AI and Machine Learning Demystified

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***Abstract*—Traditionally, data analysis has always been characterized by cognitive computing, an approach that becomes impossible when data sets are large and heterogeneous. It is for the very same reason, that big data was criticized as being an overhyped technology. Availability of more data is directly proportional to the difficulty of coming up with predictive models that work accurately. Also, traditional statistical solutions are focused on static analysis that is limited to the analysis of samples that are frozen in time. This could obviously result in inaccurate and unreliable conclusions. So in order to predict exact patterns in a system ML proposes clever alternatives to analyzing huge volumes of data. It is a step forward from all of statistics, computer science and all other emerging applications in the industry. By developing fast and efficient algorithms and data-driven models for real-time processing of data, machine learning along with AI is able to produce accurate results and analysis.**

***Keywords*—Artificial Intelligence, machine learning, cognitive computing**

I. Introduction

Artificial intelligence (AI) is intelligence exhibited by machines. In computer science, the field of AI research defines itself as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of success at some goal. Colloquially, the term "artificial intelligence" is applied when a machine mimics "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving”. Capabilities currently classified as AI include successfully understanding human speech, competing at a high level in strategic game systems (such as chess and Go), self-driving cars, intelligent routing in content delivery networks, military simulations, and interpreting complex data.

The central problems (or goals) of AI research include reasoning, knowledge, planning, learning, natural language processing (communication), perception and the ability to move and manipulate objects. General intelligence is among the field's long-term goals. Approaches include statistical methods, computational intelligence, and traditional symbolic AI. Many tools are used in AI, including versions of search and mathematical optimization, logic, methods based on probability and economics. The AI field draws upon computer science, mathematics, psychology, linguistics, philosophy, neuroscience, artificial psychology plus many others.

AI has broken away from the hypothetical and into real-world business solutions. Much of them have to do with the wide availability of GPUs (graphics processing units), which make parallel processing ever faster, cheaper, and more powerful. The ascent of AI also has to do with the simultaneous of practically infinite storage and a deluge of Data of every stripe, including images, video, audio, text and transactions.

II. Ease of Use

A. *Machine Learning*

Machine learning is the subfield of computer science that, according to Arthur Samuel in 1959, gives "computers the ability to learn without being explicitly programmed.”Evolved from the study of pattern recognition and computational learning theory in artificial intelligence ,machine learning explores the study and construction of algorithms that can learn from and make predictions on data– such algorithms overcome following strictly static program instructions by making data-driven predictions or decisions, through building a model from sample inputs. Machine learning is employed in a range of computing tasks where designing and programming explicit algorithms with good performance is difficult or unfeasible; example applications include email filtering, detection of network intruders or malicious insiders working towards a data breach, optical character recognition (OCR), learning to rank and computer vision.

Machine learning is closely related to (and often overlaps with) computational statistics, which also focuses on prediction-making through the use of computers. It has strong ties to mathematical optimization, which delivers methods, theory and application domains to the field. Machine learning is sometimes conflated with data mining, where the latter subfield focuses more on exploratory data analysis and is known as unsupervised learning. Machine learning can also be unsupervised and be used to learn and establish baseline behavioral profiles for various entities and then used to find meaningful anomalies.

Machine learning focuses on the development of computer programs that can access data and use it learn for themselves. The process of learning begins with observations or data, such as examples, direct experience, or instruction, in order to look for patterns in data and make better decisions in the future based on the examples that we provide. The primary aim is to allow the computers learn automatically without human intervention or assistance and adjust actions accordingly.

Within the field of data analytics, machine learning is a method used to devise complex models and algorithms that lend themselves to prediction; in commercial use, this is known as predictive analytics. These analytical models allow researchers, data scientists, engineers, and analysts to "produce reliable, repeatable decisions and results" and uncover "hidden insights" through learning from historical relationships and trends in the data.

B. The Methods of Machine Learning

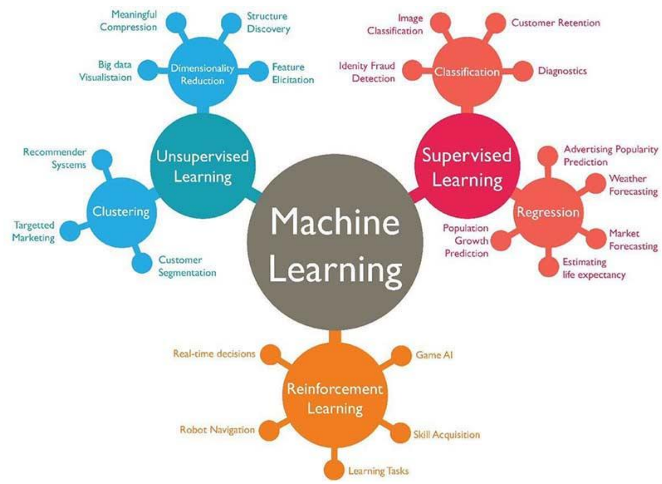
Two of the most widely adopted machine learning methods are supervised learning and unsupervised learning. Most machine learning – about 70 percent – is supervised learning. Unsupervised learning accounts for 10 to 20 percent. Semi- supervised and reinforcement learning are two other technologies that are sometimes used.

