ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

Industry Insights and Applications

Abstract

Automation, Artificial Intelligence (AI) and Machine Learning (ML) are pushing boundaries in the software and hardware industry to what machines are capable of doing. From just being a figment of someone's imagination in sci-fi movies and novels, they have come a long way to augmenting human potential (reducing risk of human errors) in doing tasks faster, more accurate and with greater precision each time – driven by technology, automation and innovation.

This is indeed creating new business opportunities and is acting as a clear competitive differentiator that helps analyze hidden patterns of data to derive possible insights. AI and ML can certainly enrich our future thereby making the need for intelligent and sophisticated systems more important than ever.

Automation comes to the core of this modernization where mundane tasks are being automated using AI and ML. B2B and B2C companies are adopting this technology and everyone is becoming a digital technology enabler. This is predominantly a cultural shift that every organization is going through and thereby elevating user experience.

CHITKARA UNIVERSITY

Report

on

AI & ML

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Machine Learning and Artificial Intelligence: Two Fellow Travelers on the Quest for Intelligent Behavior in Machines

ABOUT MASTERCLASS

Masterclass for Directors is a condensed weekend certification programme for Directors and SeniorExecutives equipping them with boardroom processes, skills, essentials of corporate governance, roles, rights and responsibilities of directors. IOD through Masterclass for Directors works towards raising the standards of India’s boardroom functioning.

Be part of an innovative and simplified learning experience that is setting the standard for directors and business leaders in the corporate world. The training programme is compiledto suite and help you become a confident and skilled director with the power to shape yourfuture and drive society forward, no matter what your background or industry is. Emerge asa true leader with personalized learning —all focused around the Director Competency Framework.

Over the years IOD has been supporting business leaders and conducted hundreds ofbatches of Masterclass for Directors nationwide, serving you, your board and your organization to grow. It is specifically designed around professional competencies anddelivered by directors, for directors.

IOD's Masterclass for Directors offers a whole vista of opportunities, for preparing and updating of both Executive and the Non-Executive Independent Directors. The course is under continuous watch to keep it updated with the latest regulatory changes, global trendsand practices. We want you to achieve tangible outcomes from your investment, enabling you to deliver increased value and respond effectively to a challenging business environment.

Institute of Directors offers a suite of governance training to equip you with the tools to perform in your role at each stage of your development as a director. Our

attendees continue to tell us how much they value the mix of learning, interaction and hearing real-lifeexperiences from practicing directors. IOD's Boardroom training programmes are delivere

1. Business and Technology Solutions using AI and ML

AI today is widely used and practically applied to help business make informed decisions and improve customer experience. AI is all about acting in a similarway, using algorithms as to what humans would do, but in a much more controlled, efficient and faster manner. It also refers to information derived by applying a setof algorithms with little or no human intervention.

Humans can put general reasoning, applysituational actions and make informed decisions much quicker. In simple terms, AIis the machine's ability to think for itself. Itaims to augment human capabilities and not replace it. It is all about algorithms,

processing data and recommendations to businesses to make decisions for very specific problems– at a greater speed, scaleand velocity than what a human can do.

The first challenge that exists in implementing automation and AI is identifying a use case. AI is all around us – ranging from unlocking our phones with face recognition to self-driving cars.

Smart Home is an example of Artificial Intelligence where home appliances are connected to each other and communicateinformation that can help create alerts.
Even the best of AI machines needs to be controlled by humans, as a computer

would mean nothing unless intelligenceis loaded onto it – through programs andsoftware written by humans. Excessive automation can do more harm than good, and humans are underrated in that context; the true potential lies in notreplacing humans but to augment and amplify them.

A lot of us today have AI enabled systemsin their homes such as Siri, Alexa and Google Assistant to name a few . AI is becoming integral part of our daily lives which will go on to influence in much wider terms, in everything that we do.
These are real-time interaction systems.

2. Artificial Intelligence and Machine Learning

Artificial intelligence and ML are very much related. According to McCarthy (2007), one of the founders of the field,

AI is “the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable.”

This is fairly generic and includes multiple tasks such as abstractly reasoning and generalizing about the world, solving puzzles, planning how to achieve goals, moving around in the world, recognizing objects and sounds, speaking, translating, performing social or business transactions, creative work (e.g., creating art or poetry), and controlling robots. Moreover, the behavior of a machine is not just the outcome of the program, it is also affected by its “body” and the enviroment it is physically embedded

in. To keep it simple, however, if you can write a very clever program that has, say, human-like behavior, it can be AI. But unless it automatically learns from data, it is not ML:

ML is the science that is “concerned with the question of how to construct computer programs that automatically improve with experience,” (Mitchell, 1997).

