First Steps toward Computational Collective Intelligence for the Learning Organization with Intelligent Information Gap Detection

Vincent Grèzes, Riccardo Bonazzi, Francesco Maria Commino
{Vincent.Grezes; Riccardo.Bonazzi; Francesco.Cimmino}@hevs.ch
Entrepreneurship & Management Institute
HES-SO University of Applied Sciences and Arts Western Switzerland

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Context & Goals

A **learning organization** is a company that facilitates the learning of its members and continuously transforms itself, to achieve organizational effectiveness when the external environment changes.

Goal of this project: develop a diagnostic tool to assess the alignment between

- internal knowledge of the organization and
- available external information.

Research question: How to promote organizational learning by assessing the gap between internal knowledge and external information?

Contact : Vincent.Grezes@hevs.ch

Literature review

Competitive and business intelligence solution providers are now able to offer services based on the use of artificial intelligence interfaced with the user in the form of a chatbot that processes the company's marketing, sales, customer relations, operations and Internet of things data. See for example https://crystal.ai.

Gap in the literature: These approaches do not take into consideration

- the computational diagnosis of the alignment of the company's internal (tacit and explicit) and external data,
- the added value of an additional organizational recommendation service.

Solution: Natural language processing (NLP) is a field of computer science concerned with the interactions between computers and human (natural) languages. With the diffusion of techniques of data mining (set of process developed to acquire huge amount of information) we had development in the field of text-mining, based on the same principle, but the data is extract from texts.

Contact : Vincent.Grezes@hevs.ch

Methodology: NLP with R Studio (1/3)

In order to illustrate our approach, we shall illustrate a simple example by using two public sources available on gutenberg.org.

Let us assume that the internal knowledge of the organization is contained in the strategy book "The art of War" of Sun Tzu. The external knowledge is described by the first chapter of "On War" of Clausewitz. We assess these two pieces of information in three steps:

1) **Internal and external data collection**: We convert the two texts into a data frame (in the example we show how we translate one of the first phrases in each book.

War therefore is an act of violence intended to compel our opponent to fulfil our will. (Clausewitz)

Sun Tzu said: The art of war is of vital importance to the State. (Sun Tzu)

	war	act	violenc	intend	compel	oppon	fulfil	sun	tzu	art	vital	import	state
Clausewitz	2	1	1	1	1	1	1	0	0	0	0	0	0
Sun Tzu	1	0	0	0	0	0	0	1	1	1	1	1	1

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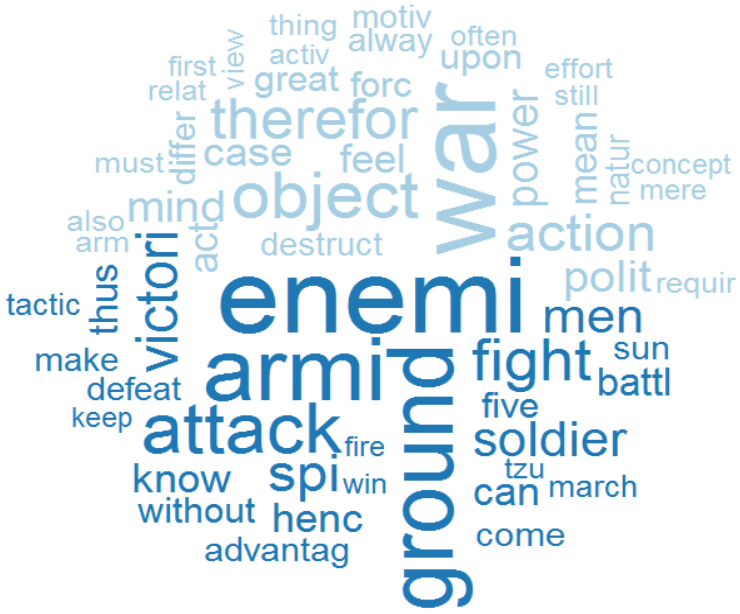
Methodology: NLP with R Studio (2/3)

2) **Data interpretation**: The dataframe allows to create polarized word clouds that show the words in common and the words specific to each text.

In our example, both sources describes how to deal with the enemy, but the first chapter of Clausewitz seems to focus on war whereas the book of Sun Tzu appears to describe how take advantage of different types of ground.

