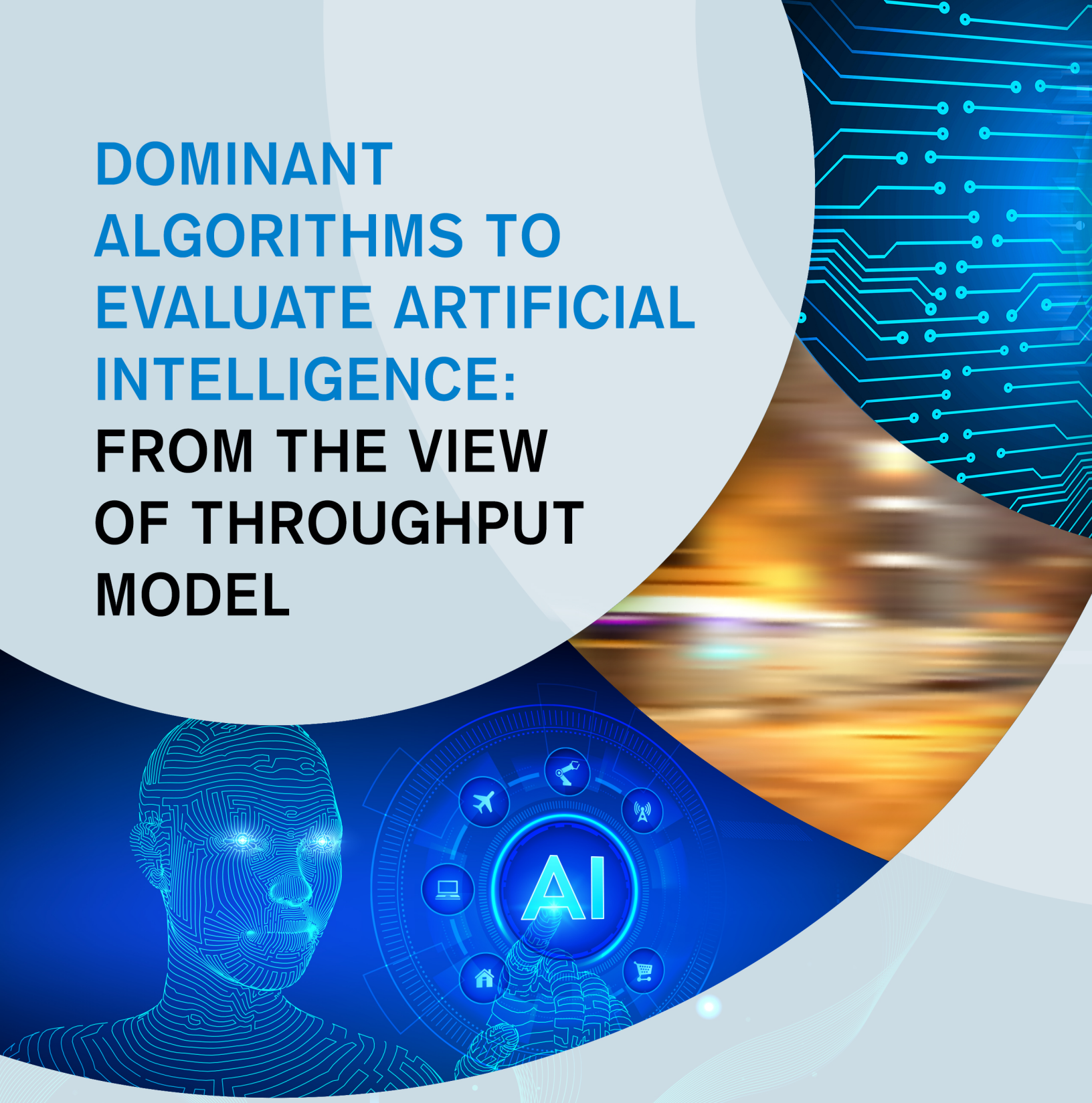
DOMINANT ALGORITHMS TO EVALUATE ARTIFICIAL INTELLIGENCE:

FROM THE VIEW OF THROUGHPUT MODEL



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Dominant Algorithms to Evaluate Artificial Intelligence: From the View of Throughput Model

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PREFACE

"Artificial intelligence would be the ultimate version of Google. The ultimate search engine that would understand everything on the web. It would understand exactly what you wanted, and it would give you the right thing. We're nowhere near doing that now. However, we can get incrementally closer to that, and that is basically what we work on." —Larry Page

I think we're going to need artificial assistance to make the breakthroughs that society wants. Climate, economics, disease -- they're just tremendously complicated interacting systems. It's just hard for humans to analyze all that data and make sense of it.

Artificial intelligence (AI) systems are already transforming individuals and organizations manner of functioning in today's world. AI can automate repetitive tasks, analyze large volumes of data, recommend content, translate languages, and even play games. Further, AI and related technologies are progressively ubiquitous in business and society. For example, AI increasingly find their way into everything from advanced quantum computing systems, automobiles, household appliances, and leading-edge medical diagnostic systems to consumer electronics and "smart" personal assistants. AI tools are also employed virtual reality, augmented reality as well as making IoT devices and services smarter and more secure.

Nonetheless, the current scope of things that AI can accomplish is relatively narrow. Some experts say the technology is far from becoming so-called artificial general intelligence, or AGI. That is, AGI is the capability to understand or learn any intellectual task that a human being can.

Furthermore, others have noted that even in its current, narrow proficiencies, AI provokes a series of ethical and trustworthiness questions. These questions represent issues such as whether the data fed into AI programs are without bias, and whether AI can be held accountable if something goes wrong.

To construct ethical and trusted AI systems, there needs to be cooperation among nations and various stakeholders. Experts have previously warned that inherently biased AI programs can present momentous problems and it may get in the way people's trust in those systems. For example, facial recognition software, for example, may incorporate accidental racial and gender bias, which may pose a threat to a particular group of individuals.

Therefore, this book provides a methodology described as the Throughput Model that can enable individuals and organizations to better identify, understand, and use algorithms to solve daily problems. Moreover, the Throughput Model can further the AI field since it represents symbol manipulation in six algorithmic pathways that seems to be essential for *human* cognition, namely, perception, information, judgment, and decision choice. Finally, The Throughput Model provides the first steps towards building architectures that combine the strengths of the symbolic approaches that can be adapted for machine learning/deep learning, and to develop better techniques for extracting and generalizing abstract knowledge from large, often noisy data sets.

As AI is employed more and more for applications where decisions require explanations, the Throughput Model offers the means to look under the hood of AI and comprehend how those decisions are attained by organizations. This is, particularly important for employing ethical and trustworthiness systems. Hence, Throughput Modelling ought to be considered from the start as it will inform the design of an AI system. Building trusted and ethical AI systems and the governance around them may potentially become a competitive strength for organizations.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTEREST

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I would like to express my gratitude to the many people who saw me through this book; to all those who provided support, talked things over, read, wrote, offered comments, allowed me to quote their remarks and assisted in the editing, proofreading and design of the book. Further, I would like to thank those for using artificial intelligence figures in the book.

Further, I would like to thank my students. Learning is a collaborative activity when it is happening at its best. We work together using each other's strengths to build our own challenges, developing our thinking and problem-solving skills. Therefore, the relationship we develop with our students at every age is one that is to be respected, nurtured, and admired.

Last and not least: I request forgiveness of individuals who have been with me over the course of the years and whose names I have failed to mention.

CHAPTER 1

Introduction to Artificial Intelligence and Algorithms

"We have seen AI providing conversation and comfort to the lonely; we have also seen AI engaging in racial discrimination. Yet the biggest harm that AI is likely to do to individuals in the short term is job displacement, as the amount of work we can automate with AI is vastly larger than before. As leaders, it is incumbent on all of us to make sure we are building a world in which every individual has an opportunity to thrive".

---Andrew Ng, Co-founder and lead of Google Brain

The AI of the past used brute-force computing to analyze data and present them in a way that seemed human. The programmer supplied the intelligence in the form of decision trees and algorithms. Imagine that you were trying to build a machine that could play tic-tac-toe. You would give it specific rules on what move to make, and it would follow them. Today's AI uses machine learning in which you give it examples of previous games and let it learn from the examples. The computer is taught what to learn and how to learn and makes its decisions. What's more, the new AIs are modeling the human mind itself using techniques similar to our learning processes.

---Vivek Wadhwa

Google's work in artificial intelligence ... includes deep neural networks, networks of hardware and software that approximate the web of neurons in the human brain. By analyzing vast amounts of digital data, these neural nets can learn all sorts of useful tasks, like identifying photos, recognizing commands spoken into a smartphone, and, as it turns out, responding to Internet search queries. In some cases, they can learn a task so well that they outperform humans. They can do it better. They can do it faster. And they can do it at a much larger scale.