So, AI and ML are both about constructing intelligent computer programs, and DL, being an instance of ML, is no exception. Deep learning (LeCun et al., 2015; Goodfellow et al., 2016), which has achieved remarkable gains in many domains spanning from object recognition, speech recognition, and control, can be viewed as constructing computer programs, namely programming layers of abstraction in a differentiable way using reusable structures such as convolution, pooling, auto encoders, variational inference networks, and so on. In other words, we replace the complexity of writing algorithms, that cover every eventuality, with the complexity of finding the right general outline of the algorithms—in the form of, for example, a deep neural network—and processing data. By virtue of the generality of neural networks—they are general function approximators—training them is data hungry and typically requires large labeled training sets. While benchmark training sets for object recognition, store hundreds or thousands of examples per class label, for many AI applications, creating labeled training data is the most time-consuming and expensive part of DL. Learning to play video games may require hundreds of hours of training experience and/or very expensive computing power. In contrast, writing an AI algorithm that covers every eventuality of a task to solve, say, reasoning about data and knowledge to label data automatically (Ratner et al., 2016; Roth, 2017) and, in turn, make, for example, DL less data-hungry–is a lot of manual work, but we know what the algorithm does by design and that it can study and that it can more easily understand the complexity of the problem it solves. When a machine has to interact with a human, this seems to be especially valuable.

This illustrates that ML and AI are indeed similar, but not quite the same. Artificial intelligence is about problem solving, reasoning, and learning in general. Machine learning is specifically about learning—learning from examples, from definitions, from being told, and from behavior. The easiest way to think of their relationship is to visualize them as concentric circles with AI first and ML sitting inside (with DL fitting inside both), since ML also requires writing algorithms that cover every eventuality, namely, of the learning process. The crucial point is that they share the idea of using computation as the language for intelligent behavior. What kind of computation is used and how should it be programed? This is not the right question. Computation neither rules out search, logical, probabilistic, and constraint programming techniques nor (deep) (un)supervised and reinforcement learning methods, among others, but does, as a computational model, contain all of these techniques.

Reconsidering AlphaGo: AlphaGo and its successor AlphaGo Zero (Silver et al., 2017) both combine DL and tree search—ML and AI. Alternatively, the “Allen AI Science Challenge” (Schoenick et al., 2017) should be considered. The task was to comprehend a paragraph that states a science problem, at the middle school level and then to answer a multiple-choice question. All winning models employed ML yet failed to pass the test at the level of a competent middle schooler. All winners argued that it was clear that applying a deeper, semantic level of reasoning with scientific knowledge to the question and answers, is the key to achieving true intelligence. In other words, AI has to cover knowledge, reasoning, and learning, using programmed and learning-based programmed models in a combined fashion.

3. The Joint Quest to Identify Intelligent Behavior in Machines

Using computation as the common language, we have come a long way, but the journey ahead is still long. None of today's intelligent machines come close to the breadth and depth of human intelligence. In many real-world applications, as illustrated by AlphaGo and the Allen AI Science Challenge, it is unclear whether problem formulation falls neatly into fully learning. The problem may well have a large component, which can be best modeled using an AI algorithm without the learning component, but there may be additional constraints or missing knowledge that take the problem outside its regime, and learning may help to fill the gap. Similarly, programmed knowledge and reasoning may help learners to fill their gaps. There is a symmetric difference between AI and ML, and intelligent behavior in machines is a joint quest, with many vast and fascinating open research problems:

• How can computers reason about and learn with complex data such as multimodal data, graphs, and uncertain databases?

• How can preexisting knowledge be exploited?

• How can we ensure that learning machines fulfill given constraints and provide certain guarantees?

• How can computers autonomously decide the best representation for the data at hand?

• How do we orchestrate different algorithms, involving learned or not learned ones?

• How do we democratize ML and AI?

• Can learned results be physically plausible or easily understood by us?

• How do we make computers learn with us in the loop?

• How do we make computers learn with less help and data provided by us?

• Can they autonomously decide the best constraints and algorithms for a task at hand?

• How do we make computers learn as much about the world, in a rapid, flexible, and explainable manner, as humans?

