AI in Marketing
Prof. Zillur Rahman
Department of Management Studies
Indian Institute of Technology, Roorkee

Week 2
Lecture-7 Transforming Marketing Strategy using AI-I

Welcome to this NPTEL online certification course on artificial intelligence and marketing. And now we will talk about module 7. Now, as you can see that we are we are talking about chapter 2, that is how to go about developing marketing strategies and plans using AI. In module 6, we have talked about the customer value and the role of artificial intelligence in the value delivery process. Now this module 7 to 11, they are dedicated to understanding how to transform marketing strategy with the help of AI. So, this is chapter 2 and we are talking about the transforming marketing strategy using AI and which is part 1 and we are in module 7.

To have a overview of this module, we will start with exploring the ideas framework and understand five elements of technology landscape. Then we will study the intelligence and data landscape of ideas framework in detail. Then we will understand different dimensions of human and machine intelligence. After that, we will study the trade-off between applying human and machine intelligence to solving marketing and business problems.

Thereafter, we will understand the shortcomings of intelligent systems and the various kinds of problems that come with them. And then we will talk about exploring the building blocks of the modern-day data foundation. So, now we let us look at the ideas framework. So, these the five elements of the technology landscape are, one is intelligence, the second is data, the third is expertise, the fourth is architecture and the fifth is strategy and together they form this ideas framework, IDEAS. Now, these elements create opportunities for value creation and distribution in innovative ways and change the way business leaders can manage the procurement, technology development, human resource management and firm infrastructure.

So, these five elements will help the leaders in in managing this these three, fourth things. Technology implementations for the sake of technology does not bring the desired value for companies. So, it is not it should not be just for the sake of the technology. Technology based on deep learning have little sense of causality space. So, this causality means cause and effect relationship. Space, time or other fundamental concepts that human beings effortlessly call on to move through the world.

Now, the first component of ideas framework is intelligence. So, that is the first component of ideas framework. Companies are now creating applications and machines whose reasoning ability is adaptable and savvy more like the way human approaches a problem and the task. So, it is more human-like. For example, new generation of robots can generalize in real world settings like warehouses manipulating items without being

told what to do.

Consider emotional AI which grew out of work with autistic children to help them understand and express their emotions. It is now evolving into on board automobile AI that could be as effective in saving motorist lives as seed welds by leveraging the most powerful cognitive characters of human that is awareness and adaptability. These developments promise potentially more intelligent solution to pressing commercial and social challenges. Now, let us look at the intelligence from the perspective of human versus machine. So, we are talking about the human supremacy.

No machine powered by AI can yet match the ease and efficiency with which even the youngest human learn comprehend and contextualize. Accidentally drop an object and a one year old child who sees you reaching out for it will retrieve it for you. So, this is how one year old child will respond. Now, throw it down on the purpose and the child will ignore it. So, if it falls then the child will pick it up for you.

If you throw it then the child will ignore it. In other words, even very small children understand that other people have intentions. That is an extraordinary cognitive ability that seems to come almost pre-wired into the human brain. That is not all. Beginning at a very young age, they develop an intuitive sense of physics.

They begin expecting objects to move along smooth paths. So, this is what a child expects. They remain in existence, fall when unsupported and not act at a distance. Now, where machine supremacy comes in, yet AI can do many things that people, despite being endowed with natural intelligence, find impossible or difficult to do well. That is, one is recognize patterns in vast amount of data.

So that defeats the greatest champion at chess, Go and Jeopardy. Run complex manufacturing processes efficiently and calls to customer service centers. Run complex manufacturing processes efficiently aid callers to customer service centers. Analyze whether soil conditions, satellite imagery to help farmers examine crop yields. Scan millions of internet images.

In the fight against child exploitation, detect financial fraud. Predict customer preferences, personalize the advertising and much else. So, this is where machines are superior to human. Now, the middle ground between the fight of these two, man and machine supremacy, automating such task lies beyond not only the capabilities of human, but also of traditional procedure logic and programming. And most important, AI has enabled humans and machines to complement each other.

So, it is not about man versus machine. It is about how they can come together. So, AI has enabled humans and machines to complement each other, transforming mechanistic processes into highly adaptive, organic and human centered activities. The next comes human like machine intelligence. A 2022 report by Accenture shows that more than three-fourth of major companies currently have deep learning initiatives underway.