Clausewitz



Sun Tzu

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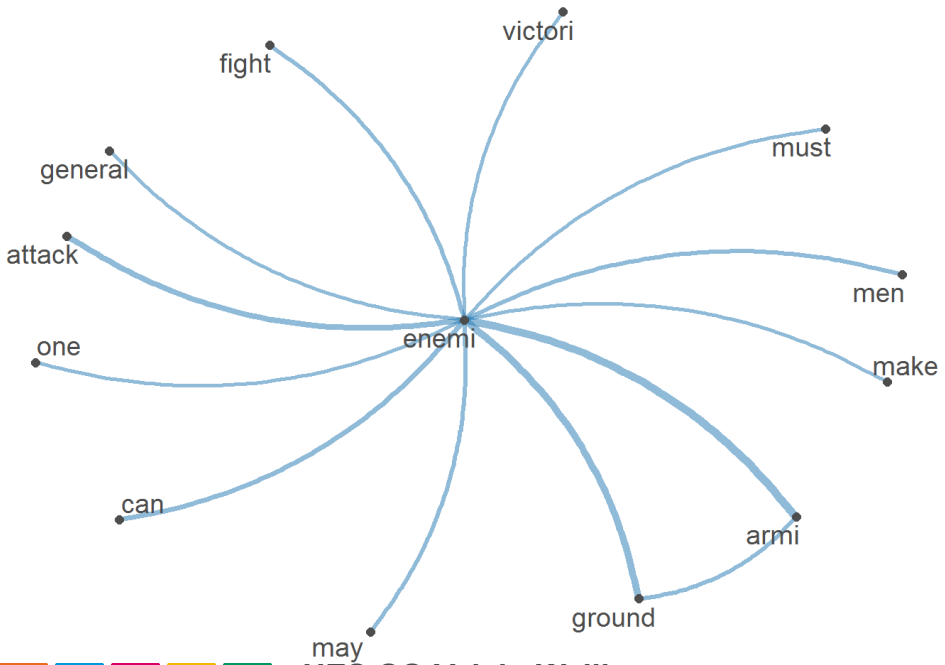
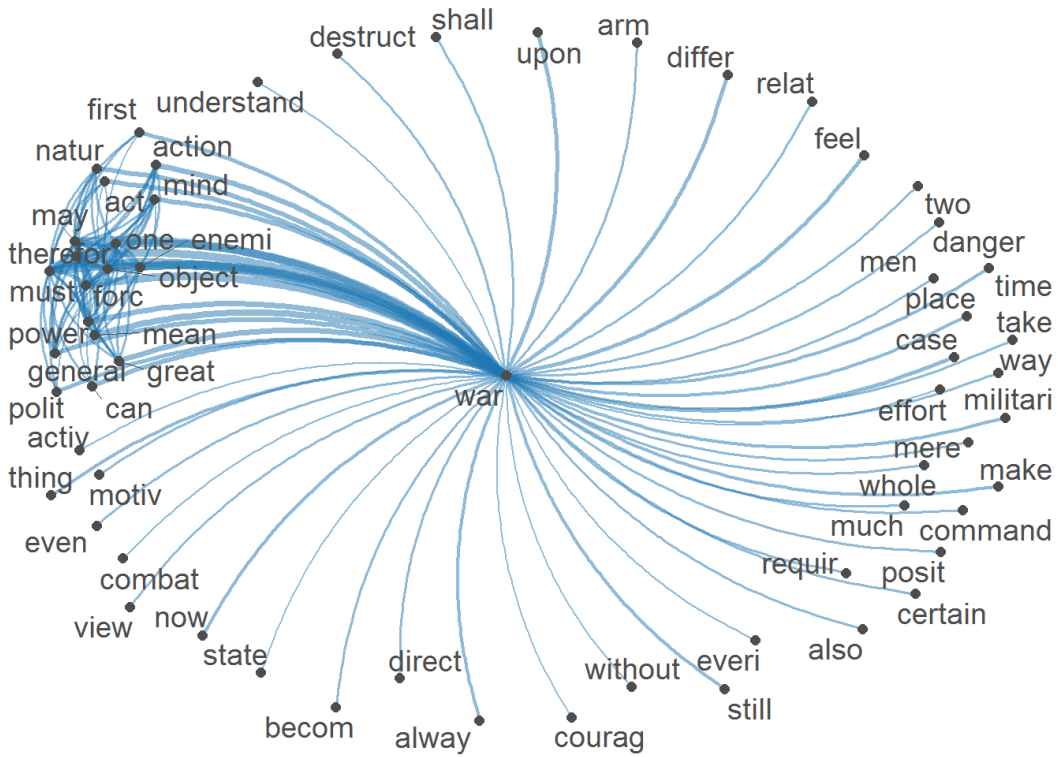
Methodology: NLP with R Studio (3/3)

3) **Learning and prescription to action**: Finally, we look at correlations between words to identify clusters. In our example, the book of Sun Tzu (on the left) seems to focus on how to beat an enemy. Instead, the first chapter of Clausewitz extends this notion (the left corner of the image on the right) and describes how to conduct war. Hence, we can prescribe to integrate the external source within the internal sources





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Discussions: Business benefits

The preliminary study produced a **proof of concept** that

1. extends the company's current services and
2. creates a clear competitive advantage in the strategic intelligence market, based on a unique positioning in terms of intelligence supported by artificial intelligence technologies.

The **commercial potential** and the extension potential of the solution are linked to the adaptation of the algorithm to different languages. This makes it possible to consider the extension of geographical markets.

The **expected revenue model** is based on licensing the use of the diagnostic application, customization of the modules, referral services for decision making and training services for the companies in the use of the application.

Contact : Vincent.Grezes@hevs.ch

Conclusions

Research question: How to promote organizational learning by assessing the gap between internal knowledge and external information?

Our **preliminary results** show an interest in continuing the research and integrating the formalization of the knowledge of all employees into the organization's knowledge base in order to align the data as closely as possible with the available external information.

Research limitations: our capacity to develop and test the external data analysis module (technical innovation on Fast Data Retrieval, Machine Learning, NLP) and the recommendation process development (service innovation). In addition, the learning effects of the recommendations will have to be measured.

Future research will focus on the processing of alignment of several sources of internal data with the external data, such as the measurement of the effects of the recommendation on the decision-making process of the organization.

Contact : Vincent.Grezes@hevs.ch

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