FOUNDATION OF DIGITAL BUSINESS

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Lecture 19

### Lecture 19 : Artificial Intelligence – Introduction

Good morning, today I will begin the section on artificial intelligence for business now and beyond. So, till now I had covered all about digital business and digital business transformation, then the foundations how to lay the foundation etcetera. Now, for the next few sessions I will be talking about artificial intelligence. So, this is obviously all of you are hearing all about it artificial intelligence in every sphere of life in or in daily life in industry. Everywhere we are talking about machine learning, artificial intelligence, chat GPT, generative AI.

So, these have now become very common lingo terminology. Coverage for this will be how to introduce AI in digital transformation or how to lay a foundation of digital business through AI tools,  because it is going to be it is already very important and it is going to be more and more important as we proceed in time and the thing is that this technology is coming in very fast. So, that is why it is very crucial that all of us become quickly aware of at least a very high level of what AI is all about, what it is capable of, what are the various models. technical person, you are not a machine learning programmer, you are not this course is not about that about those people, it is about giving a future business managers

or existing business managers an idea what AI is, what are the good things of AI, what are the not so good things about AI, what could be the dangers or pitfalls of AI which all of us must be aware of as responsible managers. So, the key word here is we are going to be responsible managers, responsible professionals. So, we should learn to how to handle such powerful technology. The point is it is being compared with say nuclear technology. So, we know all of us we know that how powerful nuclear technology or nuclear weapons etcetera.

So, the people are comparing AI with nuclear technology. which means that this is also very very powerful. So, it can do lot of good at the same time it can do lot of bad. So, you must have an idea of both. So, we will cover just basic introduction what is AI, then what are machine learning models and the next steps and the step by step in next session few sessions I will take you through the world of AI for beginners, AI for the non techie people, non programmers.

We are not AI developers or programmers, AI model developers. So, we are business users of AI. So, this is the perspective of this particular course I will be delivering over the next few sessions. So, the future set of things if you look at some I just took out some newspaper clippings just to show you what is going on around the world. So, developing an app writing a story in 5 to 10 minutes.

So, today the world has changed so drastically that we can write a story or a poetry or a painting or a video in minutes literally. Writing means you do not write we just ask somebody the tool the AI tool to write it for us. We give a plot a boy meets a girl or whatever they meet an accident or whatever you want to have a design a plot give those which are known as prompts you must all of you have heard about prompts. give those prompts and the tool will come out with a story or a script or a screenplay or a poetry whatever you want in minutes. Then on the right you see the robots to babysit.

And the cars to drive themselves, cars to drive themselves has become now quite well known. So, commercial launch has happened in many cities and it is going to start in many cities very soon. But robots to babysit, so babysitter you can go to work as a couple working couple and they leave the baby with a robot not a nanny, but a robot nanny. So, this is the type of use cases people are seriously considering and lot of money is being spent on developing such technology. You have heard must have might have heard about robots serving in restaurants in Japan and China.

So, a robot you go to a restaurant the robot comes takes your menu takes your order goes back and then delivers you whatever you have ordered. So, that has now a reality it is there in practice. So, what is artificial intelligence? Everyone is talking about AI from boardrooms to factory floors, from call centers to logistics fleets and then governments to venture  capitalist artificial intelligence is suddenly the hottest topic in town.

It must just might be the single biggest technology revolution the world has ever seen. So, this is a very powerful statement. There is a single biggest technology. It says it will be bigger than the more powerful than the nuclear technology. the world has ever seen.

AI as we know it is not really a single technology, but in its own right at all. It is a collection of different technologies that can be brought together to this is the most important thing enable machines to act with what appears to be human like levels of intelligence. So, machines acting like humans. is what AI is all about, simplistically speaking. So, this is the very simplistic definition easy to understand.

