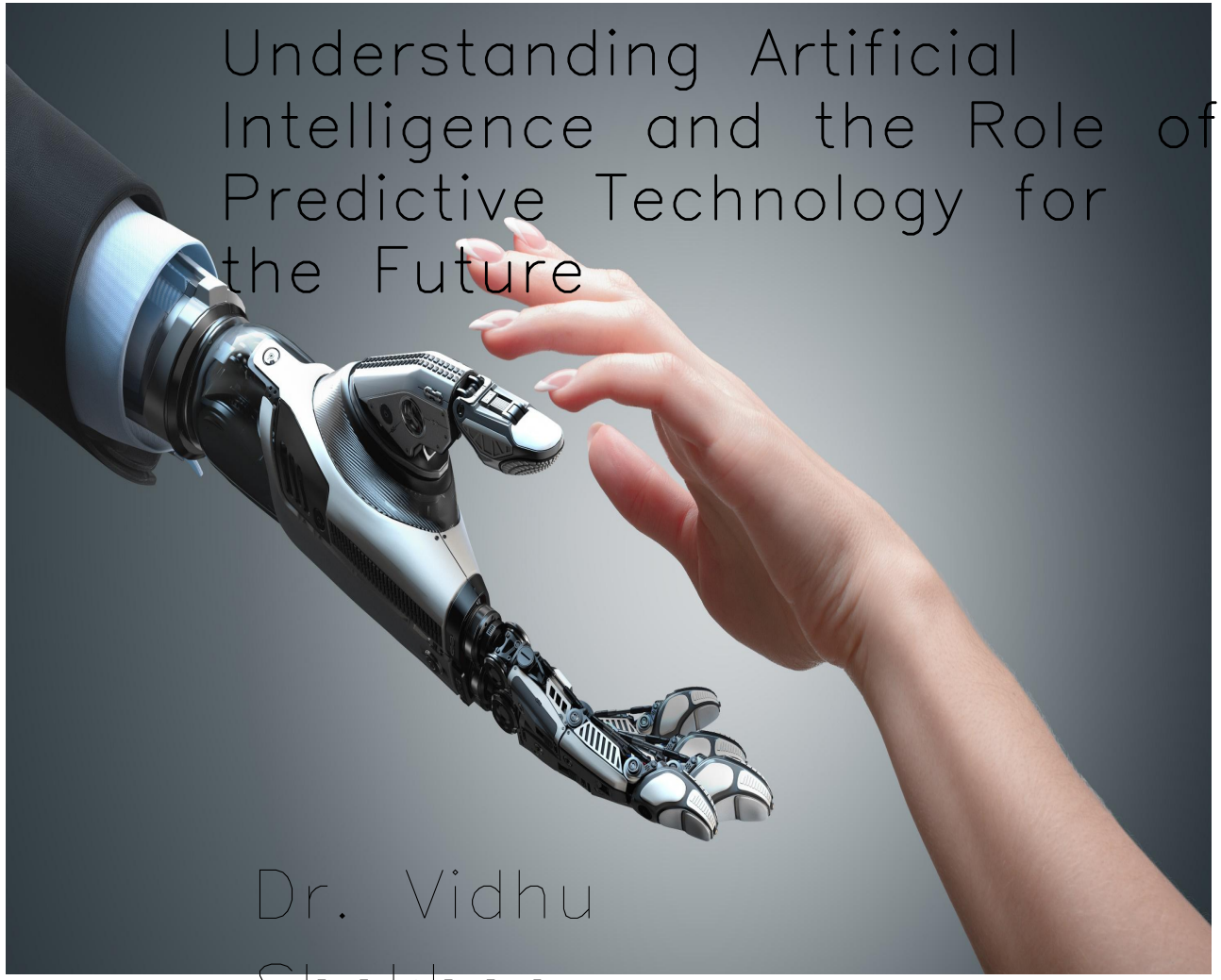
Understanding Artificial Intelligence and the Role of Predictive Technology for the Future



Dr. Vidhu Shekhar

Musk: I think generally, people underestimate the capability of AI. They sort of think like, it's a smart human. But it's, it's really much—it's going to be much more than that. **It'll be much smarter than the smartest human. It'll be like, can a chimpanzee really understand humans?** Not really, you know. We just seem like strange aliens. They mostly just care about other chimpanzees. And this will be how it is more or less in relativity.

