Computerized Applications of Natural Language Processing in Digital Economy: A Review

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ABSTRACT
Advancements in digital and Artificial Intelligence technologies have paved a new way for the study of natural language based applications using techniques such as natural language processing, predictive analytics, machine learning etc. For example, in business applications one can predict the behavior of a customer, product performance, product sales, predictions in compliance and regulatory aspects given the past business trends and sentiment analysis using natural language processing. This paper is a comprehensive study of the various applications of Natural Language Processing in Digitization. Along with key Digital forces – Mobility, Social Media, Cloud Computing, Analytics, Natural Language Processing & Artificial Intelligence applications are adding tremendous value to business users. Some of the examples are – Legal systems, robotic process automation, customer sentiment analytics, machine learning, robo-advisory apps etc. They not only improve adaption to automation, but also help significantly improve employee productivity and customer experience. This research paper outlines few such examples.

Keywords— Digitization, hyper connected organization, Artificial intelligence, machine learning, natural language processing, predictive modeling, data science, robotic process automation, legal process outsourcing, customer sentiment analysis, robo-advisory apps, syntactic and Symantec analysis.

I. INTRODUCTION

With the technological advancement in mobile, social, cloud, analytics and artificial intelligence, the digital technologies are redefining the way businesses are to be conducted. They are transforming business enterprises from product centric to customer centric. These enterprises are increasingly in search of effective digital business strategies to harness these technologies and become hyper connected organizations. Innovations & technology changes, improved time to market, customer needs, changes in compliance & regulatory needs and growing businesses requirements, have made customer service performance critical for any organization’s survival. During 2017, the top trends that impact customer experience are – Data (structured & unstructured data, analytics & insights), Personalization (adaptive web, mobile apps, using right CRM strategies, Natural Language Processing), Digital Assistants (voice search,” Siri, Alexa, Google Assistant, majority of smartphone users using voice search started using it the past year), Chat Bots (instance answer to a query using Natural Language Processing applications) and Digital Omni Channel Experience. This necessitates organizations to respond to their internal needs such as the best supply chain management to resolve quick digital orders etc., (eg. Best Buy, Amazon, e-bay etc.). Usage of technologies such as web 2.0, blogs, wikis, podcasts, IBM Watson etc., has become very common. Hence, there is a growing need for natural language processing applications applied to any industry – banking and financial services, retail, insurance, transportation, hospitality etc., and leverage Data, Analytics Insights, Predictive Modeling, omni channel governance, cyber security, cloud (eg. GE’ internal cloud based digital backbone – ’PREDIX’, Amazon - AWS) and artificial intelligence. This paper talks about a few such examples where Natural Language Processing plays a pivotal role [6].

II. METHODOLOGY

This research is based on the author's experiences, information and data available on public sources. An extensive study and analysis is performed before presenting few examples.

III. EXAMPLE 1 – LEGAL APPLICATIONS
Problem Statement

Today’s changing needs of enterprise, customer requirements, country specific rules, political environments, changes in business rules necessitates change in legal and regulatory changes; for example, enterprises need to comply with regulations of the business domain - Banking: BASEL-III, Healthcare: HIPAA etc., compliance to these regulations is a critical problem for enterprises, and the current practice of regulatory compliance is manual in most cases, domain expert dependent and incurs huge operating costs [7].

Solution

A knowledge engine and system definitions of a given regulation are represented using context sensitive grammar with a logical representation. Leveraging this, business rules are generated. This knowledge engine is continuously updated through inputs in the form of natural language. This system learns by itself and therefore can predict the possibilities of regulation change under given circumstances. Leveraging analytical engine, various reports can be generated with complete insights.

IV. EXAMPLE 2 - FRAUD MANAGEMENT, ACCOUNT TAKE OVER

In this digitally connected world, safety and security of data is of utmost concern for any organization or individual. With fraudsters getting equipped with more advanced techniques and technologies, cybercrimes and frauds like Account Take Over (ATO) are on the rise both on a voice channel as well as on digital channels. It becomes extremely challenging to combat such scenarios, especially, when the financial services organizations’ focus is on customer experience. This is a great use case for addressing these challenges leveraging digital technologies and Artificial intelligence based applications [8].

V. EXAMPLE 3 - CUSTOMER EXPERIENCE VIRTUAL / DIGITAL PERSONAL ASSISTANTS

Virtual / Digital personal assistants use natural language type of interface, and connects to web services for getting responses. The examples are SIRI, KARI etc., They use natural language processing interfaces to talk to the user thereby the interactions can be much easier. With the increase in digital devices and mobile equipment, virtual assistants are getting prominence in the digital economy for better communication and user-friendly devices [1].

V. CONCLUSION

There are several business examples where Natural Language Processing concepts have played a vital role in digital economy. This paper discussed a few notable business cases. The other examples can be digital business advisor, financial planning advisor product, medical expert systems, investment advisor etc., Coupled with machine learning, Natural Language processors give an edge over many expert systems. Some of the business use cases include – predictive analytics, forecast analysis, vehicle telematics, driving behavior analysis, pay as you drive type of models etc., The usage can be across different business verticals such as insurance, financial services, banking, utilities, transportation, manufacturing etc., Better campaigns can be designed, effectiveness of
the campaigns be measured. Overall there is a tremendous value added and there is a scope for a lot of research in this area, such as effectiveness of various natural language processing systems, ease of developing those, apps with video interfaces etc.

REFERENCES