The volume and complexity of data that is now being generated is too vast for humans to process and apply efficiently. This has increased the potential of such AI tools and technologies and as well the need for it because we are generating so much data. So, what do we do with the data? Now just to give you a the framework to understand there are three main areas of AI. So, one is AI the overall framework and within that we have something called machine learning and then we have something called deep learning.

So, AI is the overall program that can sense, reason, act and adapt. We will talk about more of this as we move ahead. And the machine learning is algorithms whose performance improves as they are exposed to more data over time. So, this is something you do by training fundamental things. A machine gets trained with existing data so that it can handle new data to predict certain things.

And the prediction accuracy will go on improving as you go on training or giving it more experience. If you compare it with a human being we learn we are doing the same job. year and after year, but when what we gain is with more years of experience we have get better insight more knowledge about the work we are doing. So, we become more efficient obviously, more knowledgeable and we become kind of masters over time. So, same similar analogy you can give it to machine learning.

go on spending giving more data new data new data etcetera it will go on updating itself and becoming more relevant and more accurate. Deep learning it is a subset of machine learning in which multilayer neural networks learn from a vast amounts of data this is somewhat simulating the way the human brain works. So, we have neurons and synapses which are the basic biological construct of a brain and that is being replicated in the computer world same layers of neurons connected by synapses to process data our brain is also doing the same thing it is processing data. So, we are fantastically skilled at performing any number of activities we do not always know exactly how we do what we do.

So, for example, we might find recognizing another person's face, it is very simple, we see him, we recognize him, we remember him, come back, we remember him etcetera.

But we really do not know what is the mechanism behind this knowledge, how we are doing it, how the brain is working, we are not very knowledgeable, clear about that, we do not have the clear idea, how the brain actually processing the data, whatever data we are seeing visually and converting it into a image with a name.

So, machine learning on the other hand, Let us say machine learn to do it all by itself. So, indeed one of the core strengths of machine learning is identifying patterns in a very large amount of data. So, if you give a large amount of data and the trained machine will be able to find out a pattern in that thing and give some recognition maybe an image, maybe an animal flower whatever. The promises of AI are it eliminates inefficiencies, it reduces human error.

It provides deeper insights and of course, it increases profits if you use it properly in business because it is reducing inefficiencies and cost. So, profit will obviously improve. So, what is important is data when analyzed can provide insights which can then guide decision making knowledge that many customers who purchase diapers also purchase beer at the same store is a classic story we teach in class where a correlation was found out in a supermarket that people who have gone young parents gone to buy diapers for the children and also buying more beers. And that just from the data they could bring this correlation and then they positioned the beer cans next to the diaper shell.

So, that person find easier to find out the beer and the sales increased. So, what is AI? AI can be thought of it is a framework of capabilities undoubtedly the best way to understand what AI is. The framework is centered around principle things that AI enables a machine to do. So, this is what the whole framework is all about.

So, what is AI really it is the thing of sense, comprehend, act and learn fundamental framework. Sense means let us say machine perceive the world around it by acquiring and processing image, sound, speech, text and other non-structured data. So, we have data of two kinds structured and unstructured. So, all these images, sounds, speech, text are part of the unstructured data which constitutes about 80-90 percent of all the data we handle or process. So, AI can make a sense out of those unstructured data, it is not digital data which we otherwise use in our excel files etcetera, numbers or text like alphanumeric text,

but this is something else it can be sentences, phrases, paragraphs whatever. AI enables the machine to understand the information, it collects recognizing pattern. So, finally, it can recognize that is output which you want from machine to tell us the pattern from the

data which otherwise we cannot do it. As humans interpret information by understanding the patterns presented and the context, so it does not derive the true meaning. But with a combination of AI and human, so it is AI enabled human cognition we can get the pattern and also get the true real true insight or meaning what is there hidden in that dataset. ACT is AI enables a machine to take actions in the physical or digital world.

based on comprehension it is like robots and agents. So, they are doing some action we will of course, discuss agents in a more detail way later. And learn is AI as a machine to continuously optimize its performance by learning from success or failure or more data as I told few minutes back. In business AI so, now, we talk come to the business world of AI is what AI is usable so, what business can use. So, the three core properties of business AI are

It is of a narrow because it is AI we know it can do a particular chess playing computer can only play chess it cannot play any other game for example, and it can play chess very well it can beat the world champion, but it cannot play any other game. Like human being a chess player can play many other world games that is the difference. It relies on availability of data for learning and it is effective in the sense it costs money to run an AI expense, but it should not be so expensive that you are unable to but it should not be so expensive that you are unable to manage the cost, it should give you some benefit out of whatever you are spending.