---Cade Metz

Abstract

The Fourth Industrial Revolution generation has ushered in extremely sophisticated digital apparatuses that have taken the place of manual processing to ensure higher automation and sophistication. Artificial Intelligence (AI) provides the tools to exhibit human-like behaviors while adjusting to the newly given inputs and accommodating

change in the environment. Moreover, the tech-giants such as Amazon, Apple, IBM, Facebook, Google, Microsoft, and many others are investing in generating AI-driven products to facilitate the market demands for sophisticated automation. AI will continually influence areas such as job opportunities, environmental protection, healthcare, and other areas in economic and social systems.

Keywords: Algorithms, Artificial intelligence.(AI), Audit, Bias, Big data, Cognitive automation, Decision choice, Deep learning, Digital workforce, Financial robots, Information, Judgment, Machine learning, Natural language processing (NLP), Neural networks, Perception, Robotic process automation (RPA), Throughput Model, Transparency.

INTRODUCTION

The development of artificial intelligence (AI) has transformed our economic, social, and political way of life. Tedious and time-consuming tasks can now be delegated to AI tools that can complete the work in a matter of minutes, if not seconds. Within the world of business, this have significantly decreased the time required to conclude transactions. Nonetheless, there is always the fear of a person being replaced by AI tools for the sake of cost and time efficiency. Although these fears are valid in some arenas, AI is not developed enough to completely replace a human's judgment or expertise in a variety of situations. Moreover, AI can be considered as a tool that should be fully embraced to improve an individual or organization efficiency and effectiveness when performing a task. Within the human resource department, machines can be used throughout the entire process.

This book presents a decision-making model described as the "Throughput Model," which houses six dominant algorithmic pathways for AI use. This modeling process may better guide individuals, organizations, and society in general to assess the overall algorithmic architect that is guiding AI systems. Moreover, the Throughput Modeling approach can address values and ethics that are often not baked into the digital systems, which assembles individuals' decisions for them. Finally, the Throughput Model specified six major algorithms (to be discussed later) that may augment human capacities by countering people's deepening dependence on machine-driven networks that can erode their abilities to think for themselves, act independent of automated systems and interact effectively with others [1]. The Throughput Model dominant six algorithms can be utilized as a platform for an enhanced understanding of the erosion of traditional sociopolitical structures and the possibility of great loss of lives due to accelerated growth of autonomous military applications. Further, the model may assist in the understanding of the use of weaponized information, lies and propaganda to dangerously destabilize human groups.

AI is the ability of a computer, machine or a robot controlled by software to do tasks that are typically performed by humans since they require human intelligence and discernment. In other words, AI can simulate humans' style of living and work rules, as well as transform people thinking and actions into systematized operations. Scientists have discovered more about the brain in the last 10 years than in all prior centuries due to the accelerating pace of research in neurological and behavioral science and the development of new research digital techniques [2].

In addition, neurological brain research experts have found that the human brain has approximately 86 billion neurons, and each neuron is divided into multiple layers [2]. There are more than 100 synapses on each neuron, and the connections between each neuron are communicated by synapses, and this transmission mode establishes a complex neural network [3]. AI mimics the brain nerve to operate, analyze and calculate things, and distribute them in the neural network like a picture by picture, completing various activities. This immensely augments people work efficiency and saves the corresponding labor force, thus reducing many labor costs and helping enterprises to have a better development [1].

Furthermore, digital life is augmenting human capacities and disrupting eons-old human activities. Algorithmic driven systems have spread to more than half of the world's inhabitants in encompassing information and connectivity, proffering previously unimagined opportunities. AI programs are adept of mimicking and even do better than human brains in many tasks [1]. The rise of AI will make most individuals and organizations better off over the years to come. AI will become dominant in most, if not all, aspects of decision-making in the foreseeable future. The utilization of algorithms is rapidly rising as substantial amounts of data are being created, captured, and analyzed by government, businesses, and public bodies. The opportunities and risks accompanying with the utilization of algorithms in decision-making depend on the kind of algorithm; and understanding of the context in which an algorithm functions will be essential for public acceptance and trust [1]. Likewise, whether an AI system acts as a primary decision maker, or as an important decision aid and support to an individual decision maker, will suggest different regulatory approaches.

Fundamentally, the goal of an algorithm is to solve a specific problem, usually defined by someone as a sequence of steps. In machine learning or deep learning, an algorithm is a set of rules given to an AI program to help it learn on its own. Whereby machine learning is a set of algorithms that enable the software to update and "learn" from prior results without the requirement for programmer intervention. In addition, machine learning can get better at completing tasks over time based on the labeled data it ingests. Also, deep learning can be depicted as a

CHAPTER 2

Understanding Throughput Decision-making Modeling

"You don't have to be a genius or a visionary or even a college graduate to be successful. You just need a framework and a dream".

---Michael Dell, founder of Dell Computers

Data is every company's secret weapon, the new oil, the gasoline that powers algorithms. Use whatever metaphor you like, but as a company manager, if data, machine learning and artificial intelligence are not at the top of your agenda, then you should be removed of your position. We still don't know who the data will belong to, we don't know if artificial intelligence will be proprietary or open, but we do know that now is the time to stop being afraid of artificial intelligence and to get working on understanding its impact.

---Enrique Dans

The field of Artificial Intelligence is set to conquer most of the human disciplines; from art and literature to commerce and sociology; from computational biology and decision analysis to games and puzzles.

---Anand Krish

Abstract

Individuals and organizations need to make decisions daily. Given limited time in formulating issues and addressing problems, individuals and organizations must enjoy a certain degree of discretion in planning, revising, and implementing strategies. The Throughput Model facilitates individuals and organizations to simplify process models by modeling perception, information, judgment, and decision choice in a parallel modeling and neural network system. In addition, the Throughput Model allows for a fundamental and wide-ranging approach to understanding first through fifth dimensions dealing with problem solving as well as advancing our knowledge towards quantum computing.

Keywords: Analytical Algorithmic Pathway, Expedient Algorithmic Pathway, Fifth dimension, First dimension, Fourth dimension, Global perspective algorithmic pathway, IoT, Limited memory, Parallel computing, Quantum computing, Qubit, Reactive machines, Revisionist algorithmic pathway, Ruling guide algorithmic pathway, Second dimension, Self-awareness, Theory of mind, Third dimension, Throughput model, Value-driven algorithmic pathway.

INTRODUCTION

The planet as we know today has transformed considerably, in 1995 cell phones were huge bricklike objects. Jump forward to 2021 and the advancements made are astounding to say the least. With the World Wide Web having taken off and establishing itself as a huge power, organizations have learned and adapted to these changes. Thereby, this has contributed to automation and computer systems being more important and central for day-to-day business. Just a few years ago people thought that introducing AI like machine learning and deep learning software's and predictive algorithms would mean a replacement of workforce. Not only in the industrial and labor work but also influencing many types of office jobs. Making all types of professions nervous and uncertain for the future.

The Fourth Industrial Revolution (which is also known as "Industry 4.0") has a positive impact on everyday lives of humans based on the convergence of new technologies [1 - 3]. The most dynamic change of human history takes place currently when individuals face the Fourth Industrial Revolution, which combined various digital and physical technologies (which can be termed digital transformation) [4] such as AI, machine learning, cloud computing, augmented reality (AR) and virtual reality (VR). During this process, AI is a key driver of the Fourth Industrial Revolution. Thus, there is no doubt that a significant and active role for AI in this revolution.

Over the past several years, more and more algorithmic accountability has become an important concern for social scientists, computer scientists, journalists, and lawyers. That is, the potential of the Fourth Industrial Revolution advances a captivating vision of AI algorithms installed in manufacturing systems that can sense, analyze, and react to physical conditions. Enlivened by improving digital technologies, similar scenarios have projected the future of intelligent buildings, hospital systems, farms, and cities.

Computation for AI algorithms is inexpensive, powerful, and small. Sensors are ubiquitous. Networks are becoming speedier and more specialized. Further, AI algorithms have transition beyond hype into broad application, powered by specialized semiconductors. For example, algorithms are all the time more substituting human decision-making on whether a loan is issued or whether an

employment candidate gets through to the next round, removing the "human element out of the loop". Nevertheless, the justification behind this decision-making is "black-boxed" to those in the organization, such as executives or managers, much less those directly affected by the decision.

The Throughput Model enables an increased understanding regarding the structure and background of algorithms used in organizational contexts. The Throughput Model is "instrumental" in the process of adopting a strategy for decision-making. That is, the Throughput Model describes the process of decision-making that enables individuals and organizations to recognize risks and opportunities in order that they can make appropriate decisions to react to different circumstances.