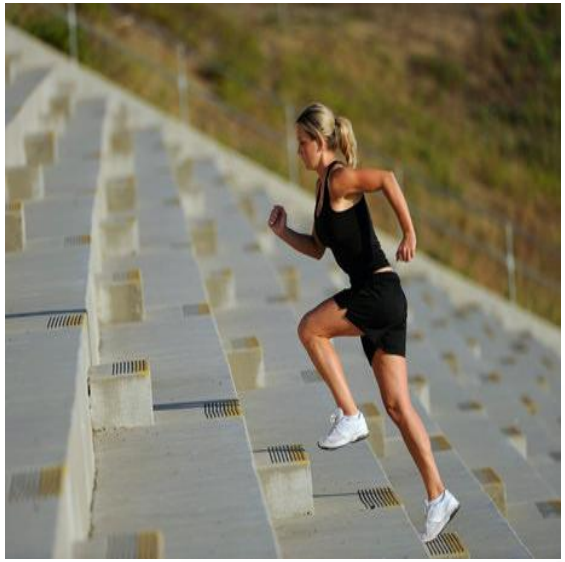
Jack Ma: You have a vision about the technology. I'm not a tech guy. I think I'm all about life**. I think AI is going to open a new chapter of the society of the world that people try to understand ourselves better, rather than the outside world**. And it's so difficult to predict the future. 99.99 percent of the predictions that human beings had in history about the future—all wrong.

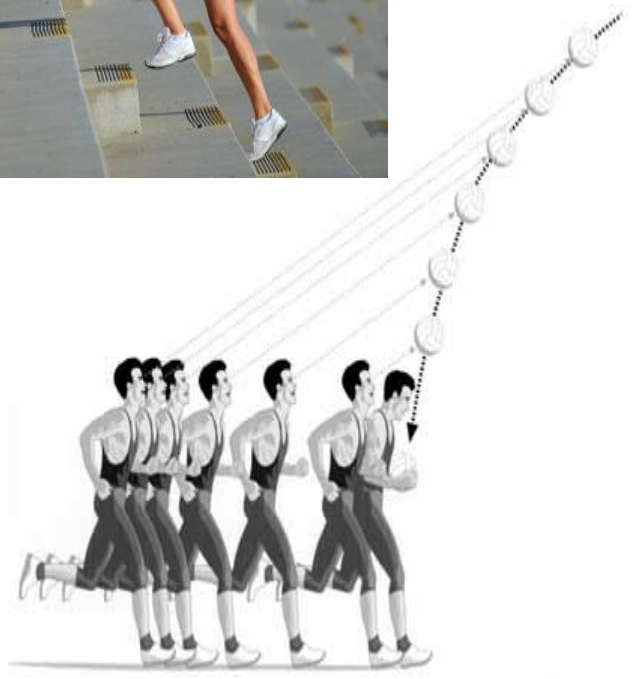
Accounting and AI

- Will Accounting as a profession survive AI
  - How old is Accounting?
  - When did Accounting came?
- Money & Accounting
  - Inherent Link
  - Traditional Theory: Family -> Barter -> Money
  - Alternative Theory:
    - Family
    - Communism (50..100?)... Currency not possible w/o nation state, else counterfeit widely avbl
    - Fights!
    - Accounting!
    - Need of a unit ... measurement requirement ... standard unit made... currency born..
    - Money born from accounting as virtual currency.. Subsequently physical currency
    - Curiously, we seem to be moving back to all virtual
- Accounting is basic to society as we know it.