Now, the topics listed here the most relevant to business AI this I am sure you must be heard about all these topics like machine learning, deep learning, computer vision, robotics, natural language processing, gen AI or generative AI and agentification I will one by one cover all of this again all at a very high level. So, that you have a very fundamental knowledge about what these talk about or where they can be most important way you can use them in which application in which use case. So, we dive into the world of machine learning for managers.

Yes, ability to learn its fundamental it is being able to decide which actions are required. to complete a task by analyzing data rather than being explicitly coded. So, there is no real coding done if this then that, if this then that. No, you are given a set of data, please tell me what it is talking about. Of course, I assume that it has been pre-trained with similar set of data.

So, coded to act in a predefined way it is arguably what makes the system very intelligent and differentiates AI from other forms of automation other previous forms of automation.

Automation was it is not a very new thing it was there for many years, but that was all through a logics and programs. And when the best AI systems are set the task of learning for themselves the results can be extraordinary. So, there is a company called DeepMind owned by Google who had developed a program and took on the a very complicated game called AlphaGo, it has it is a 19 square board something like chess, but different played very much in Korea and China etcetera places

and it has got very huge number of moves much much much more larger moves possible moves than chess game much more complicated. And there this AlphaGo computer was trained by exposing to various games multiple games and it was trained with those games it learned and it went on to defeat the then world champion Go world champion Lee Sedol from South Korea. The different ways a machine can learn, now this is what we begin the basic subject of machine learning. So, there are techniques of training. So, there are four broad areas of training.

So, one is called supervised learning, unsupervised learning, reinforcement learning and deep learning. So, supervised learning is kind of algorithm takes a label data set. So, your data set you have labeled it. So, you tell the computer this is what it is. So, it learns you give it different images or whatever you want to give and train it

and then when you expose it to test data giving new images the computer should be able to tell you what the image is.This algorithm requires no predefined labels in the data itself. It takes an unlabeled dataset and it finds similarities and anomalies between different entries within the dataset and categorizes them into its own grouping. So, it will group, classify. So, you might show the algorithm a large number of unlabeled images containing say cats and dogs and it would sort images with similar characteristics into different categories. So, it is mostly used for classification and in reinforcement learning the algorithm works by a trial and error using a feedback loop of rewards and punishment.

So, the algorithm is fed a data set it treats the environment like a game and it is told whether it is won or lost each time it performs an action takes a decision. So, this way it builds up to the decision may be right or may be wrong. So, when it is right you get some award if it is wrong you penalize it. the carrot and stick principle, moves that results in success and those that do not, The good examples of power of reinforcement learning is that deep minds alpha go as another program they developed alpha 0 etcetera.

So, that is how it got trained. So, it was it made to play the game and you have if you correct move you get something, if not correct move you get a negative. So, that is how the computer learns that this was correct and this was not correct. So, it keeps on iterative process keeps on trying and improving and deep learning is we will talk about later much more. So, this is a little bit.

So, it is a as I said it is a replica of the way the human brain works and this is now having major applications in the many places including research, science and of course, business. Some examples of business problems that ML can solve just a sample of problems for supervised learning you can use for SAP spam prediction, fraudulent transaction detection, customer churn prediction, machine failure prediction, forecasting raw material prices, forecasting consumer demand etcetera. And unsupervised learning is used for micro segregation of customers.