Answering these and other similar questions will put the dream of intelligent and responsible machines into react. Fully programmed computations, together with learning-based programmed computations, will help to better generalize, beyond the specific data that we have seen, whether a new pronunciation of a word or an image will significantly differ from those we have seen before. They allow us to go significantly beyond supervised learning, towards incidential and unsupervised learning, which does not depend so much on labeled training data. They provide a common ground for continuous, deep, and symbolic manipulations. They allow us to derive insights from cognitive science and other disciplines for ML and AI. They allow us to focus more on acquiring common sense knowledge and scientific reasoning, while also providing a clear path for democratizing ML-AI technology, as suggested by De Raedt et al. (2016) and Kordjamshidi et al. (2018). Building intelligent systems requires expertise in computer science and extensive programming skills to work with various machine reasoning and learning techniques at a rather low-level of abstraction. Building intelligent systems also requires extensive trial and error exploration for model selection, data cleaning, feature selection, and parameter tuning. There is actually a lack of theoretical understanding that could be used to remove these subtleties. Conventional programming languages and software engineering paradigms have also not been designed to address the challenges faced by AI and ML practitioners, such as dealing with messy, real-world data at the right level of abstraction and with constantly changing problem definitions. Finally, data-driven science is an exploratory task. Starting from a substantial foundation of domain expert knowledge, relevant concepts as well as heuristic models can change, and even the problem definition is likely to be reshaped concurrently in light of new evidence. Interactive ML and AI can form the basis for new methods that model dynamically evolving targets and incorporate expert knowledge on the fly. To allow the domain expert to steer data-driven research, the prediction process additionally needs to be sufficiently transparent.

4. Benefits and approaches to AI

are repeatable and the efforts saved herecan be repurposed to other important tasks.AI is all about instructing a machine to enable, repeatedly similar tasks, modify its operation based on a particular event,automating the processing of large amounts of data and helping humans make informed decisions by using insightspresented by AI technologies.

Automation is at the core of AI; it helpsin saving precious human hours so that mundane tasks can be done by robots andhumans can focus on business centric tasksand other priorities.We should embed intelligence into what we do as routine work and where it requires humungous efforts to process large volumes of data that require correlation to be built into multiple systems. Artificial Intelligence is there to augment and not replace human potential.AI is all about strategy, technology is just an enabler of that to drive insights and help with decision making.

AI has long term benefits in making things automated, processing large amounts of data at speed of the light, predicting outcomes usingtrends and patterns processing large amount of data.

One of the best approaches to implement AI is based on the four pillars below:

First and foremost, we need to carefullyassess and develop a comprehensive strategy around data, our needs, skill assessment, timelines, training change management and TCO analysis.

Second, we need to select the right software, right platform (cloud / on-premise), costs associated with the implementation, people cost and cost tolearn and sustain the systems.

Third, is creating an environment of learning, implementing the change, monitoring the input/output, managerisks and training the teams needed to operationally run it.

Finally, is managing and sustaining an AI plan with a comprehensive roadmap to identify priorities and modifying them on an ongoing basis. This is the key to growingthe capabilities and expanding horizons to allow a new set of application and needs.

5. AI and its use cases

As part of the recent study conducted by Infosys, the diagram below depicts the percentage of respondents in each industry who havealready been experiencing disruptions due to AI technologies:

AI can help us across industries and someof its abilities are as listed below:

- **The Finance industry** can greatly benefitfrom fraud detection and identity theft issues, do sales forecasting, use chat-bots,enable personalized offers, hedge fund management, customer centricity by recommending unique/customer specificofferings and lead generation. AI can also help banks detect margin improvement areas using Robotic Process Automation (RPA) that can enable bottom line growth.With the recent trends/incidents on financial frauds, detecting such incidents becomes all the more important for compliance and best governance.
- **The Healthcare industry** can be benefitted by analyzing tests and providing personal treatment, advice to patients using assistants/chatbots, monitor and recommend based on individual health data. AI can also be used to medically train people and augment capabilities of human reach.
- In the **Retail industry**, chat-bots can helpconsumers interact with your brand moreefficiently. . For example, detect usage patterns and suggest options, perform social media monitoring and marketing analytics. AI can help tremendously here as consumer spending power anddecisions have direct impact on retail industry including logistics, transportation,manufacturing, suppliers, marketing etc. Any sort of insights that can influence consumer spending will be a great boon and can help retailers to take corrective actions using AI e.g. focus on geographies,seasons, under-performing stores, errors due to paperwork etc.
- **The Education industry** can use AI to revolutionize education delivery, personalizing and customizing basedon student needs including global classrooms, checking and grading students, reviewing homework, recommending higher education
institutes based on area of interest and past educational exposure/experience and recommending learning paths.
- **The Insurance industry** can use AI to detect frauds, process claims, suggest better policies and competitive policy pricing, risk management, enable personalized offers based on health status. This can be augmented by processing data from multiple systems including Internet of Things (IoT) devices to offer personalized policies and dataanalytics and visualization and can help improve customer experience dramatically.

Some of the **practical use cases** of Artificial Intelligence, in a nutshell, are:

- Detect usage patterns and suggestoptions
- Monitor infrastructure and recommendbased on health data
- Predict analytics for data security anddata theft
- Manage entire systems independently
- Manage knowledge base
- Do sales forecasting and leadgeneration
- Perform customer service using bots

- Assist HR analytics
- Perform data management, processingand monitoring
- Perform social media monitoring andmarketing analytics
- Detect system anomalies - Anti-MoneyLaundering
- Predict technology failures - disk, file-system, reactive analysis

6. Conclusions

Machine learning and AI complement each other, and the next breakthrough lies not only in pushing each of them but also in combining them. Our algorithms should support (re)trainable, (re)composable models of computation and facilitate reasoning and interaction with respect to these models at the right level of abstraction. Multiple disciplines and research areas need to collaborate to drive these breakthroughs. Using computation as the common language has the potential for progressing learning concepts and inferring information that is both easy and difficult for humans to acquire.

