



# INTRODUCTION TO AI

Fundamentals of Artificial Intelligence

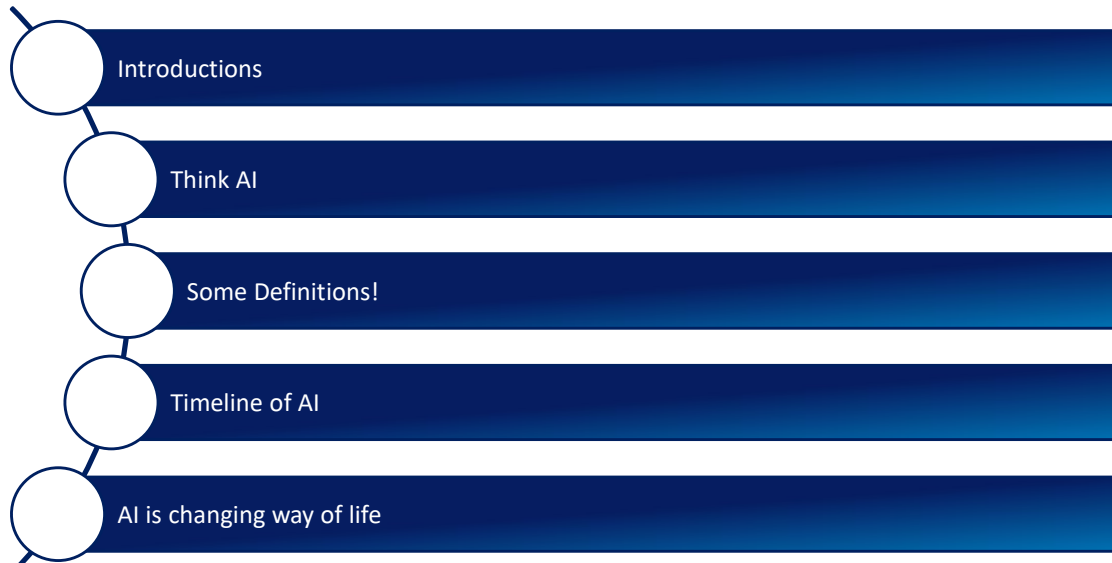
Session 01

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## Agenda



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**Name,**

**Highest Qualification,**

**Your experience in AI/ML**

**What are your Expectations from this Module???**



## Meet and Greet

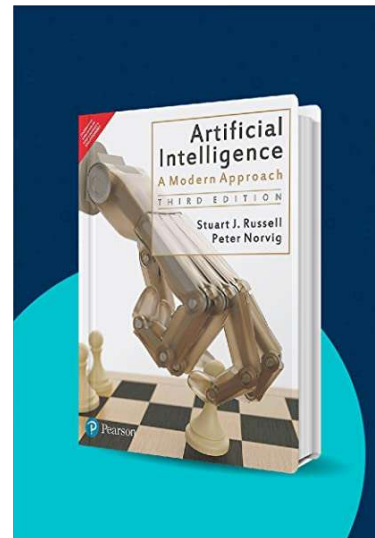
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## References

- ❑ Artificial Intelligence – A Modern Approach (3<sup>rd</sup> Edition) by Stuart Russell & Peter Norvig
- ❑ Artificial Intelligence by Example, Denis Rothman
- ❑ Artificial Intelligence by Saroj Kaushik



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Theory exam- 40% weightage  
Internal exam -20% weightage  
\* remaining for other module

”

## Evaluation Method

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## No Question is a Bad Question!