So, it is classification customers, document management, search result organization, support tickets grouping, duplicate records management and customer behavior analysis. So, in supervised learning and this is the difference between supervised and unsupervised learning from a use case perspective. So, it is all about grouping things, identifying in clusters or groups. Labeling for supervised learning is a time consuming and costly process. So, when if you go for supervised learning just remember because you have to for training you have to label each of the data set and that is very of course, that is absolutely manual

job and it is very time consuming and because you are using human resources is also expensive. The simplified model how it looks like in the training part. So, the big data you have the data set then you from here you extract some training data and then you extract some features of the data which is fed into the model for training it. It could be a linear regression model etcetera we will talk about it later. So, some model has to be developed using these features and then you have a trained model

and when you give a test data or new data then you get an output which is could be a prediction or something like that. The supervised learning machine learning regression Regression is something which you will hear very frequently in both machine learning and analytics areas. Regression is a fundamental concept in the field of machine learning, it falls under supervised learning wherein the algorithm is trained with both input features and the output labels. It helps in establishing a relationship among the variables by

estimating how one variable affects the other. If you take a simple equation like y is equal to mx plus c the equation of a straight line.

So, it is trying to find out the relationship between y which is the dependent variable and x which is the independent variables and there could be multiple variables also x1, x2, x3. So, in machine learning it is a mathematical model that allows data scientists to predict a continuous outcome because y is equal to mx plus c is an equation straight line right. So, for any x it will tell you what is the value of y in whatever increment you want x is equal to 1, 2, 3, 4 or 0.1, 0.2, 0.3, 0.4 whatever. So, what are predictive variables? Linear regression is probably the most popular form of regression analysis because of its ease of use in predicting

and forecasting and we will talk about little bit details of this which is very fundamental very simple model and which you should learn and you know you can start also using it. Algorithms are trained to understand the relationship between independent variables and outcome on the dependent variables. to predict the outcome of new and unseen that the test data of the what you want to try out predict. So, what are the types of regression? Primarily the four there are many more of course, but I just take the simple ones the linear regression, multiple linear regression, non-linear and logistic regression.

So, linear regression I have already discussed y is equal to m x plus c. Multiple is y where y is equal to the constant c 0 plus c 1 x 1 c 2 x 2 c and c n x n goes on. So, the x r x i's are basically the number of independent variables or features. And in a non-linear equation it will be x plus x square it should be parabolic hyperbolic it can take any curve shape depending on the type of the scatter of the data. And logistic regression is a different type of analysis because it is not a continuous prediction, but it tells you and a yes or no type of 1 or 0 type of output.

Categorical outcomes such as whether it will rain yes or no I mean whether it there will be storm yes or no type of prediction. Applications of regression, some applications could be predicting prices, forecasting trends, identifying risk factors and making decisions. So, identifying for example, if I take the risk factors a regression model could be used to identify the risk factors for heart diseases based on patient data. So, I have the patient history, patient data and I have a trained model and if I give that patients condition it can predict whether this patient or this person can likely to get a heart attack or not things like that.

So, there are various such use cases and applications which are being tried. Just going back I will to cover some of these other predicting like predicting price for example, regression model could be used to predict the price of a house based on its size location and other features. You have already trained the model by linear regression the various properties you analyze the property the size take the parameters the size is the features of the house how many

rooms how many whatever square feet etcetera and then the locality that is also a feature because the price depends on the locality and once you develop an equation Then for any new house you want to predict the price you just give those features like what is its area and what is the locality and any other features you have considered and it will tell you what is the predicted price. So, that is one of the application of such a model. Example is a regression model could be used to forecast the sales of a product based on historical sales data and economic indicators. So, this has been commonly used also forecasting techniques have been used, but now we can also use a machine learning technique with huge volume of data.