Algorithmic decision making can be depicted as automated decision-making based on predefined rules and/or goals. Algorithmic decision making comes with a set of assumptions. In order to better understand what algorithmic decision-making is and how it may affect individuals and organizations, the Throughput Model highlights six decision-making algorithmic pathways regarding to particular context.

The deep the impact of AI based algorithmic decision-making is already dominating across numerous spheres of social, political, and economic life [5]. For example, AI grounded algorithms are utilized to achieve what is determined to be the appropriate medical diagnosis in a much speedier and more efficient way [6], as well as the best possible way to process financial transactions and associated revenues [7].

AI can influence people, processes, and technology. Nowadays, the traditional business operation model is facing the challenge of new IT technology. The application of new technology has brought a huge impact to traditional enterprise managers and employees, which ranges from positive and negative influences. For example, in China, by way of facial recognition, traffic offenders are issued fines for jaywalking in real time, which they receive as text messages on their phones. The role of algorithms in warfare (cyber or "traditional") is increasingly apparent.

Big data technology, AI, robotic process automation (RPA), *etc.*, have widely served various industry. AI is becoming the best solution to promote many standardized and repetitive tasks with clear rules in various offices and consulting agencies. AI greatly reduces labor costs, improves work efficiency and work quality, thereby increasing productivity and work performance. The Throughput Model is a tool which can assist individuals and organizations to determinate the

CHAPTER 3

Six Dominant Decision-making Algorithms

Success in creating AI would be the biggest event in human history. Unfortunately, it might also be the last, unless we learn how to avoid the risks. ---Stephen Hawking

The insight at the root of artificial intelligence was that these "bits" (manipulated by computers) could just as well stand as symbols for concepts that the machine would combine by the strict rules of logic or the looser associations of psychology.

---Daniel Crevier

Even the smartest AI will relentlessly follow its code once set in motion -- and this means that, if we are meaningfully to debate the adaptation of a human world into a machine-mediated one, this must take place at the design stage.

---Tom Chatfield

Abstract

Algorithms have been implemented to benefit decision-making for hundreds of years and pre-date computers. While algorithms are hardly a contemporary invention, they are nonetheless progressively intricate in systems implemented to support decision-making. Algorithmic decision-making is the processing of input data or perceptual processing to influence a judgment or decision choice. Further, algorithms are utilized to support decisions such as prioritization, classification, association, and filtering. This chapter illustrates a broad introduction to six fundamental algorithms for decision making. These algorithms in total make up the Throughput Model. Each algorithm is clearly presented and can comprehensively assist individuals and organizations in considering a wide range of issues.

Keywords: Algorithms, Analytical algorithmic pathway, Artificial intelligence, Chatbot, Computer vision, *Deep learning*, *Decision choice*, *Human-computer interaction (HCI)*, Expedient algorithmic pathway, Global perspective algorithmic pathway, Heuristics and biases, Information, Judgment, Machine learning, Neural networks, Perception, Throughput model, Revisionist algorithmic pathway, Ruling guide algorithmic pathway, Value-driven algorithmic pathway.

Waymond Rodgers

INTRODUCTION

Social science is the science branch dedicated to the study of societies and the relationships among people within those societies. This term incorporates an all-embracing range of academic disciplines, which include accounting, anthropology, archaeology, economics, history, human geography, linguistics, management science, media studies, political science, psychology, and sociology.

AI taps into these fields to provide a enhance representation of how individuals make decisions.

Computer vision, neural networks, predictive analytics, speech recognition, natural-language understanding, machine-learning and deep learning systems are some of the necessary tools that provide researchers and practitioners to capture the human thought process. Research is progressing apace, media attention is at an all-time high, and organizations are progressively implementing AI-based algorithms in quest of automation-driven efficiencies. AI-based algorithms for decision making purposes are being utilized more and more in everyday life. To name a few, this comprises the delivery of government services, justice and policing, entertainment, employment, and banking.

One of the foremost open questions in both neuroscience and machine learning is: How precisely do human brains operate, and how can we estimate that with our own algorithms? To this end, researchers and practitioners have employed machine learning, deep learning, and natural language processing to depict how we as humans make decisions. These apparatuses incorporate algorithms that mimic the human thought process enhancing decision-making in a variety of tasks.

Machine learning and deep learning are types of AI that employs algorithms, which supplies computers with the ability to automatically draw inferences when exposed to new data, without being explicitly programmed. Natural language processing enables computers to assess and understand human language to process and analyze huge quantities of natural language data. This is data that may be unstructured and that does not fit conveniently into the conventional row and column systems of relational databases.

Algorithmic decision choices may be based on handcrafted systems that exercise modest scoring mechanisms, or the identification of keywords, or natural language extraction. Rules may be expressed directly by programmers or be dynamic and flexible based on machine learning of contextual data. As discussed in chapter 1, opportunities, and implications of the usefulness of machine learning algorithms in decision-making are growing. As more data is produced, a surge in

the utilization of machine learning algorithms will provide organizations to contemplate a much all-encompassing range of datasets or inputs than was heretofore possible. This allows an opportunity for better decision-making. That is, combining human and machine intelligence in an intelligent way.

Algorithms viewed from a very detail mathematics and computer science level represent a finite sequence of well defined, computer-implementable instructions, generally to solve a class of specific problems or to perform a computation. Well-defined incorporates an unambiguous way an expression has a unique interpretation or value.

Therefore, algorithms are always unambiguous and are utilized as stipulations for performing calculations, data processing, automated reasoning, and other tasks. In contrast, a heuristic is a technique used in problem solving that uses practical methods and/or various estimates to produce solutions that may not be optimal but are sufficient given the circumstances.

Algorithms in the Throughput model is basically a means of representing step-b--step solutions to a problem. These algorithms can be used to represent automated reasoning that involves knowledge representation and reasoning as well as metalogic dedicated to understanding distinct views of reasoning. This process of reasoning symbolizes the capacity of applying logic to seek truth and draw conclusions from new or existing information.

Information can be thought of as the resolution of uncertainty [1]. Whereby, it addresses the question of "What an entity is" and therefore denotes both its essence and the nature of its features. More so, the concept of *information* has different meanings in different contexts. Therefore, the concept becomes synonymous to notions of constraint, communication, control, data, and form.

Uncertainty refers to epistemic (*i.e.*, concerned with knowledge) situations concerning imperfect or unknown information. It applies to predictions of future events, to physical measurements that are already constructed, or to the unknown. Uncertainty occurs in partially observable (*i.e.*, system is not fully visible to an external sensor) or stochastic (*i.e.*, random probability distributions) environments, as well as due to ignorance, indolence, or both [2].

This chapter centers on six dominant decision-making AI algorithmic pathways described as follows: *The Expedient Pathway, The Ruling Guide Pathway, The Analytical Pathway, The Revisionist Pathway, The Value Driven Pathway, and The Global Perspective Pathway* [2, 3].

CHAPTER 4

The Expedient Algorithmic Pathway

By their very nature, heuristic shortcuts will produce biases, and that is true for both humans and artificial intelligence, but the heuristics of AI are not necessarily the human ones. ---Daniel Kahneman.

What all of us have to do is to make sure we are using AI in a way that is for the benefit of humanity, not to the detriment of humanity. ---Tim Cook.

Computers will overtake humans with AI at some [point] within the next 100 years. When that happens, we need to make sure the computers have goals aligned with ours.

---Stephen Hawking.

Abstract

The Expedient Algorithmic Pathway (P→D) represents an individual or organization with a certain level of expertise providing a decision without the assistance of information since the information may be too noisy, incomplete, inadequately understood, or the alternatives cannot be differentiated. In addition, time pressures may circumvent an individual or organization from analyzing the available information. This algorithm is very useful in AI applications ranging from data gathering to problem solving.

Keywords: Algorithms, Behavioral biometrics, Big data, Biometrics, Blockchains, Body Odor Recognition, DNA, Dynamic signature, Ear Recognition, Expedient Algorithmic Pathway, Face Recognition, Face Thermography, Fingerprint, Gait, Hand Geometry, Iris Scan , Keystroke Dynamics, Palm Print, Physiological biometrics , Retina Scan, Vein Patterns, Voice (Speech) Recognition.

INTRODUCTION

AI is a branch of computer science that shows the capacity of intelligence a computer system or robots must be able to mimic what a human can do. In AI the computer system can do almost everything a human can do, they can think,
.

process information, and then make action on the information they have. One of the purposes of AI is to create robots or machines that are intelligent enough to perform the task of a human, without always needing the human by its side.

