The Commonality between Automation and AI – A Perspective

By Jaideep Shah

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"Automation" is something that we hear about all the time and we don't even bat an eyelid. But, when we hear "Artificial Intelligence" (AI), it turns heads. The interesting thing is that the two concepts are, in fact, one and the same. Through this article, I would like to present you my perspective and explain my rationale.

Automation Is Integral to Our Lives

When we hear "automation," what comes to mind? A machine of some kind? Maybe a software program? Maybe a combination of the two? Well, all of them are correct. Every machine, every program, every combination of the two came into existence to automate some aspect of our life. While some of the automations are more direct and readily aligned with some aspect of human effort, others are indirect. For example, if we talk about an airplane, we can't say it is directly related since, as humans, we can't fly. But, if you change the lens of evaluation and think about going from one place to another over a large enough distance, the airplane automates the bulk of our locomotion effort. Without that machine, we would be walking for hours and days on end to achieve what we can cover in a matter of hours in a plane. So, the plane is an automation. Another example of automation, a mixer or blender, is a much more direct form of automation in that it chops and grinds at the push of a button.

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Automation takes on a much more impressive impact when software is brought into the picture. Software takes on many forms – sometimes visible in our daily use of computers and many times invisible in all of the machine-based automation we use. The most powerful example of software working invisibly for us is the latest wave of automobiles pioneered by Tesla. The amount of software used in the cars is an innovation over and above the change-over from gas to fully electric. Software in the Tesla motors is not completely hidden, given the large monitor that serves as the interface with the car besides the steering wheel. From GPS navigation to watching live TV while you drive, to checking the status of your battery or the security camera footage, everything is driven by

software. Not to mention that the new "features," such as extended battery charging or the updates to the automatic driving modules, are all enabled by software.

By this time, the backdrop to our main point of discussion is complete. With the above few examples, I hope I have made the case for automation being an integral part of our daily, routine lives. A lot more examples can be provided as automation applies to manufacturing, packaging, surgery, testing, delivery, cooking, washing (clothes, cars, utensils, etc.), farming, gaming, etc. – the list goes on and on. But let's switch gears to seeing the AI part in all of this.

The Role of AI in Enhancing Automation

While there are many definitions of automation based on the different context and applications, the one that I believe is the most relevant to our discussion is the following "*Automation is the creation and application of technologies to produce and deliver goods and services with minimal human intervention,*" as described in *Techopedia* (Automation, 2021). In most cases of automation, what we are basically trying to achieve is to reduce and, in some cases, completely eliminate some aspect of human involvement. The reasons for that are manifold, but it is usually because the work is laborious, repetitive and mundane. Some other important aspect for utilizing automation is to increase accuracy and reduce errors or variability. And this is where Artificial Intelligence (AI) comes into play.

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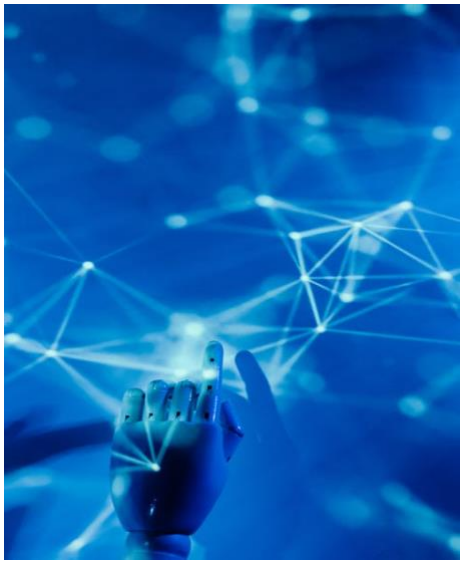
AI, as it is most commonly referred to these days, also has many definitions. Most of them mean pretty much the same thing and I am going to use the following, "*Artificial intelligence (AI), also known as machine intelligence, is a branch of computer science that aims to imbue software with the ability to analyze its environment using either predetermined rules and search algorithms, or pattern recognizing machine learning models, and then make decisions based on those analyses*." This definition comes from *Techopedia* (Artificial Intelligence AI, 2020). In real simple terms, this is the ability of the software to make decisions based on its learnings. This is akin to how us humans learn the tricks of a trade – the skills and experience – in order to make decisions during our daily routine. AI adds the ability for automations to perform more complex tasks, be more coordinated, more precise. AI has come into the lime light in the last decade or so because of major innovations and advancements made in the field of computers – namely, the ability to get, store and process more data using fewer resources, less time and comparatively less cost.