The why we go for machine learning is when we have a large very large volume of data and why we need large volume of data because the larger the volume of data more accurate will be the models prediction. mode the better fit will be that if I just take let us say straight that if I just take let us say straight line going through a set of data points. That now I will explain in the next class what how we draw this line and what are the principles used for developing this model. But, the accuracy will improve if you have the larger if you have just 2 points, 3 points, 5 points the line will be you know something else.

And, but if I have maybe hundreds and thousands of data points then that line will be more accurate in the sense the error the prediction accuracy will be much higher. and making decisions for example, a regression model could be used to recommend which investment to buy based on market data. So, overall if you see at a high level AI is a very machine learning if you talk to say let us say stick to machine learning, it is a very deep subject it has got a very wide usage as it is being shown here. If we see the AI again the domain, so we are talking about visual recognition, we are talking about speech recognition, we are talking about text processing,

we are talking about tone or empathy and we are also talking about robotics or agents the chatbots. robotic process automation. So, machine learning with all of these cases what it

is doing? It is either predicting or it is explaining and it is using algorithms and data for doing it. When we use going into deep learning modes and generative AI, gen AI etcetera, there it can do lot of activities like summarizing a text for example. So, there is no specific algorithm for that.

It is using something different model like a foundational model or transformer model etcetera to come up with texts or even come up with videos and pictures. So, AI is about really about three things. prediction automation and optimization. There is a certain fear in the market that AI is going to replace jobs, but I like to say AI is not going to replace managers. This is a very common saying we use in our class, but managers that use AI will replace the managers that do not.

So, what I am trying to say here is that you have to use AI. in your profession, in your job you cannot avoid using AI because if you do you will fall back, because others will adopt AI use in the business and they will go ahead of you and you will fall behind. So, that is what it means that AI is not going to replace managers, but managers that use AI will replace the managers that do not. The current status is if you if I take the in the business situation business scenario all over the world even India, it is in the experimental stage.

Many of the models where many people are saying a lot of things that you can do. In pilot scale probably it is doing things as it is supposed to do, but the question is when you scale up what happens. So, like let us take the driverless car. So, last few years we are hearing that the driverless car will come this year, this year, this year. So, from 2021, 22, 23, now 25 still we do not see at a scale.

There are some pilotless cars being used on trial basis in some maybe Olympic village or some local area for some specific purpose, some for program they are trying it out, some places they have started using it as a taxi in China or in US and Japan. But again in a very small scale because the number of such driverless cars on the road actually doing and doing a business or taxi business or doing a service is very few. So, people are the question which comes is when this number goes up what happens then, will there be any accidents major accidents will there be chaos etcetera. So, nobody knows and people are very very sceptic about.

So, people are afraid because as I said in the beginning of the class that AI is a very very powerful tool technology. So, that is why you should be cautious, you should not suddenly jump because the potential is as I said is very powerful potential, enormous potential and it is obviously, attracts the business. If I get so much of advantage, so much

of benefit, why do not you start using it. But, the pitfalls the dangers other etcetera is what holds you back. Then there is another question which I will talk about in future sessions is about being responsible AI.

It can do lot of damage to human beings. to your customers because you are handling data. So, whenever you are handling data, it is somebody's data, somebody has created the data, the data is representing some human being, some race, some community, some people, etc. Ultimately let us say all our customers or some customers. So, what are you doing with the data number one?

And what was your responsibility towards the data number 2? And are you taking care of the data number 3? Can that the data which is with you or you have collected from a customer can it be hacked by somebody and misused? for either their business purpose or may be creating some damage for of the people who whom the data is all about. So, I get somebody's date of birth, the name, the address or the PAN number, the bank account number such data and can I misuse it to do some scam and do some illegal thing.

So, these are all the things which has to be taken into account by all people who are using all responsible people, all responsible professionals and managers who are going to handle data and of course, AI whenever you want to do AI anything to do with AI machine learning etcetera the first thing you have to start is data. So, you have to keep that in mind that you are the owners of the data, you are working with the data. So, you are also fully responsible about the data. With that I will end this session.

Thank you very much.