AI may become one of the most disruptive technological developments in the last two hundred years. AI algorithms can create new opportunities and risks in every aspect of business, government, and human life. For example, AI represents opportunities for the audit profession to provide leadership in audit services by educating industry and government leaders on the ethical use and implementation of AI algorithmic systems.

The Decision Makers' Processes Diagram, also known as the Throughput Model, explains how a decision is made and which factors are involved. In this diagram the "P" stands for perception, the "I" for information, the "J" for judgment, and the "D" for decision choice. This diagram does not have one exact way for showing how a decision is made because there are several different ways to come to a decision and everyone will interpret the information in a different way. Someone's perception can be influenced by their previous experiences, their background including their education. Information will always be the same information provided to every individual but based on their perception they can process the information differently. Some people might have the ability to make further assumptions based on the knowledge they already have. Therefore, all these factors will lead to everyone's judgement being distinct from one another. Based on their judgement, everyone's decision will be different, it does not necessarily mean it is right or wrong, but they have different reasons for their decisions (Fig. **4.1**).

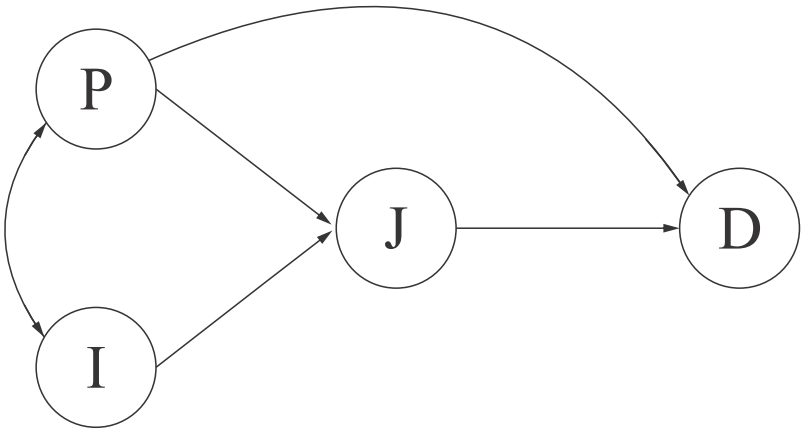

Fig. (4.1). Decision makers' processes diagram. Source: Rodgers [1].

There are three basic ways everyone comes to a decision which are represented through algorithms. An algorithm is a process used in calculations and problem-solving operations. The three basic algorithms can then be further expanded making a total of six algorithms for the way a decision can be made. The other three algorithms are very similar to the first three algorithms just with an additional concept of "*perception*" or "*information*" added to the algorithm. These algorithms are:

1. **The Expedient Pathway P→D**.
2. **The Ruling Guide Pathway P→J→D**.
3. **The Analytical Pathway I→J→D**.
4. **The Revisionist Pathway I→P→D**.
5. **The Value Driven Pathway P→I→J→D**.
6. **The Global Perspective Pathway s I→P→J→D**.

The main concepts do not change for the algorithms, they are just placed in different order, which causes the outcome to be different. The Expedient Pathway (P→D) is the center of discussion in this chapter.

The Expedient Pathway (P→D) is an AI algorithm based only on an individual's perception [1]. This is the most efficient of the pathways because it is the one that takes the least time to perform. Perception is how we frame the environment based on our past experiences. Perception is influenced by several factors, such as emotions and personal biases. The Expedient Pathway ignores information perhaps because it is unclear or unreliable. This pathway is most effective when the available information is unreliable and there is a limited time period, or the environmental conditions are shifting to make a decision choice. The main advantage of this algorithmic pathway is that it takes very little time, and the main disadvantage is that it ignores the available information sources, so if the person deciding does not have the appropriate experience, the decision may be wrong.

The Expedient Pathway only has one step to reach a decision and it serves well when an individual or organization have limited time to make a decision choice. Often, decision makers must make quick and simple decisions all the time. AI can help standardize this process by implementing regressions, decision trees, forest trees, and/or graphics. For example, there is software that automatically calculates depreciation and amortization expense, and you only have to input the variables, such as initial cost, depreciation method, salvage value, and useful life. This software eliminates the risk the risk of material misstatement in the calculation for depreciation expense.

CHAPTER 5

The Ruling Guide Algorithmic Pathway

Artificial intelligence is no match for natural stupidity.

---Anonymous

Computers bootstrap their own offspring, grow so wise and incomprehensible that their communiques assume the hallmarks of dementia: unfocused and irrelevant to the barely-intelligent creatures left behind. And when your surpassing creations find the answers you asked for, you can't understand their analysis and you can't verify their answers. You have to take their word on faith.

---Peter Watts

Our ultimate objective is to make programs that learn from their experience as effectively as humans do. We shall ... say that a program has common sense if it automatically deduces for itself a sufficient wide class of immediate consequences of anything it is told and what it already knows.

---John Mccarthy

Abstract

The Ruling Guide Algorithmic Pathway (P→J→D) elucidates a decision-making process from perception through judgment to decision choice. This algorithmic pathway is portrayed as a perceptual framing of the decision in which a person or organization may have biases and strategies, time pressures, a rejection of new informational sources, and a certain degree of expertise. This algorithmic pathway is correspondingly helpful in handling situations from both stable and unstable environments.

Keywords: Artificial Intelligence, Behavioral Biometrics, Blockchain, Contracts and Liability, Data Privacy, Decision choice, Decision tree, Deep learning, Fingerprint recognition, Fraud, Human Rights, Identification, Intellectual Property, Judgment, Machine learning, Perception, Physiological Biometrics, Ruling Guide Algorithmic Pathway, Verification, Voice recognition, XBRL.

Waymond Rodgers

INTRODUCTION

The purpose of this chapter is to analyze the ruling guide algorithmic pathway that can be utilized by AI tools. Technology employing AI can mimic some of the tasks that people can perform. Such tasks included: decision-making, recognition, and perception. Artificial intelligence technologies can be from computer systems to robotics. The purpose of these technologies is to get it to think and rational, in order to solve problems similar to a human as closely as possible. The Ruling Guide Pathway is based on perception, judgment, and decision choice. Perception includes personal biases and experiences, time pressures, rejection of information sources, and the individual making the decision, usually has some experience. In the ruling pathway, the framing of the problem, the perception, drives all of the analysis, the judgment. This pathway is typically used by individuals who are not experts. Like the Expedient Algorithmic Pathway, the Ruling Pathway also eliminates available information sources.

The **P→J→D** pathway implies our framing of the problem **(P)** drives how and what is analyzed, **(J)** before deciding. Much of what we believe contributes to influence the items we deem important for our analysis. Search patterns can also affect our analysis. It is important to note that this pathway plays down or eliminates available information sources. We must understand time pressures, problematic information, unstable environmental conditions may affect the available information use in handling a particular problem situation (see Fig. **5.1** below).

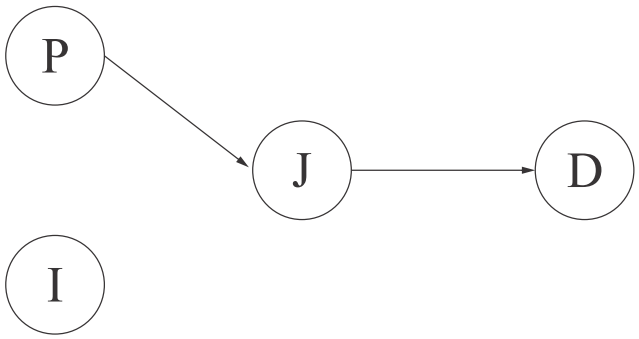

Fig. (5.1). P→J→D algorithmic pathway is from perception to judgment to decision choice. Source: Rodgers [2].

At the core of AI is a tool based on learning and adapting to new data based on software. The ruling guide algorithmic pathway is a response to this uncertainty, many legitimate questions need to be addressed to assess and control the risks related to an AI solution. Issues pertaining to the ruling guide algorithmic pathway include:

Human Rights

If the dataset is biased at the outset, what happens with the output coming from the algorithm? Will certain groups/populations be disadvantaged? What will the consequences be for an organization and the individuals?

Contracts and Liability

Most organizations cannot possibly assume all risks related to their product (particularly the unpredictable ones). Therefore, the ruling guide algorithmic pathway is a guide to draft a fair contract between entities.

Data Privacy

The ruling guide algorithmic pathway provides a guiding light for confidential or sensitive information. This algorithm also provides a gateway to making sure that information is useful for the product, but also protects the owners of said information.

Intellectual Property

Organizations are becoming difficult to value reliably and accurately due to the economy becoming increasingly intangible. Many of the criticisms of traditional methods result from its inability to value these intellectual property or knowledge assets [1]. AI technology is influencing the complexity in production processes and products. Stock market valuations are frequently several times higher than book values. This gap is viewed as evidence that the effects of AI technology and knowledge are very imperative to corporate and individual's wealth.