7. Lalit Kumar Sharma

Lalit Sharma

Head Emerging Technology and Innovation at Yamaha Motor Solutions India Pvt.Ltd.

About

Currently focused on driving Digital Transformation (DT) and CoE AI/ML in Yamaha Motors . Using technologies around AI/ML, IoT, Mobility, Connected Vehicle, AR/VR, Industry 4.0 with an ecosystem of Technology Partners and Startups.

Expertise technical experience and ability to understand the business needs.

Key Responsibilities:

Bring in new technology inside the organization.

Plan and execute digital transformations.

Increase plant profit, reduce leakages using Manufacturing IT, MES implementation with help of new tech.

Evaluate existing processes and procedures. Makes recommendations and drives process improvement and adoption of best practices (processes, tools, etc) to improve team efficiency and effectiveness.

Coordinates all aspects of the release of technologies, products, features, functions, customer deployments with Yamaha B2B, CRM, SCM application in different geographic regions.

Execute Project planning to establish an overall project plan, including key milestones. Understand and coordinate sequencing of projects to accomplish progress.

Aggregate, organize and synthesize program and project information in order to communicate with extended team and management

Manage those projects involving department or cross-functional teams focused on the delivery of a product/application

Responsible to demonstrate product features to power users and collect feedback and channel it effectively to the dev team

Knowledge & Skills:

Strong analytical and organizational skills

Specialties Technical: -AI/ML| Industry 4.0 | IOT |M2M | Factory Automation| Connected Factories.

Add On : C#, OpenCV,Sharepoint ,PYTHON, , Lotus Development [Lotus Script,Java Script , Formulas and Command,HTML.CSS] , Lotus Domino Admin, JSP, Java, Linux ,SQL,EAI

Functional :- SCM,ERP, DMS , B2B,Mfg Process, Retail Sales, CRM.

Experience

Yamaha Motor Solutions India Pvt.Ltd. Graphic

Head Emerging Technology and Innovation Centre

Yamaha Motor Solutions India Pvt.Ltd.

Aug 2017 - Present4 years 6 months

Faridabad Area, India

Currently focused on driving Digital Transformation (DT) in Yamaha Motor India (manufacturing sector). Using technologies around IoT, Mobility, Connected Vehicle, HoloLens, Industry 4.0 with an ecosystem of Technology Partners and Startups.

Education

Indian Institute of Foreign TradeIndian Institute of Foreign Trade Graphic

Indian Institute of Foreign Trade

MBAIndustrial Marketing

2009 - 2011

Indira Gandhi National Open UniversityIndira Gandhi National Open University Graphic

Indira Gandhi National Open University

BCA

2001 - 2005

DOEACC Graphic

DOEACC

MCA

1999 - 2004

Summer Fields School Graphic

Summer Fields School

12

1997 - 1999

Licenses & Certifications

Specialization Deep Learning Graphic

Specialization Deep Learning

Machine Learning A-Z™: Hands-On Python & R In Data Science Graphic

Machine Learning A-Z™: Hands-On Python & R In Data Science

Udemy

Enterprise Design Thinking Practitioner Graphic

Enterprise Design Thinking Practitioner

IBM

The Raspberry Pi Platform and Python Programming for the Raspberry Pi Graphic

The Raspberry Pi Platform and Python Programming for the Raspberry Pi

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IBM WebSphere Portal Family Sales Mastery Test v1

IBM WebSphere

BM Lotus Notes & Domino Sales Mastery Test v1 Graphic

BM Lotus Notes & Domino Sales Mastery Test v1

IBM

Test 000-833, Object Oriented Analysis and Design - Part 1 (Analysis) Graphic

Test 000-833, Object Oriented Analysis and Design - Part 1 (Analysis)

IBM Rational

Test 000-834, Object Oriented Analysis and Design Part 1 – (Design) UML 2 Graphic

Test 000-834, Object Oriented Analysis and Design Part 1 – (Design) UML 2

IBM Rational Software

Issued Aug 2010

Introduction to the Internet of Things and Embedded Systems Graphic

Introduction to the Internet of Things and Embedded Systems

Coursera

Projects

Dealer Online System - MAW Nepal

Mar 2012 - Sep 2012

Developed the application to automate the process of Dealers Management across all Dealers. Various module include Parts,Retail Track, Warranty, Service, Vehicle Ordering,Admin, Forcasting and Helpdesk.


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