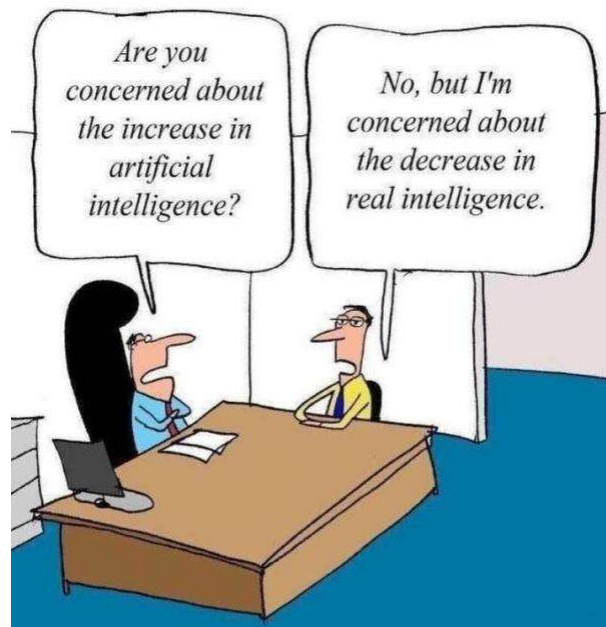


"The man who asks question is a fool  
for a minute, a man who doesn't ask is  
a fool for life."  
~ Confucius

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Think AI...

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## Think AI : What Comes to Your Mind....



It is as simple as marking spam emails!

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## AI has Changed Gaming Industry...

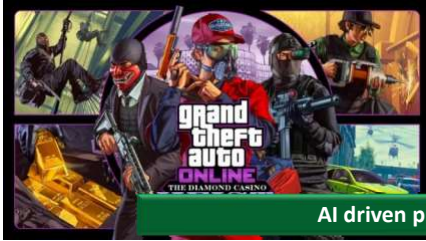


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## AI has Changed Gaming Industry...



AI driven program can beat rule based program



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## Computer games are training professionals...

### Role Playing Games (RPG)

Before active duty assignment, armed forces recruits have usually played hours of branded RPGs

Game-based desktop training tool used for squad-level training and call for fire

Used to train soldiers deploying to Iraq

Helps in cognitive learning—or "how to think" training

Certain games help with certain motor skills

Helps in practicing tactics, techniques, and procedures, and practicing making decisions

Helps recreate virtual battle field to a level of fidelity unseen before

It is combination of photo-realistic graphics and technologies like normal mapping and inverse kinematic animation

Army places high-fidelity content based upon the information available - the real-world location of roads, buildings, etc.



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## AI is helping movies become more spectacular...

- ❑ Drone Shots are common in today's movies
- ❑ Equipped with technology that uses Artificial Intelligence
- ❑ AI helps in keeping subject in frame and in focus
- ❑ Although Federal Aviation Administration has not approved drones for use by the media
- ❑ Movies makers shoot scenes on closed sets
- ❑ Also forces them to rely on footage by private users



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## Natural Language Processing

- ❑ Computer that understands natural language spoken by humans
  - ❖ Siri, Alexa...
- ❑ They can also translate text as spoken by humans...
  - ❖ 3:00 am becomes "three O'clock"
  - ❖ or "Zero three hundred" if you are military
- ❑ They can also translate text as per the context
  - ❖ How would you pronounce \$ 1.99?
  - ❖ Its "Dollar Ninety Nine" and not "one dollar ninety nine cents"...
  - ❖ What about \$10.99?
  - ❖ Its "Ten Ninety Nine"
  - ❖ If it's a just a number, it will be "ten point nine nine"
- ❑ Even communicate like a human being... Turing Test



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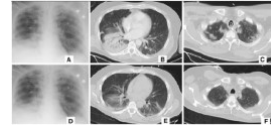
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## Other Applications

### ❑ Medical Diagnosis

- ❖ “As per a report from Nikkei’s Asian Review (h/t TechSpot), Alibaba claims its new system can detect coronavirus in CT scans of patients’ chests with 96% accuracy against viral pneumonia cases. And it only takes 20 seconds for the AI to make a determination – according to the report, humans generally take about 15 minutes to diagnose the illness as there can be upwards of 300 images to evaluate.”



