

Laboratory: ICube - UMR 7357

Institution: INSA Strasbourg

Research Team: CSIP (Design, Information Systems & Inventive Processes) - Dir : D. Cavallucci / V. Goepp - Website: [https:// icube-csip.unistra.fr/](https://icube-csip.unistra.fr/)

Supervisors: Pr. Denis CAVALLUCCI - INSA Strasbourg - denis.cavallucci@insa-strasbourg.fr

Working language: English or French

PhD Title:

Assisting Creative steps in Innovation pipeline using Artificial Intelligence

Keywords:

Inventive Design, TRIZ, Machine Learning, Deep Learning, Data Mining, Knowledge extraction, Innovation.

PhD Subject :

The early stages of Innovation process (those linked to creativity usage) are judged the less reliable ones in the pipeline of Innovation. Actual situations in enterprises still rely on old methods like brainstorming to produce ideas, especially on breakthrough projects, when no basis exist before idea generation. Paradoxically knowledge is exponentially growing in quantity while being feely available through internet. It is therefore legitimate to think that the web could constitute an endless field for feeding with data a permanent innovation activity in enterprises. We started 7 years ago, a research in Knowledge extraction in patent corpuses (patent texts), scientific papers and experts urls. The result is very encouraging since we could instantaneously capture relevant data's into unstructured texts. These data's are extracted to populate the Inventive Design Ontology we built for storing data's into servers with a given architecture, useful for rapid exploitation in R&D context. We are currently using morpho-syntactic tagging and Machine Learning for knowledge extraction but we remain open for new ways of extracting data's out of unstructured texts like Deep Learning if applicable.

After collecting these data and populating using our databases, we are now looking for investigating the field of population solution space with relevant data's. This would consist in an "information assistant" providing to users permanently relevant information extracted from reliable sources that uses our already structured database, populated using our ontology of Inventive Design.

Research Work Plan

This work will be organized in different steps:

- State of the art on Deep Learning techniques
- Study of the applicability of our extracted data's from texts within the populating of a solution space.
- Proposition of matching algorithms between problems and solutions
- Manage with a developer the building of a software demonstrator
- Contact companies and perform prototype case-study to finely tune the algorithms
- Proposition of an evaluation protocol and final integration into our software architecture
- Conducting real-life examples

References

TRIZ–The Theory of Inventive Problem Solving: Current Research and Trends in French Academic Institutions - D Cavallucci – Springer - 2017

Latent Semantic Indexing for Capitalizing Experience in Inventive Design, P Zhang, C Zanni-Merk, D Cavallucci, International Conference on Sustainable Design and Manufacturing, 37-47, 2017

Case-based Reasoning for Knowledge Capitalization in Inventive Design Using Latent Semantic Analysis, P Zhang, A Essaid, C Zanni-Merk, D Cavallucci, Procedia Computer Science 112, 323-332, 2017

Automated Extraction of Knowledge Useful to Populate Inventive Design Ontology from Patents, A Souili, D Cavallucci, TRIZ–The Theory of Inventive Problem Solving, 43-62

A more complete list can be found at :
<https://scholar.google.fr/citations?user=GlbGZnUAAAAJ&hl=gb>