Artificial Intelligence

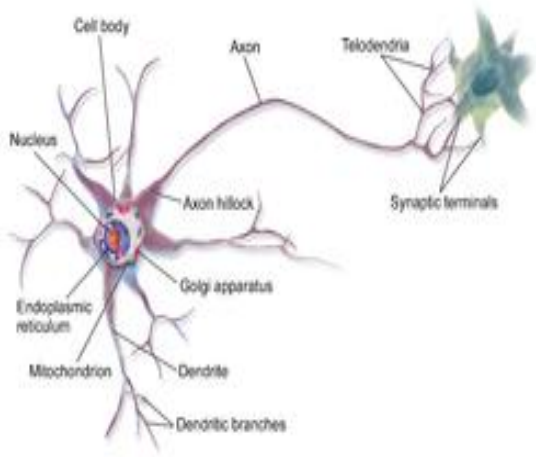
- How intelligence...
- All the maths all the

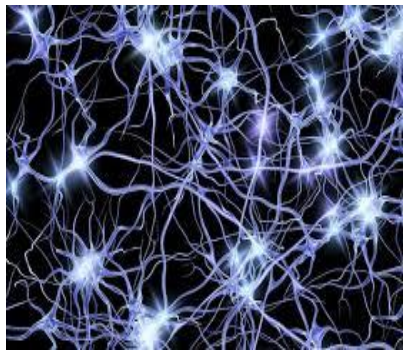




Artificial Intelligence...

- How does Brain Works????





- Most neurons receive signals via the dendrites and soma and send out signals down the axon
- Learning and storing all the time in the Network Mesh

Machine Learning..

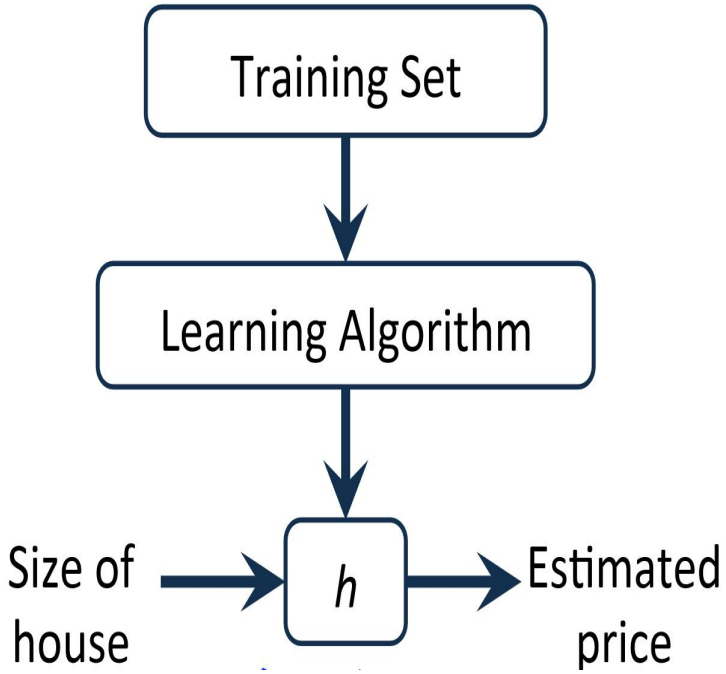
- Machine Learning
  - Grew out of work in AI. Data & Learn from it

- Definition:
  - Arthur Samuel (1959): Field of study that gives computers the ability to learn without being explicitly programmed.
  - Tom Mitchell (1998): A computer program is said to learn from experience E with respect to some task T and some performance measure P, if its performance on T, as measured by P, improves with experience E

- Examples:
  - Database mining Large datasets from growth of automation/web. E.g., Web click data, medical records, biology, engineering
  - Applications can't program by hand. E.g., Autonomous helicopter, handwriting recognition, most of Natural Language Processing (NLP), Computer Vision.
  - Self-customizing programs E.g., Amazon, Netflix product recommendations
  - Understanding human learning (brain, real AI)

Machine Learning...

- Very wide area
- Any Data, Learn, Apply



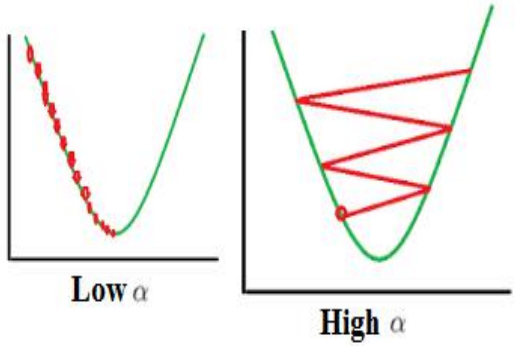
Some Concepts....