Since AI algorithms are highly collaborative, built upon the prior research and development, the ruling guide algorithmic pathway helps to strike a balance on how we balance the competing concerns of the public good and market advantages. It sheds light on how to increase collaboration between academia and industry. Finally, this algorithm is a start on how organizations can address the private legal concerns of creating intellectual property as well as the valuation [1].

The Ruling Guide Pathway is based on the specific rules, guidelines or procedures used by the people making the decisions. For example, in the case of auditors use the International Auditing Standards (IAS) or the Generally Accepted Auditing Standards (GAAS) as the guidelines to conduct an audit on a company's financial statements. In this pathway, it is assumed that the rule governs the process even though the provided information may paint a different story. In other words, rules are over substance (*i.e.*, information). The lack of relevant or reliable information forces the auditor to rely on rules to make decisions. GAAS do not provide hard

CHAPTER 6

The Analytical Algorithmic Pathway

Artificial intelligence (AI) is manna from heaven for sci-fi writers. We've seen a sentient computer called HAL wreak quiet havoc in 2001: A Space Odyssey. *We've watched a robot girl's will to survive in 2015's* Ex Machina. *Most recently we've seen an AI-meets-the-wild-west scenario in TV series* Westworld. *Writers do a great job of making AI entertaining, but does it work the other way around? Can AI itself create, develop and write storylines, scripts and other art forms? AI is spreading into every corner of human existence. So it should come as no surprise that it's helping authors, journalists and writers to create in ever more inventive ways.*

---Jamie Carter

The human brain has about 100 billion neurons. With an estimated average of one thousand connections between each neuron and its neighbors, we have about 100 trillion connections, each capable of a simultaneous calculation ... (but) only 200 calculations per second.... With 100 trillion connections, each computing at 200 calculations per second, we get 20 million billion calculations per second. This is a conservatively high estimate.... In 1997, $2,000 of neural computer chips using only modest parallel processing could perform around 2 billion calculations per second.... This capacity will double every twelve months. Thus by the year 2020, it will have doubled about twenty-three times, resulting in a speed of about 20 million billion neural connection calculations per second, which is equal to the human brain.

---Ray Kurzweil

As a global futurist and futurephile, one of the things that excites me about artificial intelligence is the death of procrastination -- anything 'left brained' that we avoided and delayed doing, like taxes, filing, travel expense coding, receipt management, and updating our calendars will be procrastinated on no longer. That in and of itself should sell you on the virtue of AI -- unless you of course derive a lot of pleasure from these activities, in which case I urge you to upgrade and diversify your thinking.

---Anders Sorman-Nilsson

Abstract

The Analytical Algorithmic Pathway, I→J→D, involves of attaining the most usefulness from an individual or organization decision given reliable and relevant information. On the other hand, information that is incomplete, noisy, and/or difficult

to interpret deteriorates the interpretation of this algorithmic pathway. This algorithmic pathway shoulders that all information is known, the environment is controllable, and the information is precise, in that it can be related to other events, or that it can be rated or ranked. Characteristically, the environment is stable, and the information and events are precise.

Keywords: Analytical Algorithmic Pathway, Artificial intelligence, Biases, Biometrics, Decision tree, Dynamic Signature Verification, Facial Recognition, Fingerprint Biometrics, Fraud, Fraud triangle, Hand geometry reader, Hand geometry recognition, Iris reader, Misstatements risks, Opportunity, Palm print reader, Pressure, Rationalization, Retina Scanner, Vein Patterns.

INTRODUCTION

The Analytical Pathway is based on information, judgment, and decision choice. This algorithmic pathway suggests that information has a direct impact on our analysis of the situation. In this pathway, perception is ignored or played down; therefore, biases, strategies, and emotions has very little import in influencing the decision choice. In the information step, information sources that are typically reliable and complete are determined and in the judgment step, those information sources are weighted on how they impact the analysis. This pathway is usually useful when the environment is stable and when information sources are reliable and relevant [1].

The Analytical Pathway is implemented by decision makers when information influences the analysis and therefore the final decision (See Fig. **6.1**). For example, in an audit, the information received by the client determines the types of procedures that will be performed in order to give a professional opinion on the financial statements and internal controls. For instance, think of a not-for-profit organization that provides medical attention to women that have income under a certain threshold. The auditor must perform procedures to ensure that adequate documentation was requested from patients to make sure they comply with the eligibility requirements. This specific information regarding the client is utilized by the auditor to select the appropriate procedures to determine if the company did a good job in only accepting patients that were eligible. AI may assist in this process if the company has access to the patient's tax records. Hence, the auditors can confirm the annual income of possible patients. This is similar to what universities' student aide administration does to evaluate the financial need of students when they apply for grants and loans. Having the AI system to access records facilitates this process. Without access to records, the company must request documentation, such as paystubs, which makes the procedure more time consuming for the auditors.

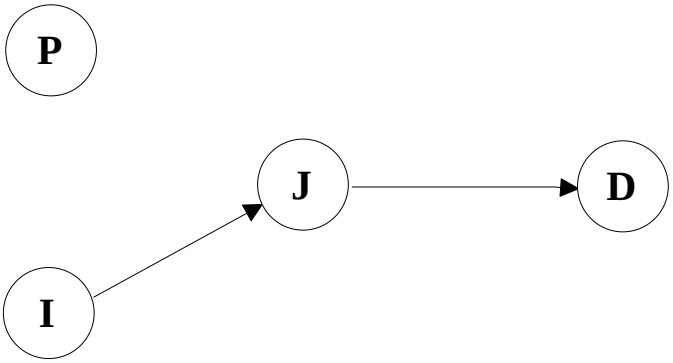

Fig. (6.1). I→J→D. The decision path consists of information to judgment to decision choice. Source: Rodgers [1].

The Analytical Algorithmic Pathway (I→J→D) does not focus on perception at all, it relies primarily on the information that is available. Nonetheless, when this pathway relies only in information, we have the risk that problems may appear and this is because sometimes information may be incomplete, or difficult to interpret. It works most admirably when information is reliable and relevant, this pathway can also be divided in two parts: stable and unstable environment [1] (see Fig. **6.2**).

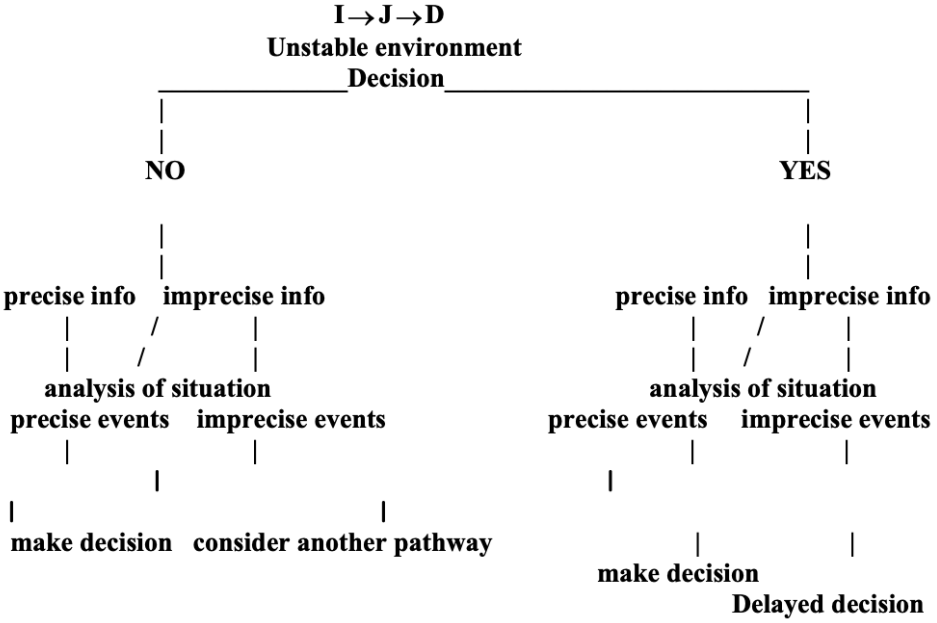

Fig. (6.2). Analytic pathway decision tree (I→J→D). Adopted from (Waymond Rodgers, Process Thinking, [1]).

CHAPTER 7

The Revisionist Algorithmic Pathway

Everything that civilisation has to offer is a product of human intelligence; we cannot predict what we might achieve when this intelligence is magnified by the tools that AI may provide, but the eradication of war, disease, and poverty would be high on anyone's list. Success in creating AI would be the biggest event in human history. Unfortunately, it might also be the last.

