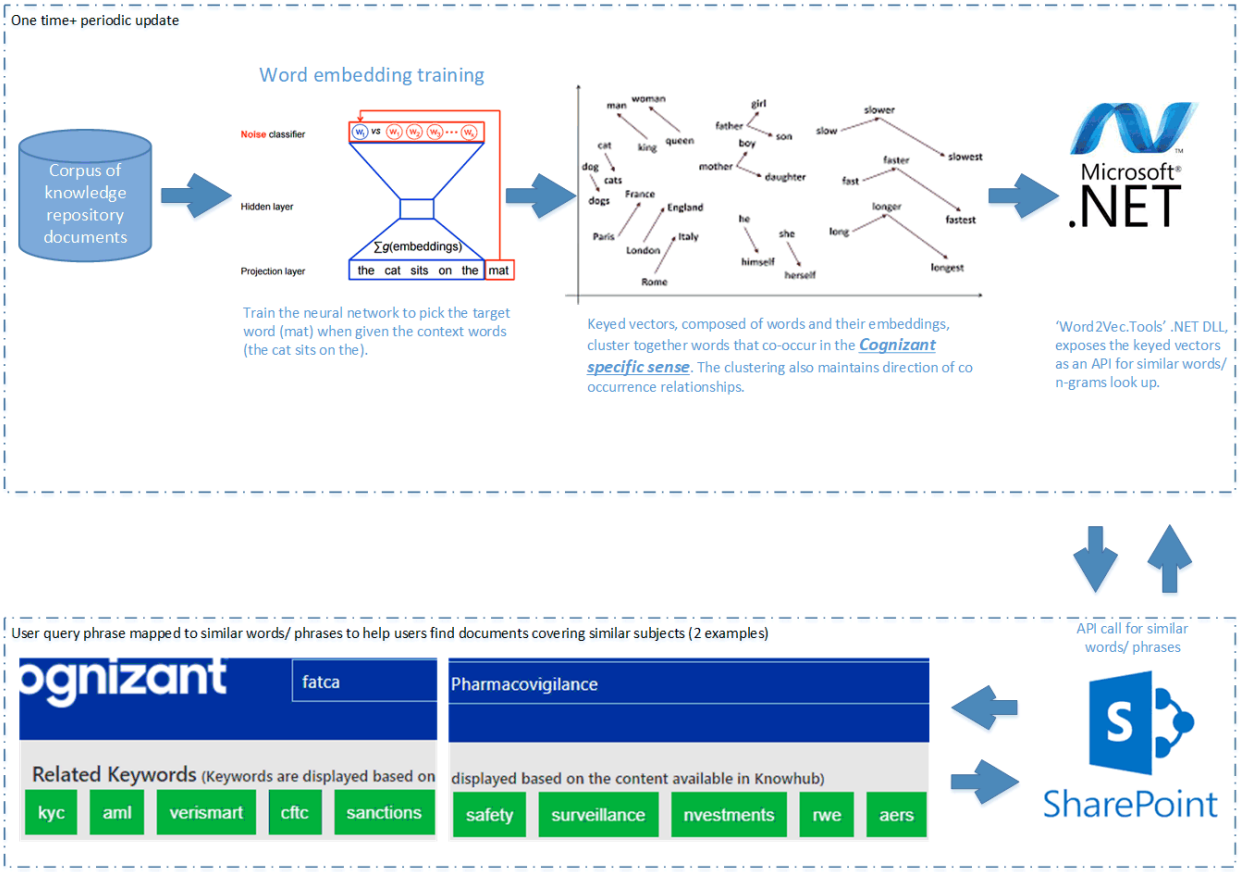
Semantic search for artifacts

Introduction:

Reuse of assets, like ideas and their implementations, is critical. Through careful improvements to such reusable assets over time, their quality and impact rise up to the level of being a competitive advantage. In the best of cases, such assets can provide non-linear/ licensing revenue opportunities.

Discoverability of reusable assets is one of the challenges faced. This is so, despite corporate document repositories containing documents that describe the reusable asset. The same concepts are expressed differently by different team members and by the same people at different times. While the repositories support tagging to help discoverability, the consistency of such expert tagging is doubtful.

Solution - Semantic similarity search:



Microsoft's powerful SharePoint is the document repository at Cognizant. We extended its impressive search capabilities using the following approach.

1. Word similarity: Semantically similar words frequently occur in the context of the same word groups (sentences). Extensive documentation for this assertion exists and we refer the reader to Mikolov et al's paper at https://arxiv.org/abs/1301.3781.

2. Cognizant specific word embeddings: While many pre-trained embeddings exist, they are trained on generic documents like news and Wikipedia articles. However, by training a custom embedding for the ~100,000 documents in Cognizant's repository, we were able to exploit domain specific word similarities.
3. Word embedding implementations: There are many word embedding implementations, each based on different techniques. The reader is referred to this white paper for details https://arxiv.org/pdf/1901.09785.pdf. We chose to work with a Word2Vec skip-grams library to generate "keyed vectors", which contains the words and n-grams that occur in a corpus of documents, and their vector representation. This space is rapidly evolving and further evaluation is warranted.
4. .NET Word2Vec DLL: The above "keyed vectors" are exported as a binary file that is then read by the Microsoft Word2Vec.Tools DLL. This DLL exposes an API through which similar words and n-grams can be looked up.
5. SharePoint: When users enter a search terms the documents corresponding directly to the search term are displayed as usual. In addition, a parallel call is made to the Word2Vec API and a ribbon of similar terms is populated, clicking on which updates the documents returned. Users can now look at documents that match the exact search term or documents that match similar search terms.

Results:

As seen in the image above, searching for pharmacovigilance prompts the user to also consider documents covering Real World Evidence (RWE) and Adverse Event Reporting System (AERS). A user, like a Business Development team member, can effectively gather Cognizant's artifacts related to a particular deal she is working on and not leave out important information from her sales pitch.

Such benefits are delivered to Cognizant employees across industry verticals, technology horizontals and different roles (e.g. a technical architect might search for a reusable Continuous Integration/ Continuous Deployment pipeline design without having to rebuild one).

Users have now reported much improved satisfaction levels with the repository as a reuse enabler.

Image sources:

1. Word embedding training: TensorFlow team
2. Word vector similarity https://medium.com/analytics-vidhya/implementing-word2vec-in-tensorflow-44f93cf2665f

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