AI, as the name indicates, is the semblance of human intelligence being added to automation. This process involves teaching a machine, largely through software, a specialized skill. The machine doing the learning is representational of our brain and is aptly called an Artificial Neural Network (Artificial Neural Network (ANN), 2021). The techniques used to make the ANN learn are jointly referred to as Machine Learning (Machine Learning (ML), 2021). The learnings are typically referred to as a model or an ML algorithm. It is this algorithm/model that is leveraged for the purpose of imparting intelligence to the automations.

The models are developed largely through three types of training, each relying on feeding data to the model through which the model develops the intelligence to recognize the concept of choice.

When the data are predefined to match the desired output (like pictures of cats, frequencies of a birds call when in distress, physical motion of a swimmer, etc.), the algorithm is set to learn through Supervised Learning (Supervised Learning (ML), 2018). Seeing the same type of data in large volumes, the algorithm learns to recognize the specific common characteristics and able to recognize the same very reliably and accurately.

Another popular mechanism to train the model is when a large quantity of data is provided without any special predefinition of what the data refer to. The model generates inferences from common patterns that exist in the provided data and generates its own definition of the concept. Once trained, the model is able to identify the same concept or pattern in the provided data. This technique is known as Unsupervised Learning (Unsupervised Learning (ML), 2018).



Both of the above learning mechanisms require some amount of prep work to be done at the model level to define the desired outcome, be it the recognition/classification of certain types of data or the detection of a pattern among the various data. To a large extent, the model is given the problem that it needs to learn to solve. A third approach to train the model does away with this restriction and is meant to allow the model to learn through constant feedback about its learning. As the model presents its learning, it is provided with a reward or punishment (basically reward when the decision was correct or punishment if it was incorrect). The model is trained to take this feedback into account when making the next decision. Over a period of time, the model's learning is reinforced through this feedback toward making a certain type of decision. This technique is referred to as Reinforcement Learning (Reinforcement Learning (RL), 2021). This is modeled based on how babies typically learn and do new things.

While many of you might not have needed the above primer on AI, I wanted to make sure that at least the broad concepts were understood in order to appreciate the core theme of this discussion, which equates AI and automation. And here is the main point – for any automation to perform a task, it must be provided with the rules of how to perform the task. When the rules are known and well defined, they can be "hand" coded by an engineer into the automation. When the rules are not well defined, AI models/algorithms are utilized to define these rules. Both cases result in the development and execution of the task through the automation. What is different is the type of resources utilized and the completeness of the rules embodied by the automation.

Introducing Robotic Process Automation

Let me illustrate the above using automations through Robotic Process Automation (RPA) (Robotic Process Automation (RPA), 2021). RPA is a software automation technique allowing human users to quickly and effectively use computer programs to perform the same actions they take when interacting with a computer. For example, let's say that I am a financial portfolio manager, and one of the tasks I perform during the course of my day involves me having to send to my respective customers the current stock prices of all the stocks in their portfolio. I might have a spreadsheet with all of my customers and their respective stock holdings. For me to send them an update, I

would take each stock symbol from the spreadsheet and go to, let's say, finance.yahoo.com, search for that stock and copy the current price from the web page into the spreadsheet. Once I had completed all of the price reads, I would send an email to each of my customers with a copy of their respective stocks and associated prices from the spreadsheet.

You can imagine how time consuming this could become. Not to mention that I might copy the wrong price against the wrong stock or misspell the symbol and get the wrong stock's price or send the wrong set of prices to a customer. Even if I am very methodical and diligent with my work, over a period of time, I could become complacent and end up with one or more of the above errors. Using RPA technology, I can quickly develop a software robot (called a bot) that would do all of the tasks required, from opening up the spreadsheet to downloading the prices and sending out the emails. This automation would never get tired and never get complacent. Additionally, the bot will complete the task in a fraction of the time it takes me to complete the task today.