Deep learning is a powerful subset of machine learning. It works through neural networks consisting of simple neuron like processing units that collectively perform complex computations. AI based on deep learning must be trained from the bottom up on massive amounts of data and often fine-tuned with additional data. So, deep learning is trained from bottom up and massive amount of data is required. But this data-hungry approach is beginning to run into significant challenges.

Challenges of capacity, challenge of affordability and the challenge of sustainability. So, these are the three challenges that this deep learning faces. So, the three challenges that deep learning faces are capacity, affordability and sustainability. Meanwhile, on the frontiers of research, the nature of machine intelligence is taking radically human turn, becoming less artificial and more intelligent. Less like the autonomous vehicle that has to be laboriously taught everything and more like the human infant who comes equipped with a remarkable efficient capacity to learn.

The quest for more human like AI after lying dormant for decades have taken on a new life. Impelled by the limits that current approaches to intelligence are now running up against. For senior leaders, navigating this dilemma begins with an understanding of those limits. Now, what is the trouble with intelligence? The limit of the present deep learning-based AI warrants a new approach to machine intelligence which is more human like. So, deep learning is more suitable or suited to tackle for certain narrowly defined problems and not as a basis for more general intelligence.

So, this deep learning is not going to replace general intelligence. Some key troubles with the present-day AI are many AI systems are not all that smart. AI image recognition was one of the great AI success stories of recent years, but it has been very easily confused by researchers. What is at stake is not simply correctly classifying an image but genuinely recognizing an object. As with self-driving cars or delivering drones, failure could have fatal consequences.

The next is, so that was one problem. The next problem is complex systems suffer from the black box problem. AI systems are often used to help make highly consequential decisions. Who gets approved for a loan, who gets hired, who wins payroll, who long, how long a present sentence someone gets, where and how a company ads are distributed on social media and more. But many of these systems, especially those that employ deep learning are opaque, that is they are not transparent.

So, it is impossible to explain how these deep learning algorithms working with enormous amounts number of parameters and many intricately interconnected layers of abstraction reach their conclusion. And those conclusions can sometimes be disastrous. So, one is that we do not know how they have reached that conclusion. And then that can be sometimes disastrous. Resulting in racial discrimination in loans and criminal justice, respected brands whose ads on social media show up next to neo-nausea content or conspiracy theories.

So, they lack fundamental knowledge frameworks. So, that is the third problem that they

lack fundamental knowledge frameworks. Causation an essential component of common sense. Much of the success of deep learning has been driven by powerful ability to find correlations. So, this is what we are looking for such as that between a constellation of symptoms and a particular disease.

But as we should all know by now correlation is not causation. So, this correlation does not mean cause and effect relationship. If machine understood that one thing causes another then they would not need to be retrained for each new task. Instead, they should apply what they know in one domain to the different domain. Now, let us talk about the intelligence and human AI augmentation.

AI has enabled human and machine to work together efficiently. And such collaboration is creating an array of new high value jobs. So, now these humans and machines are coming together, and they have created high value jobs. Now, let us take a look at the case of Obeta a German electronic wholesaler. At Obeta a German electronic wholesaler whose warehouse is run by Austrian warehouse logistic company NAP.

Human workers are teaching a new generation of robo pickers how to handle different sized and textured items. To train a robo NAP workers put unfamiliar object in front of it and see if it can successfully adapt to them. When it fails it can update its understanding of what it is seeing and try different approaches. But when it succeeds it gets a reward signal programmed by humans to reinforce the learning. Then a set of SKUs that is stock keeping units differs totally from other sets.

The team reverts to supervised learning, collecting and labeling a lot of new training data as happens with deep learning systems. NAP robo pickers are acquiring general purpose abilities including 3D perception and an understanding of how objects can be moved and manipulated. In many cases the items have not been pre-categorized, which is unusual for industrial packaging systems. It means that the robots are learning how to handle them in real time. Now, this is a critical skill to have when dealing with electronics especially when you consider the different care required to handle a light bulb and a stove.

What are the implications of using smart robots? One is the increased reliability. Previously NAP robo pickers reliably handled only about 15% of the objects. The covariant powered robots now reliably handle about 95% of the objects. The second is the increased speed. Robots are faster than humans, picking about 600 objects an hour versus 450 for human.