### ❑ Other applications:

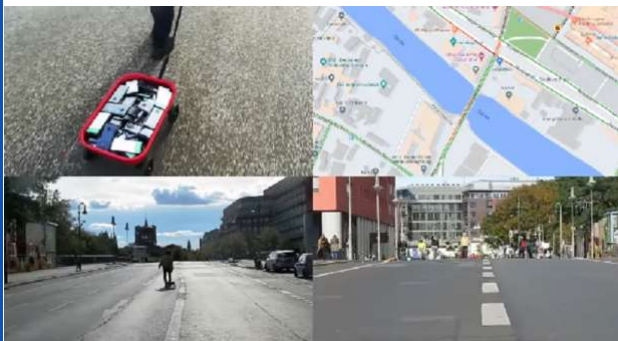
- ❖ Computer Virus Detection & Cleaning, Information Management, Help Desks Management, Employee Performance Evaluation, Loan Analysis, Planning & Scheduling, the Configuration of Manufactured Objects, Financial Decision Making, Knowledge Publishing, Process Monitoring & Control, Supervise the Operation of the Plant & Controller, Stock Market Trading, Airline Scheduling & Cargo Scheduling

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## Google Maps



German artist Simon Weckert creates "virtual traffic jams" on the streets of Berlin.



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## CHAT GPT – help me write an application to the Principal



write a leave letter to principal from 7/10/2023 to 9/10/2023 to enjoy Diwali vacation



[Your Name]  
[Your Address]  
[City, State, ZIP Code]  
[Your Email Address]  
[Today's Date]

[Principal's Name]  
[School Name]  
[School Address]  
[City, State, ZIP Code]

Dear Principal [Principal's Last Name],

I hope this letter finds you well. I am writing to formally request a leave of absence from [start date], which coincides with the Diwali vacation, until [end date].

Diwali is a significant and joyous festival celebrated by millions of people in our country and around the world. As a part of this cultural celebration, my family and I have made plans to come together and enjoy this festive period. It has been a tradition in our family to celebrate Diwali together, and I believe that this time spent with my loved ones during the festival will be both spiritually enriching and emotionally fulfilling.

I understand the importance of attending school regularly and keeping up with my studies. Therefore, I have taken proactive steps to minimize the impact of my absence:



1. I have discussed my leave request with my teachers, and they have assured me that I can make up for any missed assignments, homework, or classwork upon my return.
2. I will diligently study and review my coursework during the Diwali vacation to ensure that I am prepared for any upcoming exams or assessments.
3. I will maintain communication with my classmates to stay informed about any class updates or important announcements during my absence.

I fully respect the school's commitment to academic excellence and its attendance policies. I would be grateful if you could grant me permission for this leave during the Diwali vacation so that I can celebrate this festival with my family while ensuring that my academic responsibilities are not compromised.

I will return to school promptly on [end date], ready to catch up on any missed lessons and fully engage in my studies. I assure you that I am dedicated to maintaining a high level of academic performance.

Thank you for considering my request, and I appreciate your understanding of the cultural significance of Diwali to me and my family. Your support in this matter means a lot to me.

Sincerely,

[Your Name]  
[Your Student ID]  
[Your Contact Number]

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Some Definitions!

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The science and engineering of making intelligent machines,  
especially intelligent computer programs.

”

-John McCarthy

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Field of study that gives computers the ability to learn without  
being explicitly programmed.

”

-Arthur Samuel , 1959

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Subfield of computer science, Evolved from the study of pattern recognition and computational learning theory in artificial intelligence.

Explores the study and construction of algorithms, That can learn from and make predictions on data.

Such algorithms operate by building a model from example inputs in order to make data-driven predictions or decisions, rather than following strictly static program instructions.

”

-Wikipedia

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“

Building programs with tunable parameters that are adjusted automatically so as to improve their behavior by adapting to previously seen data.

A subfield of Artificial Intelligence; Algorithms can be seen as building blocks to make computers learn to behave more intelligently by somehow generalizing rather than just storing and retrieving data items like a database system would do.

”

- PyCon

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## Once Again... in different words...

- ❑ Science of programming computers to learn from data...
- ❑ Make a system (computer, a robot, or a product) to
  - ❖ Learn from past experience (data points)
  - ❖ Take action (produce outcome) under near similar situation
- ❑ Approaches include :
  - ❖ Statistical methods
  - ❖ Computational intelligence
  - ❖ Traditional coding

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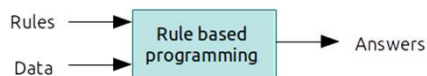
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## What's Being Played...



Can a Rule based system answer based on the data provided?

We, as humans can easily guess!