- Regression Problems
- Classification (One vs All & M
  Problems
- Learning
  - Supervised
  - Unsupervised
- Cost Functior
- Gradient Desc

$$\theta_0 := \theta_0 - \alpha \frac{\partial}{\partial \theta_0} J(\theta_0, \theta_1)$$
$$\theta_1 := \theta_1 - \alpha \frac{\partial}{\partial \theta_1} J(\theta_0, \theta_1)$$

$$\{$$
$$\theta_j := \theta_j - \alpha \frac{1}{m} \sum_{i=1}^{m} (h_\theta(x^{(i)}) - y^{(i)}) x_j^{(i)}$$
$$\}$$

Learning Rate



Linear Regression

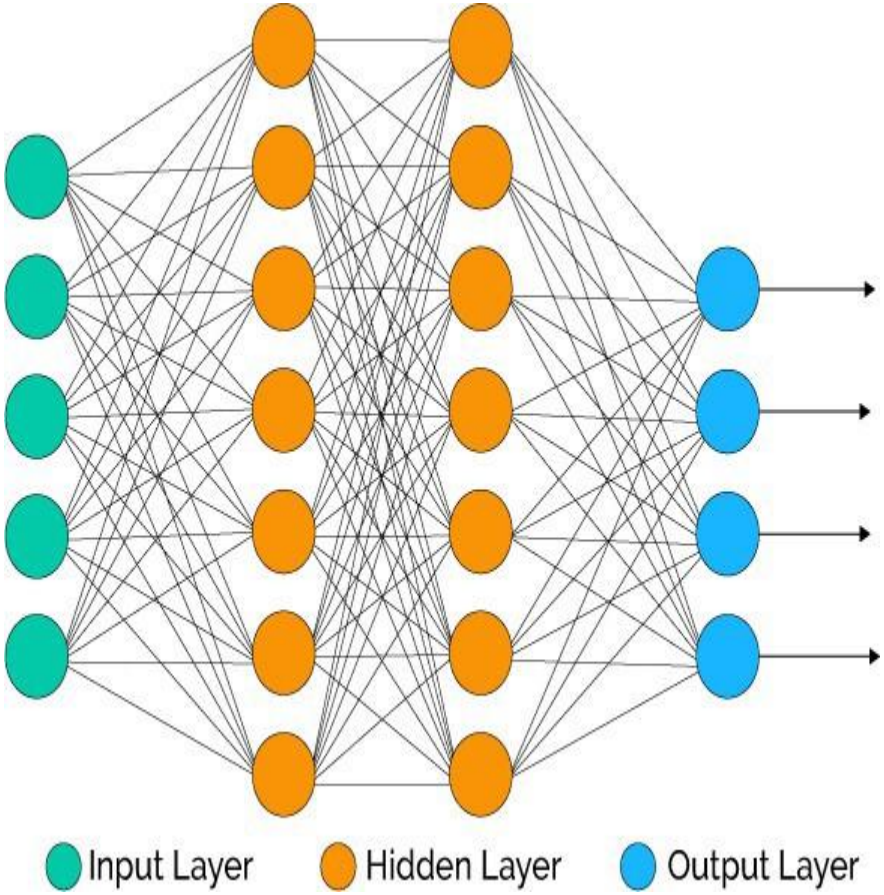
Hypothesis: $h_\theta(x) = \theta_0 + \theta_1 x$