---Stephen Hawking

In case you are sitting here pondering this question thinking that AI will never eliminate human intelligence because humans still have to program and train them, that isn't entirely true. Right now, there are of course still researchers, programmers, and engineers who train robots and rudimentary AI systems. However, more and more code -- much of it in relation to AI -- is actually being written by AI programs already. Programmers today no longer have to write long complex codes for AI telling the robot to do this or that. They simply have to write code that tells a program to write code telling the AI to do this or that.

---Trevor English

One could argue that an AI system would not only imitate human intelligence, but also "correct" it, and would also scale to arbitrarily large problems. But we are now in the realm of science fiction.

---Michael Jordan

Abstract

The Revisionist Algorithmic Pathway (I→P→D) focusses on an unstructured environment whereby people or organizations may use all available information to influence their perception before rendering a decision. In this situation, the information can be complete or incomplete. Nonetheless, due to the vagueness of the event it becomes challenging for individuals or organizations to model the data according to rating, ranking, or ordering. Hence, the use of this algorithmic pathway is highly dependent on information changing resulting in a alteration of how individuals or organizations perceive a situation.

Keywords: 4th Industrial Revolution, Algorithm, Biometrics, Decision choice, Deep learning, Facial recognition, Fraud triangle, Identification, Information, Machine learning, Neural networks, Opportunity, Perception, Pressure, Rationalization, Revisionist algorithmic pathway, Supervised Learning, Throughput Model, Unsupervised Learning, Verification, Voice recognition.

INTRODUCTION

The I→P→D algorithmic pathway is known as the "revision pathway" because information can influence an individual's perception of looking at things. When individuals use this pathway, they must trust the information is accurate. When there is time pressure or an unstable environment this pathway can force an individual to use it because they may not have time to analyze the situation. The I→P→D pathway can be divided into two parts given a stable or unstable environment, which could result in different decision choices.

The Revisionist Algorithmic Pathway (I→P→D) is based on Information to Perception to Decision Choice. This pathway suggests that available sources of information will influence the perception of the problem and therefore, will guide the decision. This pathway relies on information to revise our perception. This pathway suggests that information will be used to shape our perception even if it is incomplete, unreliable, or wrong, as long as the person making the decision believes the information to be true. This pathway serves well in unstable environments and is used when time is not sensitive in solving the problem (Fig. **7.1**).

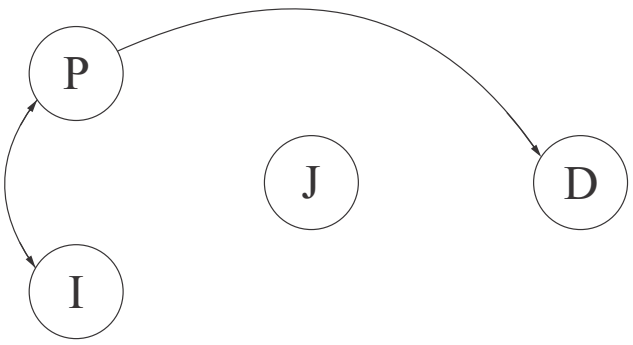

Fig. (7.1). I→P→D The algorithmic decision pathway consists of information to perception to decision choice. Source: Rodgers [1].

The Revisionist Pathway (I→P→D) is similar to the Expedient Pathway (P→D), with the exception that information revises the perception of an individual. An example about this would be when an audit firm gets a new client. Before accepting a new engagement with a new client, auditors have the responsibility of

contacting the prior year auditor's and get the necessary information to get started on the audit. Since the auditor does not know the client, the information received from the prior auditors helps shape the auditor's perception of the client. This is a very important and mandatory step in the process. If the auditor is unable to obtain information from the prior auditors, the auditor must Fig. out a way to replace that step. In this case, the decision would be whether to accept the client or not. AI that would help the auditor with this step, would be if the prior auditors had some sort of compatible software, where the new auditors could easily transfer the required information.

The information can be considered as the starting point, since new information provides the necessary signals to improve our shape or the way we are understanding the situation and it helps before any action is taken. This process is like a symbolic neural network function that updates an entity's perception (*i.e.*, I→P), which reflects a Bayesian model (Rodgers, 2020).

Furthermore, in this pathway information is effectively used even if it may be incomplete, or with interpretational problems. In other words, this pathway may also indicate individuals making decisions based on information they are given, whether it is accurate or not. If the information confirms their framing or belief structure with what they have already perceived, an individual may go ahead and continue to make a decision choice based on it. An important example is when some individuals may decide to attend graduate school and pursue a postsecondary education because they believe that will prepare them better for the workforce and they will get paid more as compared to someone who does not attend graduate school.

EXAMPLE 1: REVISIONIST PATHWAY (I→P→D) FOR PAY CARD SYSTEMS

Driven by the 4th Industrial Revolution, technology has completely infiltrated our world and there is no going turning back. AI and the concepts surrounding it may still seem to the layperson, as distant ideas that do not lay within our homes but that would be incorrect. Our everyday lives are filled with computers and the advancements that tech giants have created. This is even more apparent in the business world. There are fewer and fewer organizations that do not rely on technology and AI to help stabilize and grow their business. As a result of this, there are more opportunities' for not only fraud prevention, but also for misstatements and flaws that can wreak havoc on any organization. As technology and the businesses that utilize them advance it is vital that auditors and forensics advance and understand these models as well. Understanding algorithms, natural language processing, machine learning, and deep learning is becoming more and

CHAPTER 8

The Value-driven Algorithmic Pathway

I'm hoping the reader can see that artificial intelligence is better understood as a belief system than as a technology.

---Jaron Lanier

In a way, AI is both closer and farther off than we imagine. AI is closer to being able to do more powerful things than most people expect -- driving cars, curing diseases, discovering planets, understanding media. Those will each have a great impact on the world, but we're still figuring out what real intelligence is.

---Mark Zuckerberg

The implications of AI are still being worked out as technology advances at a dizzying speed. Christians, like everyone else, are asking questions about what this means. But one thing people of faith want to affirm most strongly is that technology has to serve the good of humanity -- all of it, not just the privileged few. Intelligence -- whether artificial or not -- which is divorced from a vision of the flourishing of all humankind is contrary to God's vision for humanity. We have the opportunity to create machines that can learn to do things without us, but we also have the opportunity to shape that learning in a way that blesses the world rather than harms it.

---Mark Woods

Abstract

The Value Driven Algorithmic Pathway (P→I→J→D) designates how people or organizational perceptual framing assists in guiding and selecting types of information utilized in the judgmental stage. This algorithmic pathway is motivated by information processing limitations, complexity, and coherence between perception and the available information. Therefore, to take this algorithmic pathway, a person or organization's perception is modified and selected as the information that will be analyzed for a decision choice.

Keywords: Algorithms, Artificial intelligence, Big data, Categorical variables, Continuous variables, Decision choice, Decision tree, Deep learning, Entropy,

Waymond Rodgers

Information, Judgment, Learning, Machine learning, Perception, Problem solving, Reasoning, Retina Scan Image, Throughput Model, Type 1 and type 2 errors, Value-Driven Algorithmic Pathway.

INTRODUCTION

The Value-Driven Algorithmic Pathway (**P→I→J→D)** indicates that perception **(P)** guides the different types of information sources **(I)** is used in the analysis **(J)** enroute to make a decision choice **(D).** Perceptual framing **(P)** has an influence on a variety of information (**I**) that will be selected and used in the analysis process (**J**) (see Fig. **8.1**). It is crucial to understand that our handling of a situation is strongly influenced by the education, training, and experience of individuals. This pathway is also known as the "value driven," since our perception tend to change or how we interpret the information that we have available or have share with us. Further, the information in this pathway is weighted based on how we frame each situation [1].

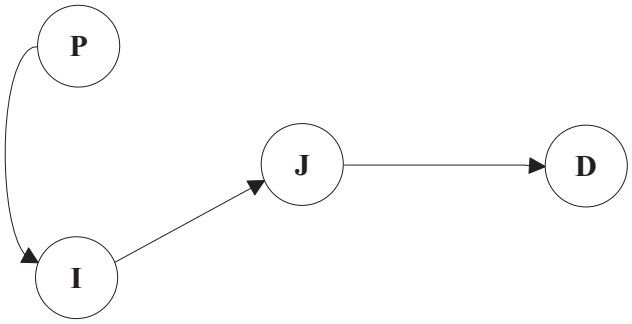

Fig. (8.1). Value-driven algorithmic pathway (P→I→J→D). The decision path consists of perception to information to judgment to decision choice. Source: Rodgers [2].

