Design of Natural Language Processing Toolkits in the Industry: Lessons Learned and Takeaway Messages for Chatbot

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OSFI BSIF

The presentation is based on my work experience and opinions. It does not necessarily reflect the view of OSFI as my employer

Canada

I conduct research and build real-world impactful applications using data science tools and techniques

Academia

MSc, Computer Science
2006 - 2008
A mathematical trust model for service-oriented software

PhD, Computer Science
2010 - 2018
Automatically summarize sentiments and reviews from social media data

Assistant Professor (tenure-track)
Electrical and Software Engineering
2020 - Present
Founding director of Data Intensive Software Analytics (DISA) lab to design responsible ML Software

Industry & Government

Data Engineer
2008 - 2010
Investment analytic software development using company stock prices and balance sheets

Researcher & Software Engineer
IBM Watson Analytics
2011 - 2015
Automatically determine intents in the textual queries of users and produce output to answer to queries using NLP

Data Scientist
2016 - 2018
Processing of millions of scanned mail labels from Canada Post and generate analytics (fraud detection)

Senior Data Scientist
Data and Statistics Office
2018 – 2020
Data governance and forecasting model for TransUnion consumer credit microdata

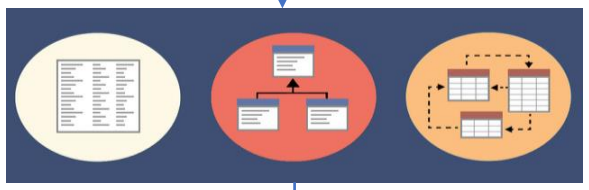
Manager
Advanced Analytics
2021 - Present
Design and development of SupTech (Supervisory Technology) tools using AI/ML/NLP techniques

Automatic understanding and responding to user “Intents” in a natural language query