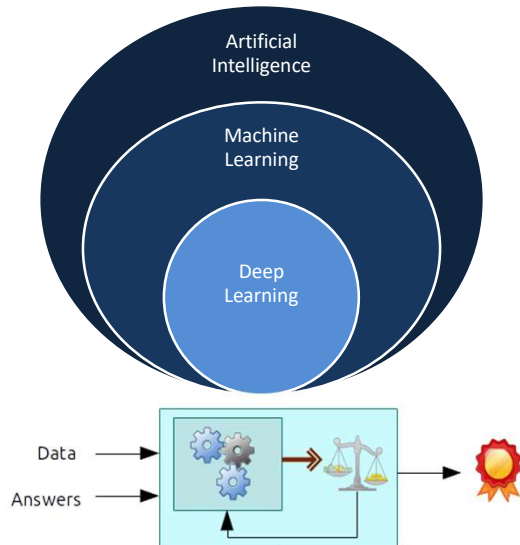
Time	Day	Type
9:00 AM	Weekday	News
11:00 AM	Weekday	K-Soaps
3:00 PM	Weekday	Soaps
5:00 PM	Weekday	Soaps
6:00 PM	Weekday	Cartoons
9:00 PM	Weekday	Sports, Movies
4:00 PM	Weekday	???
1:00 PM	Weekday	???

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## AI vs ML vs Deep Learning



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- ❑ Used interchangeably
- ❑ AI is a broader concept it includes basic AI to Deep learning.
- ❑ Machine learning: enabling Machines to Learn from the past incidents (available data).
- ❑ Deep Learning: One can say that it tries to copy information processing patterns found in the human brain

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## Artificial Intelligence

- ❑ A man-made thinking power:
  - ❖ Create intelligent machines that can simulate Human thinking capability and behavior
  - ❖ Intelligent software to automate routine tasks, understand speech or images, make diagnoses in medicine and support basic scientific research
- ❑ Algorithms which can work with their own “intelligence”.
  - ❖ No pre-programming needed.
  - ❖ Algorithms such as Reinforcement Learning algorithm and Deep Learning Neural Networks being used in multiple places such as Siri, Google’s AlphaGo, Chess playing, etc.
- ❑ Based on capabilities, AI can be classified into three types:
  - ❖ Weak AI
  - ❖ General AI
  - ❖ Strong AI
- ❑ Currently, we are working with weak AI and general AI. The future of AI is Strong AI for which is claimed to be more intelligent than humans (???)

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## Definitions

- ❑ Weak AI
  - ❖ The idea that machines could act as if they were intelligent
- ❑ Strong AI
  - ❖ Machines can actually think consciously thinking
  - ❖ Not just simulating thinking
- ❑ Over time new level was introduced as “human-level AI” or “general AI”
  - ❖ Programs that can solve an arbitrarily wide variety of tasks, including novel ones,
  - ❖ and perform as well as a human

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## Machine Learning

- ❑ An application or subset of AI
- ❑ Allows machines to learn from data without being programmed explicitly
  - ❖ Uses a massive amount of structured and semi-structured data
- ❑ It can work only on data it has seen
  - ❖ For unknown cases it becomes unresponsive or unreliable
- ❑ Being used for online recommender system, for Google search algorithms, Email spam filter, Facebook auto friend tagging suggestion, etc.
- ❑ It can be divided into three types:
  - ❖ Supervised learning
  - ❖ Unsupervised learning
  - ❖ Reinforcement learning
- ❑ You will also learn about semi-supervised /self-supervised learning

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## Deep Learning

### ❑ Large Neural Networks

“Using brain simulations, hope to:  
Make learning algorithms much better and easier to use,  
Make revolutionary advances in machine learning and AI,  
I believe this is our best shot at progress towards real AI.”