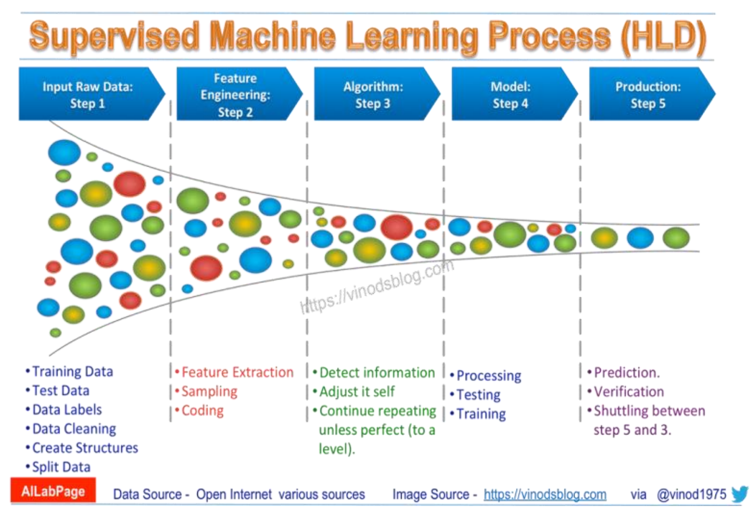
- **Supervised learning** algorithms are trained using labeled examples, such as an input where the desired output is known. For example, a piece of equipment could have data points labeled either “F” (failed) or “R” (runs). The learning algorithm receives a set of inputs along with the corresponding correct outputs, and the algorithm learns by comparing its actual output with correct outputs to find errors. It then modifies the model accordingly. Through methods like classification, regression, prediction and gradient boosting, supervised learning uses patterns to predict the values of the label on additional unlabeled data. Supervised learning is commonly used in applications where historical data predicts likely future events. For example, it can anticipate when credit card transactions are likely to be fraudulent or which insurance customer is likely to file a claim.

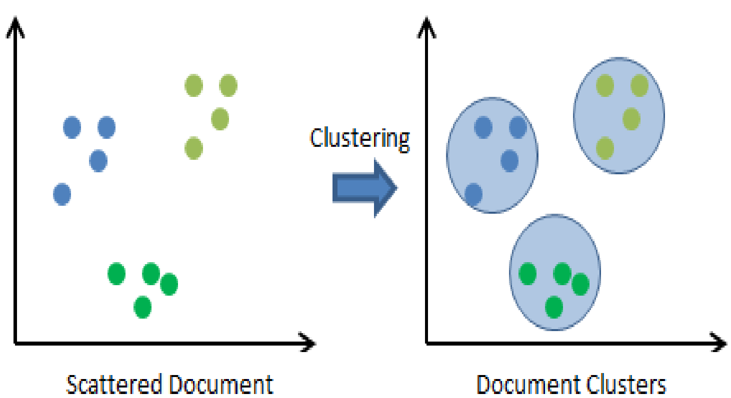
- **Unsupervised learning** is used against data that has no historical labels. The system is not told the "right answer." The algorithm must figure out what is being shown. The goal is to explore the data and find some structure within. Unsupervised learning works well on transactional data. For example, it can identify segments of customers with similar attributes who can then be treated similarly in marketing campaigns. Or it can find the main attributes that separate customer segments from each other. Popular techniques include self-organizing maps, nearest-neighbor mapping, k- means clustering and singular value decomposition. These algorithms are also used to segment text topics, recommend items and identify data outliers.

- **Semi-supervised learning** is used for the same applications as supervised learning. But it uses both labeled and unlabeled data for training – typically a small amount of labeled data with a large amount of unlabeled data (because unlabeled data is less expensive and takes less effort to acquire). This type of learning can be used with methods such as classification, regression and prediction. Semi-supervised learning is useful when the cost associated with labeling is too high to allow for a fully labeled training process. Early examples of this include identifying a person's face on a web cam.

- **Reinforcement learning** is often used for robotics, gaming and navigation. With reinforcement learning, the algorithm discovers through trial and error which actions yield the greatest rewards. This type of learning has three primary components: the agent (the learner or decision maker), the environment (everything the agent interacts with) and actions (what the agent can do). The objective is for the agent to choose actions that maximize the expected reward over a given amount of time. The agent will reach the goal much faster by following a good policy. So the goal in reinforcement learning is to learn the best policy.