Yet another aspect of the Value Driven Pathway is that it embodies the Analytical Pathway (**I→J→D**). Or another way of describing this embodiment is to view the perceptual frame (**P**) as a conditioning influence on an analytical and programmatic way of reaching a decision. The highlight of the Value Driven Algorithmic Pathway is that it can modify or discard informational sources used in analysis (**J**).

Moreover, in the use of this pathway, we must make sure we take extra case to acknowledge that certain strategies may be a part of our perceptions, which will impact on the available information. In addition, this is an appropriate pathway to use when an individual has the knowledge or can consider himself/herself and expert in the situation. Nonetheless, this pathway should not be also under extreme time pressure that may limit the use of relevant and reliable information [1].

The Value Driven Pathway is one of the two pathways that include all of the elements in the Throughput Model: perception, information, and judgment to arrive to a decision. The Value Driven Pathway suggests that perception shapes the types of information that will be used in the analysis. This means that the person making the decision will look for sources based on his/her perception of the situation. This limits the amount of information that comes into play and some useful and relevant information sources may be ignored. This pathway is especially useful when the person is an expert on the situation, there is no time pressure, and the information acquired is relevant and reliable.

The Value Driven Algorithmic Pathway is used by expert auditors when there are no time pressures, and the information is reliable. Suppose you are working on an audit for a client that had a few findings last year, and it was hard to get appropriate documentation from them. The auditor already has the perception of the client that it will be a complicated audit and therefore asks for additional information than usual because the client has made material misstatements in the past. The auditor will try to find the same material misstatements as last year, because it is likely for a repeat finding to happen. Suppose the client had several material misstatements in the financial statements, and net income is overstated, expenses are understated. This year, the auditor will perform additional procedures and request more information, to ensure that the same mistakes are not made again. This process is lengthier because it requires the auditors to go over a lot more information and perform a deeper analysis. If the same material misstatements exist, there will be repeat findings, and possibly a qualified opinion. If the company improved their internal controls, and avoided the same mistakes, the opinion will be unmodified. AI technology can be suggested by the auditors to help the client implement more efficient internal controls, such as better software more tailored to the company's size and industry.

DECISION TREES

Machine learning is part of AI. It can provide new ways of solving problems. AI inspired machine learning can learn, predict, and decide. In this way this type of technology analyzes the data in new ways, recognize, like facial recognition, automated car recognition and make decision choices. There are different kinds of machine learning. Supervised learning where you have the data and answers. In this case, you already have the data as to who can make the payments and who cannot from the people who have already applied for the loan. This process helps predict on the next person if they are going to make the loan or not. The second learning is unsupervised learning groups the like kind of data like it would categorize all houses in one group, all trees in one group without knowing what they are. The third type of learning is reinforcement learning. Here you don't have

CHAPTER 9

The Global Perspective Algorithmic Pathway

The story of evolution unfolds with increasing levels of abstraction.

---Ray Kurzweil

Any kind of artificial intelligence clearly needs to possess great knowledge. But if we are going to deploy AI agents widely in society at large -- on our highways, in our nursing homes and schools, in our businesses and governments -- we will need machines to be wise as well as smart.

---Gillian Hadfield

Although we don't know much about how the human brain works, we know a bit more about how it got to this state: natural selection. So some people are trying to artificially replicate natural selection with machines -- although it won't take millions of years, because it's less random. It's called evolutionary computation, or genetic algorithms, and it sets up machines to do certain tasks; when one is successful through trial and error, it's combined with other machines that are successful. But it's an iterative process, which presents a problem: We don't know how long it will take to create intelligence equal to our own.

---Vasco Pedro

Abstract

The Global Perspective Algorithmic Pathway (**I→P→J→D**) takes into deliberation all types of information sources. This algorithmic pathway requests for an open-minded approach in which all possible information sources will be considered that can assist to update and modify a person or organization's perceptual frame. This process begins with information revising perception, followed by judgment to the decision choice. This algorithmic pathway is most ideal when there are no time pressures that will bound the time it takes to assemble the information and analyze the problem.

Keywords: Artificial intelligence, Decision choice, Facial Recognition, Fraud, Fraud triangle, Global perspective algorithmic pathway, Information, Iris recognition, Judgment, Keystroke dynamics, Opportunity, Perception, Pressure,

Rationalization, Risk of Material Misstatement (RMM), Type I "False Positive," Type II "False Negative," Retina Scan, Vein Recognition, Voice (Speaker) Recognition.

INTRODUCTION

Algorithms are not characteristically biased, algorithmic decisions are contingent on several factors, including but not limited to how the software is employed, and the quality and representativeness of the underlying data. The Throughput Model ensure that data transparency, review and remediation is considered during its algorithmic engineering processes. The Throughput Model has several important aspects regarding its algorithmic pathways.

First, input: it provides a set of defined input (*i.e*., perception and information).

Second, output: it produces results as output pertaining to problem solving or decision-making tasks.

Third, finiteness: the algorithmic pathways have a finite number of instructions.

Fourth, generality: the algorithmic pathways apply to a set of defined inputs.

Similar to the Value Driven Algorithmic Pathway, the Global Perspective Algorithmic Pathway also includes all the concepts, but in a different order of importance: information, perception, and judgment (see Fig. **9.1**). The Global Perspective Pathway suggests that information sources provide us to modify our perceptions and biases before the analysis gets to a decision. In the Value Driven Pathway, perceptions, or framing of the problem, influenced the information sources used in the analysis. In the Global Perspective Pathway, information sources are more extensive and varied, and they shape the person's perception or problem framing. This modified perception drives the analysis performed and therefore, the final decision choice. This algorithmic pathway has a much more elaborate process to gather information. The person (or for that matter a machine software program) making the decision must find information that is useful and identify and eliminate the biases and errors in it. This pathway considers incoming information sources in the framing of the perception that influences judgment (*i.e*., analysis). This pathway is the most time consuming; therefore, it is not useful when time is very sensitive. For this pathway to result in the superior decision, the information must be reliable and relevant.

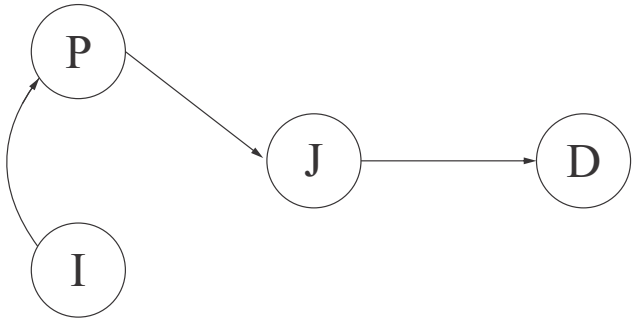

Fig. (9.1). I→P→J→D The decision path consists of Information to Perception to Judgement. Source: Rodgers [1].

For example, an auditor's perception can be shaped by the information received. Suppose an auditor is analyzing a client's inventory and obtains new information that the client just introduced robots that organize all the inventory. The only ones allowed to move inventory are the robots, and the orders must be approved by customer's online orders or by several people in management. This new information helps the auditor determine that internal controls related to inventory are strong and not a lot of procedures are necessary. The auditor analyses how the robots work, and the segregation of duties in the approvals, and decides the procedures that will be used in the audit.

The pathway represents a challenge for individuals perceptual framing **(P)** to devise a system to process information **(I).** This process contributes to the following dimensions: (1) to recognize the use of information and how we can identify biases and error in it; (2) to establish a system that helps/alerts for changing information; and last (3) provide a system that is similar or matches incoming information with our frame.

Nonetheless, it is important to mention one of the situations we may face with this pathway will be that can be immensely weakened by time pressure situations. In every situation time pressure may affect our decisions not just in projects but also in life. It can cause an individual to hurry to make a decision and it can end up on not making the right one. This will be because of missing information or trustable information. Time pressure can be seen as an unstable environment since it brings many stresses to individuals.

EXAMPLE 1: GLOBAL PERSPECTIVE ALGORITHMIC PATHWAY

When it comes to new advances in technology, one of the most important innovations is AI and the different aspects of it that help it become more useful for individuals, organizations, and society. This example illustrates how machine

CHAPTER 10

Moving Forward with Throughput Modelling and Advancing Technologies

"The pace of progress in artificial intelligence (I'm not referring to narrow AI) is incredibly fast. Unless you have direct exposure to groups like Deepmind, you have no idea how fast—it is growing at a pace close to exponential. The risk of something seriously dangerous happening is in the five-year timeframe. 10 years at most." —Elon Musk wrote in a comment on Edge.org

It is difficult to think of a major industry that AI will not transform. This includes healthcare, education, transportation, retail, communications, and agriculture. There are surprisingly clear paths for AI to make a big difference in all of these industries. ---Andrew Ng

Artificial intelligence may well help solve the most complex problems humankind faces, like curing cancer and climate change -- but in the near term, it is also likely to empower surveillance, erode privacy and turbocharge telemarketers.