- Andrew Ng

- ❑ Learning successive layers of increasingly meaningful representations
- ❑ Modern network contain hundreds of successive layers
- ❑ Successive layers are learned via “neurons” connected via neural network
- ❑ Deep learning can process more complex data than traditional Machine Learning
- ❑ Deep learning models are of two types – Discriminative and Generative

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## Deep Learning

- ❑ Why Deep Learning is more practical today?
  - ❖ Availability of large computing power
  - ❖ Availability of large datasets
- ❑ Most flavors of the old generations of learning algorithms, performance will plateau
- ❑ Deep learning that is scalable
  - ❖ Performance just keeps getting better as more and more data is fed
- ❑ Most value today is coming from supervised learning
- ❑ Eventually, we will see benefits of unsupervised learning

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## Deep Learning

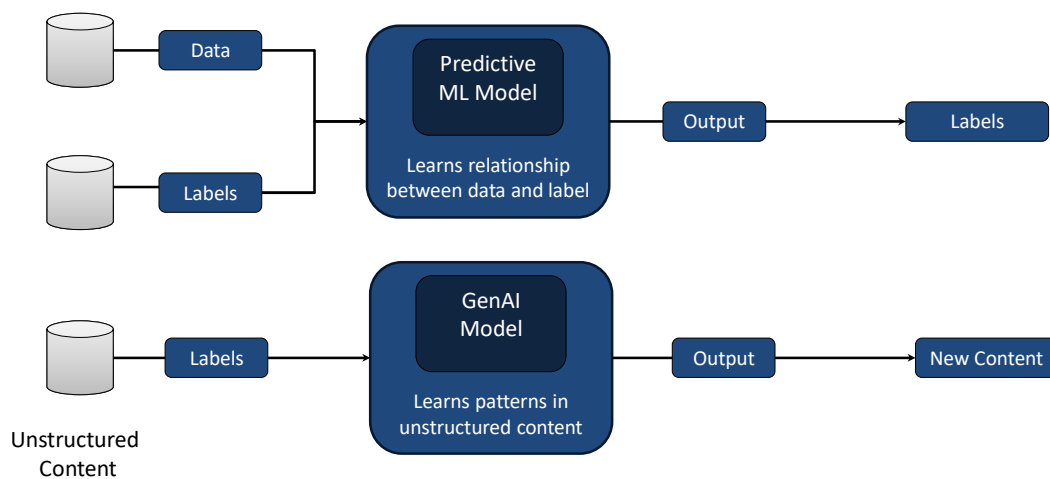
- ❑ Usually a neural network contains
  - ❖ Input Layer
  - ❖ Hidden layers [ 1 ... n]
  - ❖ Output layer
- ❑ We may call network with
  - ❖ 1 to 2 hidden layers as “shallow”
  - ❖ 10 or more layers as “deep”
- ❑ No set demarcation
- ❑ Early paper in 2006 called it deep learning instead of just “Artificial Neural Networks” as it had multiple layers
  - ❖ Scientist just got excited when someone labeled them as deep network