The third is no layoff. Human workers instead of losing their jobs have been retrained to understand more about robotics and computers. Two, we next discuss the future of intelligence. Now let us look at the future of intelligence. The authors of building machines that learn and think like humans, a seminal piece on the new direction in machine intelligence state. As long as natural intelligence remains the best example of intelligence, we believe that the project of reverse engineering, the human solution to difficult computational problems will continue to inform and advance the artificial intelligence.

The question of for senior leaders in which more human like cognitive abilities detailed next might be most relevant to capture value for their businesses and delivering value to their customers. So, the first is generalizing in real world settings. While theoretical arguments rage over deep learning versus some ideal versions of artificial general intelligence as the means of getting to more human like intelligence, practitioners are not waiting. They are drawing on all the disciplines of AI to open up new possibilities for machine capabilities and performance. For example, covariants are looking to build out its brain to power robots in manufacturing, agriculture, hospitality, commercial kitchens and eventually people's homes.

The case of Alberta using smart robots which we discussed is also an example of this kind of applications. The next is the survival of the fittest algorithm. For a e-commerce seller like Zappos, irrelevant search results are a perennial headache. Because queries can now have multiple different meanings to a website search engine. Having accurate search results among the enormous inventory can be very difficult.

So potential customers who enter such term for a particular style of dress shoe who are shown dresses instead will soon get fed up and move on to the competitors. So, the customer are asking for dress shoes and the search engine is showing them dress so they will soon be fed up and move on to the competitors. To solve the problem, Zappos is putting algorithm against each other in a digital game of survival. A relevance text which stimulates how users behave rewards the winning algorithm by passing on its trait to the next generation of algorithms. The best performing algorithm goes live on the website until it is superseded by a fitter one, continuously improving the performance of the search engines.

Making better bets, so human routinely and often effortlessly sort through probabilities and act on the likeliest, even with relatively little prior experience. Machines are now being taught to mimic such reasoning through the application of Gaussian processes that is probabilistic models that can deal with extensive uncertainty, act on space data and learn from experience. Example of this is the project Loon by Alphabet that is the Google's parent company. Then comes the closing in on causation. AI is good at spotting correlations and making valuable predictions based on them.

So that is what the problem with AI is. For instance, GNS Healthcare, a Cambridge, Massachusetts precision machine company uses causal algorithms to help some of the world's largest pharmaceutical companies understand not only which patient responds to what drugs, but also why do they respond. So that is also important. So, what, which patient will respond to what drug that is one and why are they doing so. So that is another important thing that it does so what and why. Using Bayesian techniques, this software platform translates data into causal models, cause and effect models.

So this causal model is cause and effect models. These techniques identify which variables in a data set appears to have the most influence on other variables. The next comes taking on the time and space. Researchers at the MIT IBM Watson AI lab have

recently developed a new technique for training video recognition systems that is both highly accurate and saves on computation costs. The researchers were able to train video recognition models three times faster than existing state-of-the-art techniques.

So it has increased the efficiency of the of the models. The increased speed could be critical for the ability of autonomous vehicles to recognize and react to visual information and to predict what is likely to take place around them. Retailers would benefit immensely from such a video recognition technology. Next comes calling on common sense. No AI system currently deployed can reliably answer a broad range of simple questions such as, if I put my socks in a drawer, will they still be there tomorrow? So that is a simple question that the AI system are not able to answer. How can you tell if a milk carton is full? So, these are some simple questions where the AI fails.

To help define what it means for machines to have common sense, AI2 that is Allen Institute of Artificial Intelligence is developing a portfolio of tasks against which progress can be measured. The Defence Advanced Research Project Agency, DARPA, is investing $20 to $2 billion in AI research. In its Common Machine Sense program, researchers will create models that mimic core domain of human cognition, including the domain of objects that is intuitive physics, places, spatial navigation and agents' intentional actors. So, this is what this machine common sense program is trying to achieve. Researchers at Microsoft and MacGill University have jointly developed a system that has shown great promise for untangling ambiguities in natural languages.

Untangling ambiguities in natural language, a problem that requires diverse forms of inference and knowledge. With such systems, the goal is to produce both the right answer and the rationale for the answer. It is not only about the right answer but also the rationale for that answer. Consider chatbots and voice digital assistants, which often leaves users frustrated.

