How a Leading Car Manufacturer Automated its Requirement Analysis Process

Cortical.io Semantic Search Case Study

The Challenge

The company was coping with a growing number of requirements (over 150,000) that were described in multiple documents and databases. Thousands of specification sheets existed, each of them containing on average 500 requirements. So far, there was no information about whether a requirement relates to a specific project or to multiple projects, nor an easy way to compare requirements across projects. The requirement engineers had to copy-paste requirements and manually compare them, before using them in new documents.

Previous attempts to automate this task had failed, because similar requirements formulated in different ways could not be identified and because requirement texts are often too short to convey a meaning to conventional search engines.

The fact that many specification sheets contain complex tables from which requirements must be extracted and that specification sheets do not have a standard structure made it even more difficult for current approaches to solve the problem.

Company Profile
Leading Car Manufacturer

The Goal
Automate the requirement analysis process and increase its transparency

The Solution
Cortical.io Semantic Search

The Cortical.io Solution

Leveraging Cortical.io's patented approach to natural language understanding, the company developed a new requirement analysis tool that automates the grouping of technical requirements. The tool was trained with reference data from the car manufacturer's language domain (specification sheets, indices of abbreviations, company-specific standards, industry standards, automotive engineering literature, etc.) and evaluated against a Gold Standard of requirements for which correct entries had been specified in the respective specifications. Compared to this Gold Standard, the Cortical.io solution achieved 88% recall and 96% precision.

The Cortical.io Impact

Because the solution was able to match different formulations of the same requirement, even when the text was short, it provided requirement engineers with a transparent overview of specification details across projects. The solution enabled them to easily compare specifications, which helped them make sure their own specification sheet is complete and up to the company standards. The comparison table also allowed them to identify and question variations of requirements across similar projects. Unnecessary or duplicate requirements could be eliminated, requirement formulation standardized.
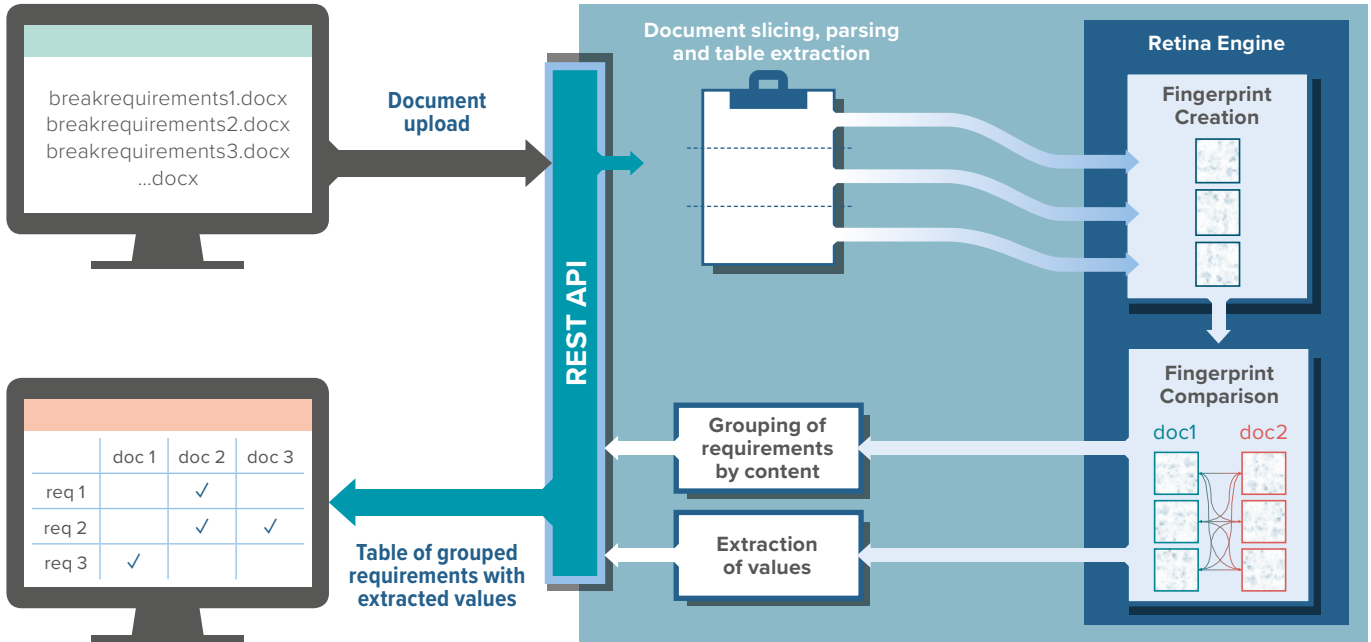
Biologically-inspired natural language understanding

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By using Cortical.io Semantic Search, the company was able to:

- Ingest all specifications and subdivide them into requirements

- Calculate the semantic similarity values between the requirements of all specifications and group similar requirements together

- Output the requirements analysis in a table that lists all requirements, showing in which projects they occur, whether they are project-specific or not, and the value of similar properties like weight, material, color etc. across projects

- Access the requirement analysis via a simple web interface

Requirements	Group	Projects				
		A	B	C	D	E
The screw connections to the body must not fail in the event of a crash.	Generic	✓	✓	✓	✓	✓
The installation and functional surfaces must be free of PVC.	Specific			✓		
The maximum press-in force oft the rubber bearings is __kN.	Value	35	12	30	50	45

How does it work?

breakrequirements1.docx
breakrequirements2.docx
breakrequirements3.docx
...docx

Document upload

REST API

Document slicing, parsing and table extraction

Retina Engine

Fingerprint Creation

Fingerprint Comparison

doc1   doc2

Grouping of requirements by content

Extraction of values

Table of grouped requirements with extracted values

	doc 1	doc 2	doc 3
req 1		✓	
req 2		✓	✓
req 3	✓		

For more information about this case study and Cortical.io solutions, visit
www.cortical.io or email **info@cortical.io**

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