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## Deep Learning

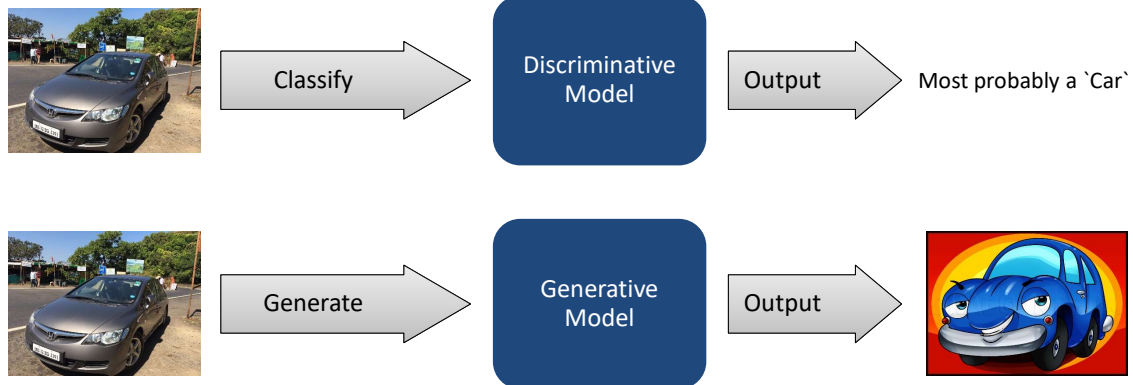


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## Deep Learning

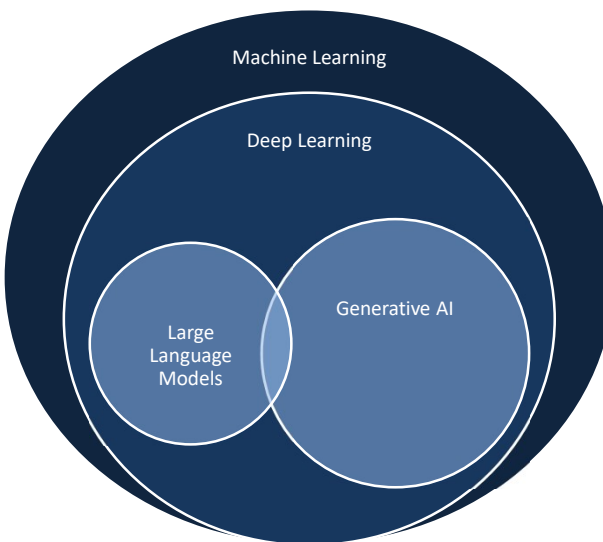


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## Generative AI



- ❑ Gen AI is a subset of Deep learning
- ❑ Can process:
  - ❖ Labeled data
  - ❖ Unlabeled data
- ❑ Using:
  - ❖ Supervised methods
  - ❖ Unsupervised methods
  - ❖ And semi-supervised methods

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## Key Milestones

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## Timeline of AI

### 1941 – Turing Test

- ❑ If a machine can engage in a conversation with a human without being detected as a machine, it has demonstrated human intelligence
- ❑ The Turing Test judges the conversational skills of a bot
- ❑ According to the test, a computer program can think if its responses can fool a human into believing it, too, is human
- ❑ Not everyone accepts the validity of the Turing Test, but passing it remains a major challenge to developers of artificial intelligence

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## Timeline of AI

1950 – I, ROBOT

- ❑ I, Robot is a fixup novel of science fiction short stories or essays by American writer Isaac Asimov
- ❑ The stories are woven together by a framing narrative in which the fictional Dr. Susan Calvin tells each story to a reporter (who serves as the narrator) in the 21st century
- ❑ Although the stories can be read separately, they share a theme of the interaction of humans, robots, and morality. When combined these stories tell a larger story of Asimov's fictional history of robotics

Figment of the imagination of some famous science fiction writers have greatly influenced direction of AI.

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## Timeline of AI

1956 – John McCarthy coined Artificial Intelligence

- ❑ McCarthy was one of the founders of the discipline of Artificial Intelligence.
- ❑ Co-authored the document that coined the term "artificial intelligence" (AI),
- ❑ Developed the Lisp programming language family,
- ❑ Significantly influenced the design of the ALGOL programming language,
- ❑ Popularized time-sharing,
- ❑ Invented garbage collection,
- ❑ Very influential in the early development of AI.

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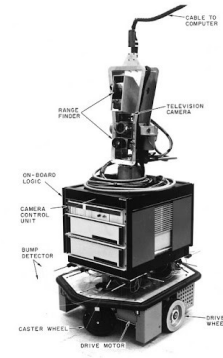
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## Timeline of AI

### 1969 – Shakey

- ❑ First general purpose mobile robot that was able to take actions by reasoning about its surrounding
- ❑ The project combined research in robotics, computer vision, and natural language processing.
- ❑ The first project that melded logical reasoning and physical action.
- ❑ Was developed at the Artificial Intelligence Center of Stanford Research Institute (now called SRI International).



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## Timeline of AI

### 1973 – AI Winter

- ❑ Million spent, very little to show for...
- ❑ Research budgets slashed
- ❑ The field has experienced several hype cycles, followed by disappointment and criticism, followed by funding cuts, followed by renewed interest years or decades later
- ❑ A chain reaction that begins with pessimism in the AI community, followed by pessimism in the press, followed by a severe cutback in funding, followed by the end of serious research

Roger Schank and Marvin Minsky: at the annual meeting of AAAI (then called the "American Association of Artificial Intelligence") in 1984 warned the business community that enthusiasm for AI had spiraled out of control in the 1980s and that disappointment would certainly follow. Three years later, the billion-dollar AI industry began to collapse.