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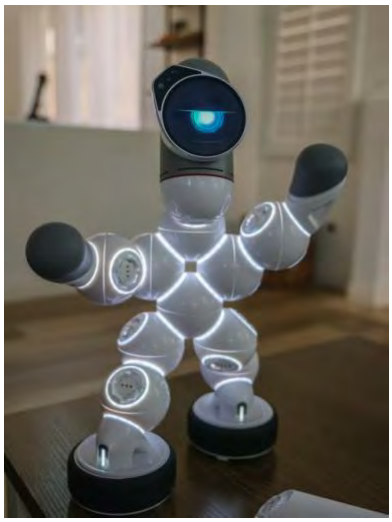
RPA technology is at a point today where the task of creating the bot is as simple as me pushing a "record" button while performing the set of steps that I do. The recording captures all of the applications I am interacting with and understands the actions I am taking, like opening a file or clicking on the download button or selecting and copying the price from the website, etc. The recording is then able to replicate my steps instantaneously. This allows me, as a portfolio manager, to spend my time developing richer insights for my customers, researching other stocks to improve their ROI, etc.

Now, one might ask the question where is the AI in that? If I directed the bot to record my steps and the bot repeated my steps, where is the intelligence in that? I basically told the bot everything it needed to do. Of course, I knew you would think that. In fact, I wrote that section with the express intent for you to think about that question.



The AI in the bot automatically figures out the application you are using. It could have used the title from the application window, or the layout of the different menus and other application components or maybe the appearance of grids or the address bar, etc. The RPA tool provider would have embedded this level of intelligence so that you would be able to simply press the record button to get the automation created for you. Similar to how an AI model was trained by providing it with a significant amount of data with similar characteristics, the RPA tool might require you to provide more than one recording of the work that you perform. AI could be leveraged to understand and eliminate various behavioral differences for performing the same task. For example, opening the spreadsheet by first launching the Excel application and then navigating to the file through the "File > Open…" menu or by navigating to the file using Windows Explorer and then double clicking on the file or by right clicking on the file and selecting the Open option, etc. The AI could determine that the fastest or the most

reliable or the most commonly used mechanism to open the file across multiple users would be the "navigate and double click" option.

AI could be used to provide resiliency in the automation. Let's say that the finance.yahoo.com website were to undergo a change and the stock price is now displayed to the left of the stock symbol when earlier it was shown in a table below the stock symbol. AI could then be used to leverage the bot failures in a reinforced learning mode to automatically capture the steps performed by the user to resolve the error condition. Through that learning, the next time the bot fails to execute as designed, it would have learned how the human resolved the issue and follow the same path. Over time, the AI will allow the bot to become self-correcting.

AI could also be used to look for patterns within the recordings to identify where additional automations could be leveraged. Similar to the unsupervised learning mode, multiple people could provide different recordings of the work that they are performing. The AI could automatically identify the most common patterns and either make recommendations for automating those steps, or generate the automation automatically.

As you can see from this very simplistic example, the aspect of automation is richly augmented and extended by the utilization of AI either directly or indirectly.

Take GPS-based navigation as another example. When GPS based navigation first came into existence, we all remember the small and bulky devices that provided this automation. It eliminated the need for us to carry paper maps and look for land marks to orient ourselves. When AI was applied to GPS navigation, just-in-time route changes became a reality. Today, the navigation application, driven by AI, almost always guarantees that we will reach our destination in the shortest amount of time. Before, finding the optimum route was considered an art and perfected over time through experience and was restricted to the routes that we most often traveled. AI has led to the enhancement of that automation to help you easily navigate unfamiliar roads, unforeseen circumstances and changing traffic patterns.

Reducing Human Effort and Eliminating Harm

If you noticed a pattern in this article, it is obvious that, where automation was used to solve a particular problem, AI was used to extend the reach of that automation. AI is also very commonly used to predict future trends! There are models for predicting the movement of stocks, the way people might vote, the clothes that people might wear, the foods that people might eat, etc. In many areas, AI is used for predicting failures in systems that would otherwise be catastrophically large, for example, an engine failure of plane in mid-air or a ship in mid-ocean, a deep-sea oil rig fire in the middle of the ocean, a controller failure in a nuclear reactor, etc. I completely agree that the AI used for such predictive aspects may not directly be related to an automation, but they all relate to avoiding failures in systems put in place to automate certain dimensions associated with reducing human effort or eliminating human harm.

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