They would immensely benefit from these advancements. Tracking of emotions. Affectiva, a Boston startup founded in 2009 by researchers from MIT framed Media Lab and acquired in mid-2021 by Swedish company SmartEye, is currently working on an AI system designed to read emotions. So now we are moving on to reading the emotions. Affectiva algorithms read people faces to detect their emotional and other cognitive states.

The technology is being used in AI-assisted semi-autonomous cars. So, we are not talking of only the autonomous car, we are talking of semi-autonomous cars. The company has also developed an emotion tracking system that enables media and advertisers to test responses to their programming and video ads with the target audience. The system is based on the analysis of more than 7.6 million faces in 87 countries.

So this is the data set that is being used for this kind of study. About one-fourth of the Fortune Global 500 have used the technology to test their ads around the world and help them predict purchase intent, sales lift or the likelihood of content to go viral. The next component of IDR's framework is data. Business data is often locked in legacy on-site

platforms that are siloed, making it difficult if not impossible for employees to get different types of data to work together. Creating a robust data foundation requires breaking information out of traditional file silos.

So this is what is required. So that it can be unified, one, optimally stored, two and easily accessed three and readily analyzed with new tools all in the cloud. With a solid data foundation, more data from more sources managed with the help of AI and widely disseminated within an organization can help in maximizing data potential. Now let us look at the case of McDonald's. In 2018 McDonald was facing a major challenge. Its competitors have used online delivery to leapfrog its lock on the fast-food markets.

So the competitor were given online delivery using online delivery for the competitors were using online delivery. So, McDonald leaders quickly devised an online delivery solution through a global partnership with Uber Eats that by 2019 was adding dollar 4 billion to the annual sales. But top executives knew that the company's long-term future depends on making a rapid and complete transformation to become data driven. So, this kind of stopgap arrangement will not last long and therefore something more needs to be done and that is a complete transformation to become data driven. This required reconfiguring its restaurants into enormous data processes complete with machine learning and mobile technology to support highly customized customer orders and delivery.

Data crunching also aids in calculating how external factors from weather to big sporting events would impact demand and restaurants ability to serve customers. So now you see that we are also looking at the effect of external factors like the change in weather or a big sporting event and then predicting and forecasting the restaurants' ability to serve the customer. And gathering and processing data were important for developing new products and initiatives that could be immediately successful. Now implications of using data driven approach is first is the financial success. Within two years the transformation effort successfully achieved financial results.

Few companies in the S&P 500 have outperformed McDonald creating a modern data foundation. So, mastering the use of big and small data to generate value from AI requires that organization lay a solid foundation and for that three capabilities are key. First is modern data engineering, second is AI assisted data governance and the third is data democratization. So, in modern data foundation data comes from a variety of internal and external sources through a number of organisms including batch and real time processing and APIs. It get stitched together into highly curated and reusable data sets that can be consumed for a variety of analytic purposes.

A good foundation relies on reusable frameworks for data ingestion and ETL that is extract, transform and load that support diverse data types. These frameworks also handle rules of data quality and standardization so that new data pipelines for analytic use cases and data products can be developed quickly and at scale on the cloud. AI assisted data governance, cloud-based AI tools offer the advanced capabilities and scale to help automatically. Cleans, classify and secure data gathered on the cloud as it is ingested

which supports better quality data veracity and ethical handling.

Data democratization. A modern data foundation gets more data into more hands. It makes data accessible and easy to use in a timely manner while enabling multiple ways to consume data including self-service, AI, business intelligence and data science. The latest cloud-based tools democratize data and empower more people across the enterprise to easily find and leverage data that is relevant to their specific business needs faster, create a modern data foundation. Together these three capabilities help companies overcome some of the most common barriers to value.

Data accessibility, data trustworthiness, data readiness and data timeliness. So, these are the four things. They enable companies to blend data from big and small data sets together in real time, build agile reporting and leverage AI to create broadly accessible customers, markets and operational insights that deliver meaningful business outcomes. In order to conclude, we have discussed the intelligence and data landscapes of IDEA's framework. There are many shortcomings of deep learning-based AI. Machine intelligence is now being augmented with human intelligence and human have superior cognitive intelligence and machines excels in pattern recognition.

We have also studied the implementation of smart robot augmented with human intelligence at Obeta helped them to increase reliability and speed. Three key capabilities are required to build a modern-day data foundation. One is modern data engineering, AI assisted data governance and the third is data democratization. These are the five books from which the material for this module was taken. Thank you.