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## Timeline of AI

### 1981 – Narrow AI

- ❑ Instead of trying to create a general intelligence, research shifted towards "expert systems" which are "task-focused", "purpose-built"
- ❑ John Searle - would be useful for testing hypothesis about minds, but would not actually be minds"
- ❑ Siri, Cortana, and Google Assistant are all examples of narrow AI, as they operate within a limited pre-defined range of functions

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## Timeline of AI

### 1990 – Bottom Up Approach

- ❑ Rodney Brooks spearheaded the "bottom-up" approach: aiming to develop neural networks that simulates brain cells and learned new behaviors
- ❑ Brooks chose a traditional AI problem for his doctoral research (1981), which he subsequently expanded and published as Model-Based Computer Vision (1984)
- ❑ Disappointment with using "top down" approach, Brooks turned that approach on its head, arguing that research should focus on a bottom-up approach—that is, on action and behavior rather than on representation and function

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## Timeline of AI

### 1997 – Deep Blue

- ❑ IBM developed a supercomputer - Deep Blue a chess-playing computer
- ❑ First computer to win both a chess game and a chess match against a reigning world champion under regular time controls
- ❑ First match Deep Blue won its first game against world champion Garry Kasparov but lost by a score of 4–2
- ❑ In May 1997, heavily upgraded Deep Blue won the six-game rematch 3½–2½
- ❑ Becoming the first computer system to defeat a reigning world champion
- ❑ Kasparov accused IBM of cheating

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## Timeline of AI

### 2002 – Roomba

- ❑ iRobot created first commercially successful robot for home cleaning - an autonomous vacuum cleaner
- ❑ Roombas feature a set of sensors to detect and act :
  - ❖ Presence of obstacles,
  - ❖ Detect dirty spots on the floor,
  - ❖ Sense steep drops to keep them from falling down stairs,
  - ❖ Obstacle avoidance,
  - ❖ Performance maps,
  - ❖ Camera with navigation software ,
  - ❖ Recharging bases , beacons, etc.



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## Timeline of AI

2005 – Big Dog

- ❑ US Military started investing in autonomous robots
- ❑ Big Dog by Boston Dynamics, was first one Dynamically stable quadruped military robot
- ❑ Other collaborators were Foster-Miller, the NASA Jet Propulsion Laboratory and the Harvard University Concord Field Station
- ❑ It was funded by DARPA
- ❑ The project was shelved after it was deemed too loud for combat



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## Timeline of AI

2008 – Google App

- ❑ Google launched a speech recognition app
- ❑ It was first step towards Siri, Google Assistant, Alexa, Cortana
- ❑ Google Assistant (latest) is an artificial intelligence–powered virtual assistant developed by Google
- ❑ It is primarily available on mobile and smart home devices
- ❑ Unlike the company's previous virtual assistant, Google Now, the Google Assistant can engage in two-way conversations

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## Timeline of AI

2010 – 20 Nao Robots Danced in perfect harmony for 8 mins at Shanghai's 2010 World Expo!



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## Timeline of AI

2011 – Watson

- ❑ IBM Watson took on humans on Jeopardy and won against two best performers of all time on the show
- ❑ Watson is a question-answering computer system capable of answering questions posed in natural language,
- ❑ Developed in IBM's DeepQA project by a research team led by principal investigator David Ferrucci.
- ❑ Watson was named after IBM's founder and first CEO, Thomas J. Watson.

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## Timeline of AI

2014 – Eugene Goostman

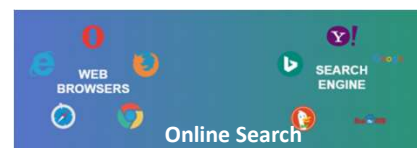
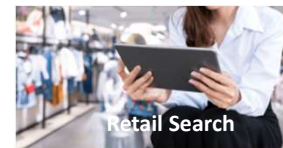
- ❑ 64 years after it was conceived, a Chabot called Eugene Goostman passed the Turing test
- ❑ Goostman is portrayed as a 13-year-old Ukrainian boy
- ❑ On 7 June 2014, 33% of the event's judges thought that Goostman was human
- ❑ As per Turing's prediction in his 1950 paper Computing Machinery and Intelligence, that by the year 2000, machines would be capable of fooling 30% of human judges after five minutes of questioning
- ❑ Google invested a billion \$ in driverless car
- ❑ Skype launched real-time voice translation

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## Different Fields Different Expertise



Fine-tuned model from one field may not work in other field.  
Learning/experience from one field is not transferable.