IBM Watson Analytics

User data

Automatically Create data model



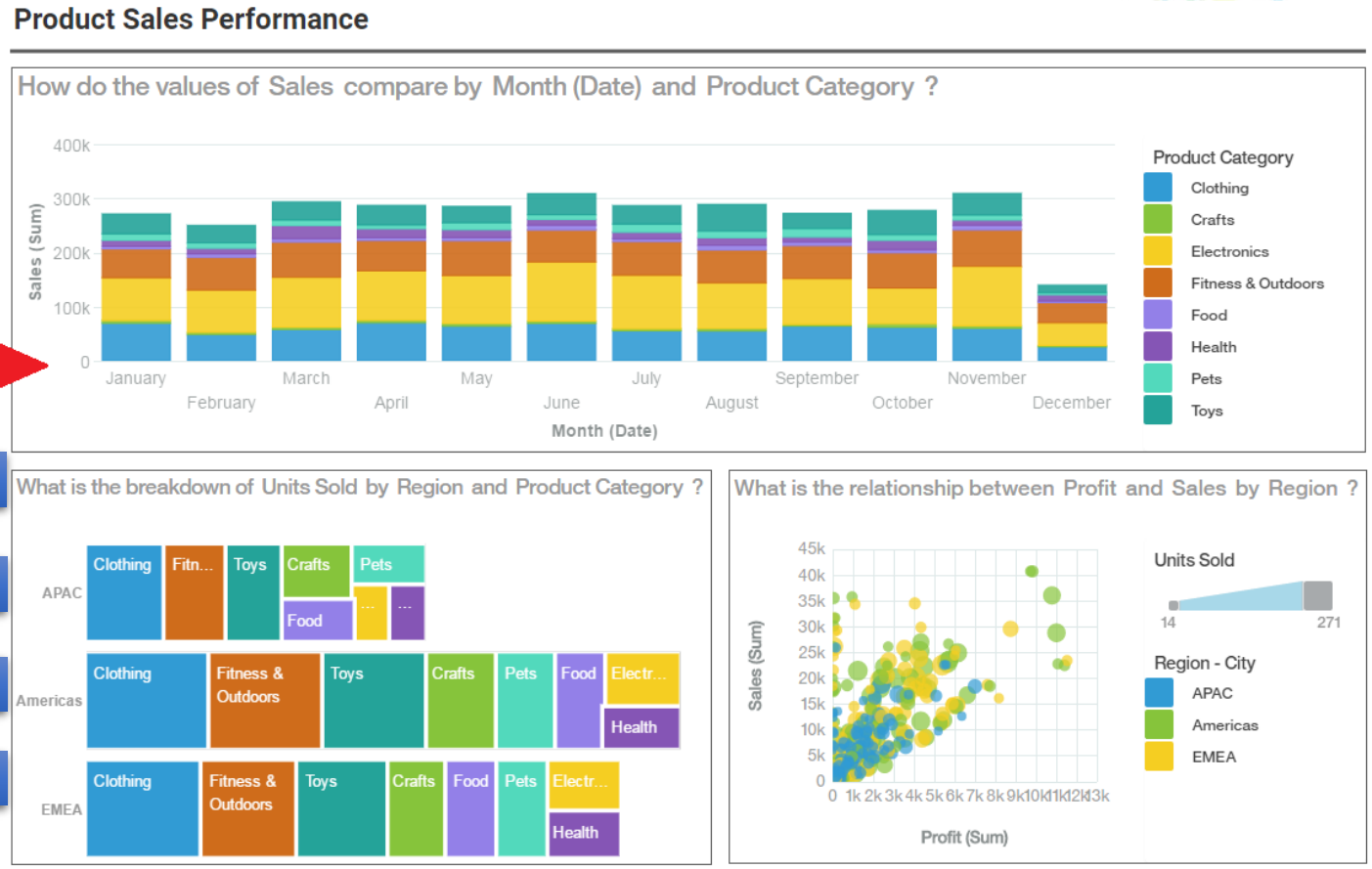
User query

Query intent understanding (find focus words)

Semantic query mapping (vocabulary match)

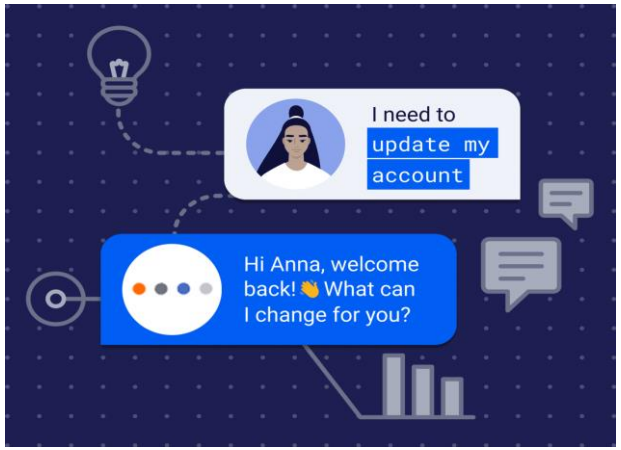
Recommend data visualization for query result

Show query results in the Watson dashboard



Product development team consisted of hundreds of software developers, architects and product managers in several countries across two continents (North America & Europe)
Required more than two years’ of planning and development to build first consumer ready version
Used by thousands of millions of users when operationalized
The core natural language processing team was based out off of Ottawa (intent detection was considered as a key achievement within IBM)
Influenced the development of multiple spin-off products within IBM (e.g., IBM consumer insight analysis, IBM orchestrate)

Lessons learned and takeaway messages to build Chatbots



Tool

- It is almost impossible to find a third-party tool that can do all the NLP tasks that can meet specific business objectives
- It often requires extensive customization of the third party tools to tailor those to specific needs

Technique

- ML model is only a part of many non-ML but NLP/data tasks in any textual analysis
- Intent detection or any NLP task (e.g., classification) can be very much a domain-specific problem, requiring specialized ML/NLP models tailored to each domain

Operationalization

- Operationalization of ML models often require a holistic change due to the integration of the ML models and the workflow/pipeline into the traditional software systems
- Adoption of NLP tools needs to be human-centered by focusing on specific needs and by continuously updating the tools based on changing requirements

Responsible AI

- There can be a fundamental change in approach between how a model is designed during exploration phase vs how it may be used in real-world use cases
- Wrong data or wrong technique/tool in a Chatbot can have harmful consequences besides providing wrong outcome

Microsoft

Microsoft's chatbot Tay was shut down 16 hours after launch as it had learned slang and inappropriate language from Twitter trolls.

https://en.wikipedia.org/wiki/Tay_(bot)