Case Study:-

Cancer Burden in Africa and Asian Countries

Population-based cancer survival data, a key indicator for monitoring progress against cancer, are reported from 27 population-based cancer registries in 14 countries in Africa, Asia, the Caribbean and Central America. In China, Singapore, the Republic of Korea, and Turkey, the 5-year age-standardized relative survival ranged from 76-82% for breast, 63-79% for cervical, 71-78% for bladder, and 44-60% for large-bowel cancer. Survival did not exceed 22% for any cancer site in The Gambia, or 13% for any cancer site except breast (46%) in Uganda. For localized cancers of the breast, large bowel, larynx, ovary, urinary bladder and for regional diseases at all sites, higher survival rates were observed in countries with more rather than less developed health services. Inter- and intra-country variations in survival imply that the levels of development of health services and their efficiency to provide early diagnosis, treatment and clinical follow-up care have a profound impact on survival from cancer. These are reliable baseline summary estimates to evaluate improvements in cancer control and emphasize the need for urgent investment to improve awareness, population-based cancer registration, early detection programs, health-services infrastructure, and human resources in these countries in the future.

How AI and ML can Reduce Burden:-

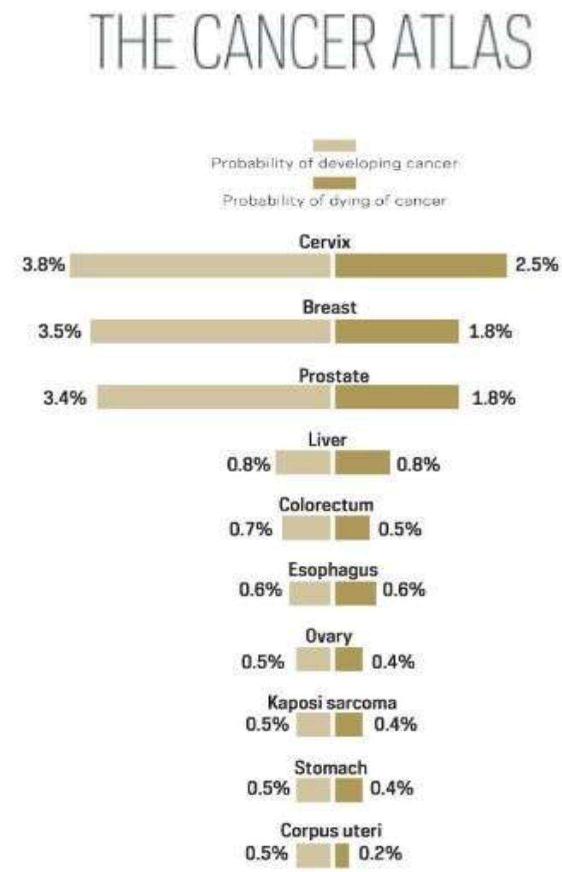
- Bring taxonomies and ontology to life
- Broaden access to evidence based medicine
- More informed treatment decisions

AI in Action for successful Health Care:

- AI analyses data (treatment options, similar patients)
- Goal: Provide quick, evidence based options
- Physician selects treatment for patients based on situation
- AI success is helping physician (not replacing)

CONCLUSION

Artificial Intelligence and machine learning are basically machine perception. It is the power to interpret sensory data. Two main ways we interpret things are by naming what we sense; Algorithms train to name things through supervised learning, and to cluster things through unsupervised learning. The difference between supervised and unsupervised learning is whether you have a labeled training set to work with or not. The labels you apply to data are simply the outcomes you care about .May be you care about identifying people in images. Maybe you care about identifying angry or spam emails, which are all just unstructured blobs of text. Maybe you're looking at time series data -- a stream of numbers -- and you care about whether the next instances in the time series will be higher or lower.



So Machine learning, working with other algorithms, can help to classify, cluster and predict. It does so by learning to read the signals, or structure, in data automatically. When deep learning algorithms train, they make guesses about the data, measure the error of their guesses against the training set, and then correct the way they make guesses in order to become more accurate. This is optimization.

Now imagine that, with machine learning, you can classify, cluster or predict anything you have data about: images, video, sound, text and DNA, time series (touch, stock markets, economic tables, and the weather). That is, anything that humans can sense and that our technology can digitize. You have multiplied your ability to analyze what's happening in the world by many times. With machine learning, we are basically giving society the ability to behave much more intelligently, by accurately interpreting what's happening in the world around us with software.

Prediction alone is a huge power, and the applications are fairly obvious. Classification sounds banal, but by naming something, you can decide how to respond. If an email is spam, you send it to the spam folder and save the reader time. If the face captured by your front door camera is your mother, maybe you tell the smart lock to open the door. If an X-ray shows a tumorous pattern, you flag it for deeper examination by medical experts.

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