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## Exciting times

- ❑ Exciting and meaningful work going on is tremendous
- ❑ 20 years ago, it was internet
- ❑ Today it is AI
- ❑ AI is no longer limited to tech companies like Google or Facebook
- ❑ Every industry needs it! Common Joe is demanding it!!

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## “AI is New Electricity”

- ❑ Electricity changed the way industry used to operate
- ❑ AI is going to impact the industry and our lives same way!



- ❑ You will be one of the leaders of this transformation!
- ❑ Go transform in a meaningful way:
  - ❖ Education, Healthcare, Employment, Law and even Literature

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## Reflect...

- ❑ Do you think that real intelligence is decreasing?
  - ❖ Effect of social engineering!
  - ❖ Over dependence on apps
- ❑ Presence of road side shops and congested sidewalks affect Google maps ability to predict traffic conditions?

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## Reflect...

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>❑ Artificial Intelligence is about _____.           <ul style="list-style-type: none"> <li>❖ Playing a game on Computer</li> <li>❖ Making a machine intelligent</li> <li>❖ Programming on machine with your own intelligence</li> <li>❖ Putting your intelligence in machine</li> </ul> </li> <li>❑ How many layers a shallow network has?           <ul style="list-style-type: none"> <li>❖ One</li> <li>❖ Two</li> <li>❖ Three</li> <li>❖ No set demarcation</li> </ul> </li> <li>❑ Can rule bases engine (Expert Systems ) interpolate for in-between conditions (not specifically coded)           <ul style="list-style-type: none"> <li>❖ Yes</li> <li>❖ No</li> <li>❖ Either</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>❑ What is the full form of "AI"?           <ul style="list-style-type: none"> <li>❖ Artificially Intelligent</li> <li>❖ Artificial Intelligence</li> <li>❖ Artificially Intelligence</li> <li>❖ Advanced Intelligence</li> </ul> </li> <li>❑ What is Artificial Intelligence?           <ul style="list-style-type: none"> <li>❖ A field that aims to make humans more intelligent</li> <li>❖ A field that aims to improve the security</li> <li>❖ A field that aims to develop intelligent machines</li> <li>❖ A field that aims to mine the data</li> </ul> </li> <li>❑ What is major difference between Rule based system and AI based system</li> </ul> |
|--|--|

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## Reflect...

- ❑ Which of the following is the branch of AI?
  - ❖ Machine Learning
  - ❖ Cyber forensics
  - ❖ Full-Stack Developer
  - ❖ Network Design
- ❑ \_\_\_\_\_ is the goal of artificial intelligence.
  - ❖ To solve artificial problems
  - ❖ To extract scientific causes
  - ❖ To explain various sorts of intelligence
  - ❖ To solve real-world problems
- ❑ Which of the following is an application of AI?
  - ❖ It helps to exploits vulnerabilities to secure the organization
  - ❖ Language understanding and problem-solving (Text analytics and NLP)
  - ❖ Easy to create a website
  - ❖ It helps to deploy applications on the cloud

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## Reflect...

- ❑ The Turing Test judges the conversational skills of a bot?
- ❑ Roombas commercially successful robot for home cleaning from iRobot?
- ❑ Learning/experience from one field is not transferable?
- ❑ Who is the inventor of AI?
  - ❖ Geoffrey Hinton
  - ❖ Andrew Ng
  - ❖ John McCarthy
  - ❖ Jürgen Schmidhuber
- ❑ DARPA, the agency that has funded a great deal of American Artificial Intelligence research, is part of the Department of \_\_\_\_\_
  - ❖ Defence
  - ❖ Energy
  - ❖ Education
  - ❖ Justice
- ❑ Which year Google invested in driverless Car?
  - ❖ 2000
  - ❖ 2004
  - ❖ 2010
  - ❖ 2014

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## Next session



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