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AI: Past, Present, and Future

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AI: Past, Present, and Future

Section 1: The Challenge

What is Artificial Intelligence (AI)? If human intelligence *can be so precisely described that a machine can be made to simulate it*, then that is Artificial Intelligence. The problem is that it is usually very hard to describe human intelligence, and that is the reason why AI is still in its infancy.

What is Intelligence? How do machines learn?

For that, we just need to look at how a child or a baby learns. A baby hears sounds and sees things around her or him. After a period, if the baby comes across a familiar sound or a sight, it recognizes it. This type of pattern recognition is what machines do as well. As a baby grows, it learns to solve problems and reason out things. So can machines!

Section 2: Evolution of AI Applications

Probably the first exciting application of Artificial Intelligence was Chess. Just to compute the possible moves and counter moves ahead of time was very challenging since the computers were not that powerful in those days. These are all relative because, 10 years from now, we might feel that computers were not that powerful in 2018. With not-so-powerful computers then, scientists used heuristics to cut down the number of moves to be analyzed, and the computer beat the world champion around 20 years ago.

Fast forwarding to today, there has been an explosion of AI applications in various domains and industries. The recent growth in AI can be attributed to two aspects:

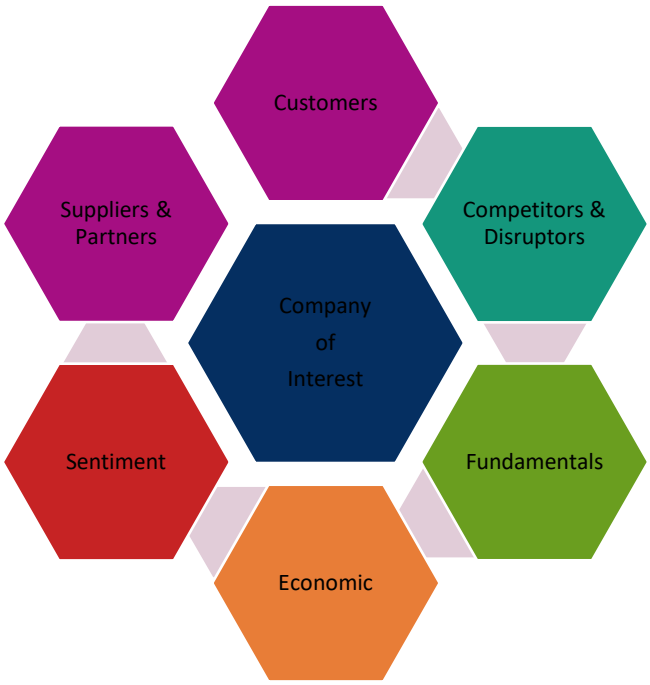
- Cloud computing, where it has become possible to have theoretically infinite data capacity and at scale computer power to mash data; and
- Availability of open source libraries that implement AI/Machine Learning algorithms and models.

One of the exciting applications of AI is self-driving cars. Here, a car is made to drive by itself by observing the traffic on the road, the signs posted on the side of the road, the road conditions, pedestrians, and the weather. Once again, the car needs to recognize patterns using deep neural networks, and so it is trained by driving a few million miles in different environments with differing road conditions.

If a car can be managed by looking at the traffic, road conditions, and the road signs, can the performance or the risks associated with a company be understood by looking at its balance sheet, its cash flow, its supply chain, the demand for its products, and the prevailing economic factors? This is a very pertinent question to the insurance domain as the industry has been grappling to understand and estimate the risks as the basis for any product or service. Reflecting on the question, we know the risks and returns are not random. They adhere to action/reaction, cause/effect, patterns, and feedback loops. However, understanding and estimating risk and performance is a chaotic and complex process.

Section 3: Risk and Performance of Companies

Michael Porter from Harvard University[1] claimed that the performance/risks of a company are best understood from its 5-forces: Customers, Suppliers, Partners, Competitors, and Disruptors. Of course, the fundamentals, balance sheet, income statement, cash-flow statement, and other microeconomic factors become equally important. The precision to estimate risks could potentially go up if there is an understanding on the macroeconomics aspects, as well. In particular, there are hundreds of economic factors across supply, income, spending, inflation, monetary/fiscal rates, and the Federal policies that govern the operating environment of both publicly listed and, more importantly, private companies. In today's connected world, the sentiment on the company, be it from social media, news media, customers/consumers, analysts, or investors, can also play a big role on the top-line of the company in the short term. Pictorially, the following diagram provides the building blocks to understand the performance and risks of a company, both from the micro and macroeconomics aspects.



Now that there is clarity on the key aspects to estimate the risks associated with the company, could Machine Learning and Artificial Intelligence help understand and compute these boxes automatically? Of course, these mathematical models require large amounts of data to produce reliable results. Fortunately, our industry has vast quantities of structured data (timeseries), as well as unstructured (English) documents to feed into these models. The following are some key data sources that could help automatically construct these boxes for a company of interest:

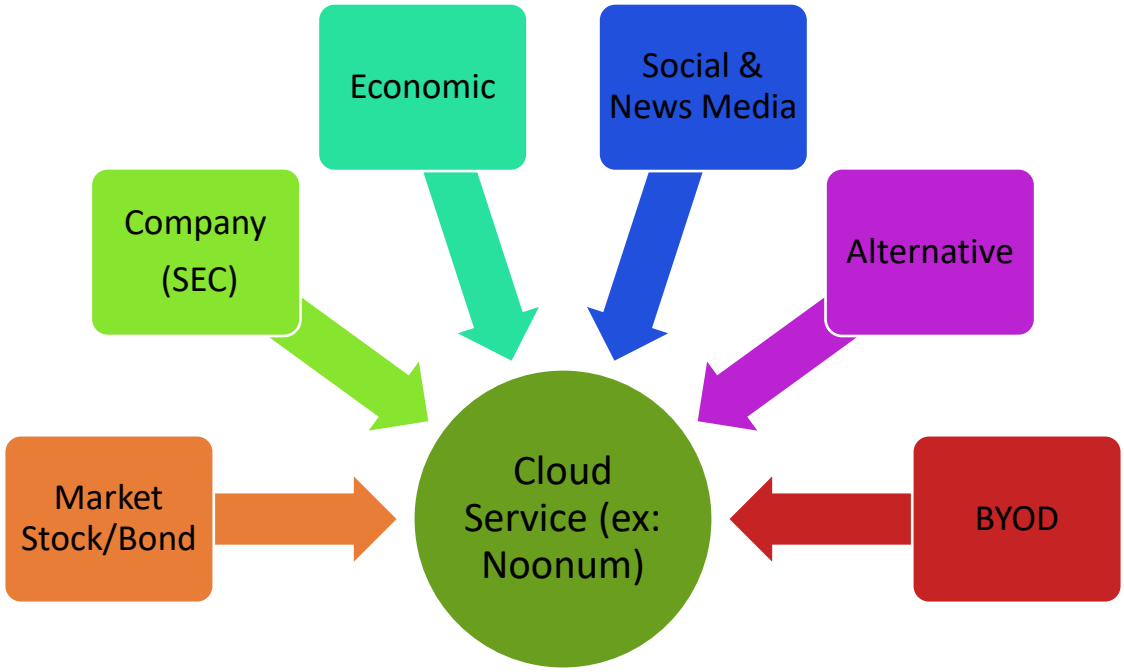
- Market data from the exchanges
- Company filings from the SEC

[1] https://www.isc.hbs.edu/strategy/business-strategy/Pages/the-five-forces.aspx

- Economic data from the Federal Reserve, National Bureau of Economic Research, Bureau of Labor Statistics, International Monetary Fund, World Bank, and others
- Social Media from Twitter and Facebook
- News from Reuters, New York Times, Financial Times, and other trusted sources
- Alternative data, such as weather, health, and transactions
- Proprietary data that could be relevant

The challenges around learning and understanding from the vast quantities of data through the latest advances in Natural Language Processing (NLP) and Machine Learning are enormous. Combining and associating quantitative data with that of qualitative, in particular, is still evolving.

Cloud-service companies, such as Noonum[2] and others, often take on this challenge of leveraging Machine Learning and NLP to understand and evaluate risks and the performance of companies. These types of cloud services continually mine a few million text documents and timeseries from a variety of different sources to accumulate knowledge and synthesize useful insights for FinTech and InsurTech industries. The following diagram is a pictorial view of the different types of data described above that are digested by these types of engines. Often, it is also interesting to analyze proprietary and private data in conjunction with the public data, which is done through the BYOD (Bring Your Own Data) module.



[2] https://noonum.ai

By performing various types of analyses (including risk, impact, and mechanistic) on this interrelated myriad of signals, these services build millions of nodes/edges in a semantic knowledge graph connecting companies to other companies that are in their supply chain, their competitors, companies to commodities, companies to geopolitical factors, companies to people, products, and places. This business graph helps the professionals in the actuarial and the investment world make data-driven and emotion-free decisions.

Section 4: Conclusion

While AI and Machine Learning can play a key role in the insurance industry, there are several applications that glean insights from vast quantities of data in the healthcare and other industries that is helping solve key problems. Some challenges include inventing drugs that cure diseases and helping hospitals do a better job with patient administration.

With all these advances, are we there yet? No. Today's machine intelligence can barely match that of a two-year-old. So, we have a long way to go. A fully-grown human being is capable of understanding emotions, non-verbal cues, words with double meanings, etc. Also, human beings can joke and are (usually) ethical when making decisions. So, machines have a lot of growing up to do, but we are in exciting times for sure.

About The Society of Actuaries

The Society of Actuaries (SOA), formed in 1949, is one of the largest actuarial professional organizations in the world dedicated to serving more than 30,000 actuarial members and the public in the United States, Canada and worldwide. In line with the SOA Vision Statement, actuaries act as business leaders who develop and use mathematical models to measure and manage risk in support of financial security for individuals, organizations and the public.

The SOA supports actuaries and advances knowledge through research and education. As part of its work, the SOA seeks to inform public policy development and public understanding through research. The SOA aspires to be a trusted source of objective, data-driven research and analysis with an actuarial perspective for its members, industry, policymakers and the public. This distinct perspective comes from the SOA as an association of actuaries, who have a rigorous formal education and direct experience as practitioners as they perform applied research. The SOA also welcomes the opportunity to partner with other organizations in our work where appropriate.

The SOA has a history of working with public policymakers and regulators in developing historical experience studies and projection techniques as well as individual reports on health care, retirement and other topics. The SOA's research is intended to aid the work of policymakers and regulators and follow certain core principles:

Objectivity: The SOA's research informs and provides analysis that can be relied upon by other individuals or organizations involved in public policy discussions. The SOA does not take advocacy positions or lobby specific policy proposals.

Quality: The SOA aspires to the highest ethical and quality standards in all of its research and analysis. Our research process is overseen by experienced actuaries and nonactuaries from a range of industry sectors and organizations. A rigorous peer-review process ensures the quality and integrity of our work.

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Quantification: The SOA leverages the diverse skill sets of actuaries to provide research and findings that are driven by the best available data and methods. Actuaries use detailed modeling to analyze financial risk and provide distinct insight and quantification. Further, actuarial standards require transparency and the disclosure of the assumptions and analytic approach underlying the work.

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