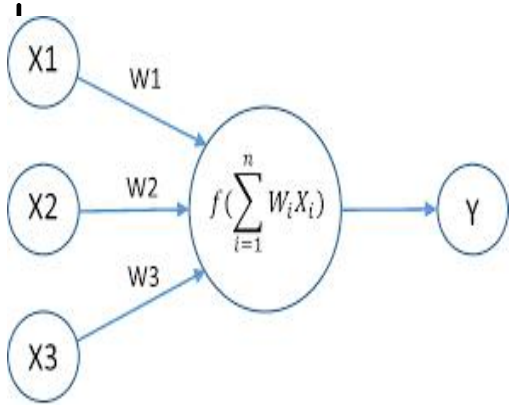
Parameters: θ_0, θ_1

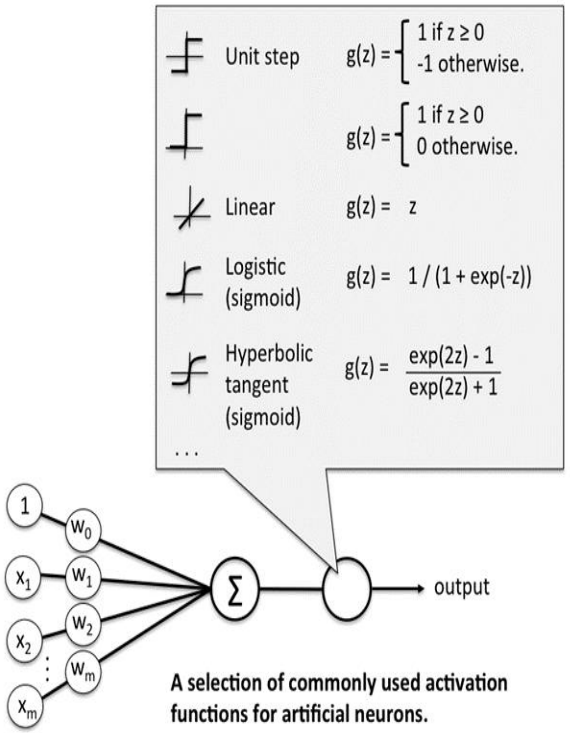
Cost Function: $J(\theta_0, \theta_1) = \frac{1}{2m} \sum_{i=1}^{m} \left(h_\theta(x^{(i)}) - y^{(i)}\right)^2$

Goal: $\underset{\theta_0, \theta_1}{\text{minimize}}\, J(\theta_0, \theta_1)$

Neural Networ



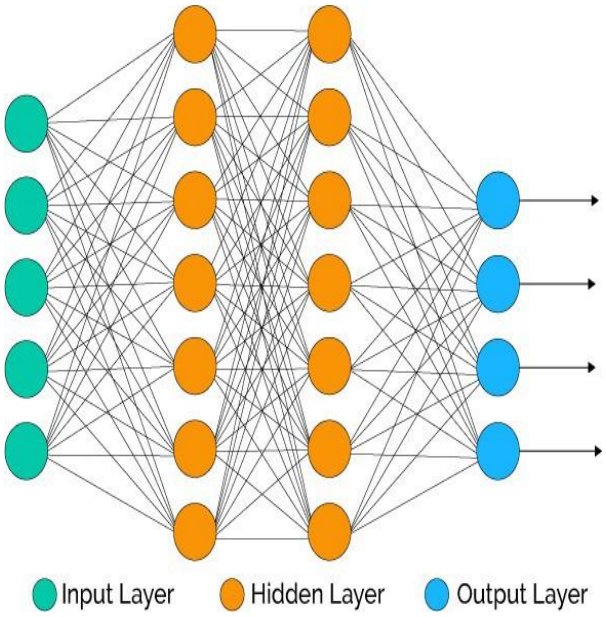


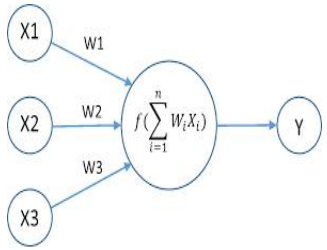


A selection of commonly used activation functions for artificial neurons.

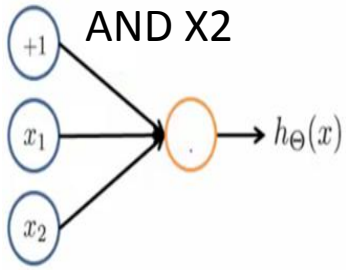
Neural Networks..

Feed Forward & Back propagation





Lets do X1 AND X2



$$J(\Theta) = -\frac{1}{m}\left[\sum_{i=1}^{m}\sum_{k=1}^{K} y_k^{(i)} \log h_\theta(x^{(i)})_k + (1 - y_k^{(i)}) \log(1 - h_\theta(x^{(i)})_k)\right]$$
$$+\frac{\lambda}{2m}\sum_{l=1}^{L-1}\sum_{i=1}^{s_l}\sum_{j=1}^{s_{l+1}}(\Theta_j^{(l)})^2$$

$$\min_{\Theta} J(\Theta)$$

For Single/Multi Classification

Feed Forward & Back Propagation

- **Feed Forward**
  - This is the algorithm which takes your neural network and the initial input into that network and pushes the input through the network
    - It leads to the generation of an output hypothesis, which may be a single real number, but can also be a vector

- **Back Propagation**
  - Back propagation basically takes the output you got from your network, compares it to the real value (y) and calculates how wrong the network was (i.e. how wrong the parameters were)
  - It then, using the error you've just calculated, back-calculates the error associated with each unit from the preceding layer (i.e. layer L - 1)
  - This goes on until you reach the input layer
  - These "error" measurements for each unit can be used to calculate the **partial derivatives**
    - Partial derivatives are the bomb, because gradient descent needs them to minimize the cost function
  - We use the partial derivatives with gradient descent to try minimize the cost function and update all the values
  - This repeats until gradient descent reports convergence

Strengths of AI & ML

LARGE DATA VOLUMES	COMPLEX AND CHANGING PATTERNS	CONSISTENCY
They can process huge amounts of data (structured and unstructured) - much more than humans ever could; for example, the results of every piece of medical research carried out on a topic, or every piece of financial regulation. This provides a stronger and more powerful basis for learning.	They can pick up weaker or more complex patterns in data than we can. Therefore, machines may be better in environments that we find less predictable. Where feedback loops can be built into the models, they can also be highly adaptive and learn from errors or new cases.	They can be far more consistent decision-makers. They do not suffer from tiredness or boredom. They also do not exhibit human biases and therefore provide opportunities to eliminate cognitive biases - such as availability or confirmation bias - as well as socially-based biases, such as racism.

But is That all?

- **The Data Problem**
  - Data … & Large Data….
  - Data clean?
  - In a proper format…
  - Data Bias free?
  - And above all… Human Decision Making Process is not limited to brain…

But is That all?

HUMAN DECISION-MAKING

Humans make decisions in two different ways.

INTUITION	REASONING
Much of our thought process is instinctive and unconscious, taking place very quickly and with little effort. This type of thinking is rooted in recognising patterns based on what has happened before, and is often described as intuitive.	We also use logic and reason in order to answer questions and make decisions. This conscious process uses our knowledge and typically takes over when intuition has not produced a satisfactory answer. This process takes time and effort.

Then There is that Out of Blue in Dream Thing….

Reasoning, … Calculations… Brains… Intelligence… Vedanta

Combining AI & Day to Day Accounting

- AGI not coming anytime soon…
  - New Brain Though is available
  - Real Intelligence is in picking up that new brain
  - AI will become commoditized very shortlty… Almost there..
  - Would is all about learning after all

- But ASI is Here…
  - Excellent Pattern Recognition Abilities…
  - But Low on Regression & Cross Learning Ability
  - And no Non analytical works (e.g. love… Ethics.. Morality.. Though some claim it can be learned too)
  - So good Signals… But not Dependable in Complex Decisions
  - Can make routine, memory based/rule based workers defunct possibly.. So Level Up!

- AI Tech Can Aid in 3 Broad Varieties
  - providing better and cheaper data to support decision-making;
  - generating new insights from the analysis of data;
  - freeing up time to focus on more valuable tasks such as decision-making, problem solving, advising, strategy development, relationship building and leadership.

Combining AI in Day to Day Work

- AI Tech Can aid in 3 broad Varieties
  - using machine learning for accounting entries; improving on the accuracy of rules based approaches, enabling greater automation of processes;
  - using machine learning–based models for generating early warning system..
  - improving fraud detection through more sophisticated, machine learning models of 'normal' activities and better prediction of fraudulent activities;
  - using machine learning–based predictive models to forecast revenues; and
  - improving access to, and analysis of, unstructured data, such as audited results, contracts and emails, through deep learning models
- But none can work independently w/o expert intervention.. Hybrid Ai is Better than Standalone AI today .. Will likely be in foreseeable future