---Jeff Goodell

Abstract

AI and related digital technologies have practically weaved its way through everything the 21st Century is tied to for performance and productivity. It provides individuals and organizations with a better, closer, more holistic view of solutions as never before. For most organizations, speed is essential on today's landscape. Furthermore, AI, machine learning, deep learning, natural language processing, big data, and other digital technologies assist individuals and organizations to collaborate with others in real time and connect processes and data to rapidly build trust and confidence.

Keywords: 5G, As-a-Service (aaS), Augmented reality, Automation, Blockchains, Cyber security, DARQ, Extended reality, Fifth dimension, First dimension, Fourth dimension, Human enhancement (HE), Internet of Behavior (IoB), Internet of Things (IoT), Parallelism, Quantum computing, Quantum qubits, Second dimension, Six dominant algorithmic pathways, Third dimension, Throughput Model, Virtuality reality.

Waymond Rodgers

INTRODUCTION

Today computers are in practically everything humans are involved with daily. Previously, the image of computers was depicted as rectangular objects either on a desk, or during contemporary times in our pockets. However, computers are in automobiles, thermostats, refrigerators, *etc*. More and more computers are no longer objects at all, but they permeate fabric and practically every other material. Some scholars predict that the influence of AI will be as worldwide transformative on economic and social structures as steam engines, railroads, electricity, electronics, and the Internet [1, 2]. In essence, the future of computing is going to impact individuals and organizations on an everyday basis.

Some of the exciting technological breakthroughs can be pictured by the Throughput Model in capturing the first, second, third, and fourth dimensions (Fig. **10.1**). For example,

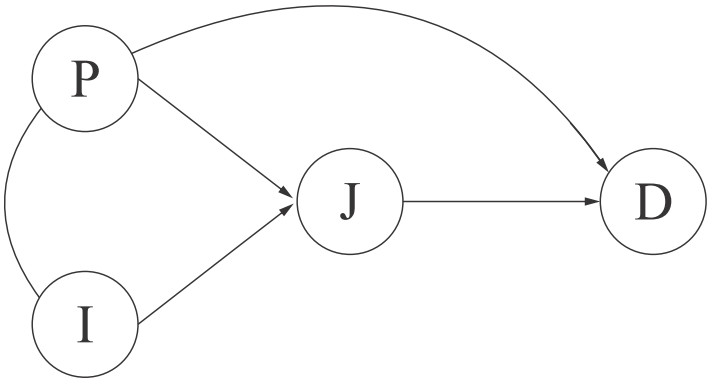

Fig. (10.1). Throughput modelling diagram. Source: Rodgers [7, 8].

Where P= perception, I= information, J= judgment, and D= decision choice.

DeepMind teams, a subsidiary of Google, work on leading-edge computer science, neuroscience, ethics, and public policy to responsibly pioneer AI systems. This research is very instrumental in clarifying ethical considerations and its importance between human and AI tools interaction (Rodgers and Gago [3 - 6]. Research scientists and engineers work together throughout DeepMind and with partners to produce systems that can advance all parts of society.

The Throughput Model's six dominant algorithmic pathways are motivated by different branches of learning such as psychology, behavioral economics, human-centered design, and ethics (Rodgers [7 - 10]. The Throughput Model postulates diverse stages as well as algorithmic pathways that depict the patterns in data use.

1. **The Expedient Algorithmic Pathway P→D**
2. **The Ruling Guide Algorithmic Pathway P→J→D**
3. **The Analytical Algorithmic Pathway I→J→D**
4. **The Revisionist Algorithmic Pathway I→P→D**
5. **The Value Driven Algorithmic Pathway P→I→J→D**
6. **The Global Perspective Algorithmic Pathway I→P→J→D**

Research implies that the dimensions are states of consciousness, and the higher dimensions are closest to the source energy and others say that they are different densities [11]. AI neural networks attempts to mimic the human brain to provide faster, more efficient, and more effective problem solving in arriving at better decision choices (see Fig. **10.2**).

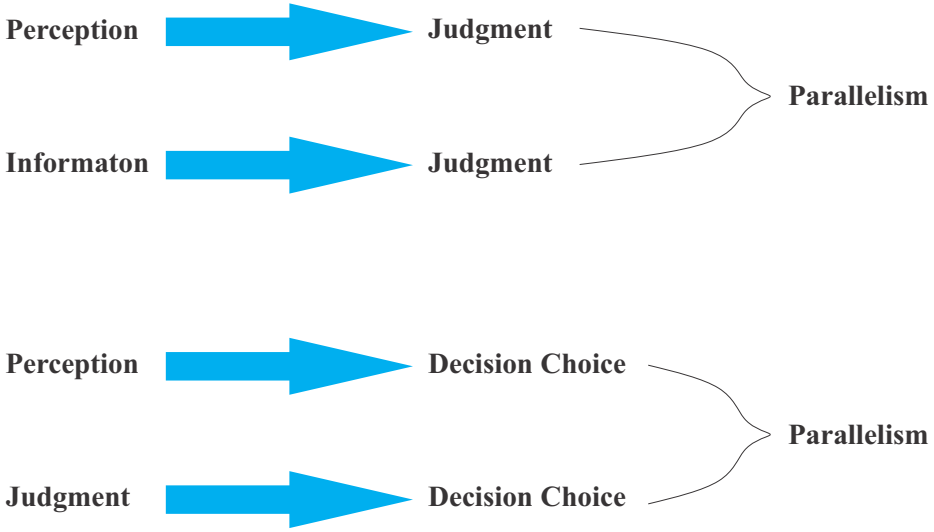

Fig. (10.2). Fifth dimension showing parallelism in the throughput model. Source: author.

The first dimension is a single point. For example, the constructs of perception, information, judgment, or decision choice. The second dimension contains two axis, x & y. For example, the two axes in the Throughput Model represents the following:

1. P→J

2. P→D

3. I→J

4. J→D

CHAPTER 11

The Coming Era of Artificial Intelligence will Provide Prosperity and Peace

Abstract

"The coming era of Artificial Intelligence will not be the era of war, but be the era of deep compassion, non-violence, and love".

---Amit Ray, Pioneer of Compassionate AI Movement.

Deep-learning will transform every single industry. Healthcare and transportation will be transformed by deep-learning. I want to live in an AI-powered society. When anyone goes to see a doctor, I want AI to help that doctor provide higher quality and lower cost medical service. I want every five-year-old to have a personalised tutor. ---Andrew Ng

The coming of computers with true humanlike reasoning remains decades in the future, but when the moment of "artificial general intelligence" arrives, the pause will be brief. Once artificial minds achieve the equivalence of the average human IQ of 100, the next step will be machines with an IQ of 500, and then 5,000. We don't have the vaguest idea what an IQ of 5,000 would mean. And in time, we will build such machines--which will be unlikely to see much difference between humans and houseplants.

---David Gelernter

Computers already undergird our financial system, and our civil infrastructure of energy, water, and transportation. Computers are at home in our hospitals, cars, and appliances. Many of these computers, such as those running buy-sell algorithms on Wall Street, work autonomously with no human guidance. The price of all the labor-saving conveniences and diversions computers provide is dependency. We get more dependent every day. So far it's been painless. But artificial intelligence brings computers to life and turns them into something else. If it's inevitable that machines will make our decisions, then when will the machines get this power, and will they get it with our compliance?.... Some scientists argue that the takeover will be friendly and collaborative--a handover rather than a takeover. It will happen incrementally, so only troublemakers will balk, while the rest of us won't question the improvements to life that will come from having something immeasurably more intelligent decide what's best for us. Also, the superintelligent AI or AIs that ultimately gain control might be one or more augmented humans, or a human's downloaded, supercharged brain, and

Waymond Rodgers

not cold, inhuman robots. So their authority will be easier to swallow. The handover to machines described by some scientists is virtually indistinguishable from the one you and I are taking part in right now--gradual, painless, fun.

James Barrat

Abstract

All around the planet, individuals and organizations have had to suddenly re-evaluate their plans. The necessity to innovate and transform organizations to the new frontier is upon us now. AI and its related digital technologies have taken over the traditional computing methods, changing how many individuals and organizations perform their day-to-day operations. From research and manufacturing to modernizing finance and healthcare streams, leading AI has transformed the entire tapestry in economic, political, and social endeavors in a relatively short amount of time. Moreover, the Throughput Model algorithmic processes can assist in the digital transformation and adoption of AI and related digital technologies by organizations by providing essential algorithms to solve and optimize many core challenges in the world today. These algorithms can be applied directly to assist programmers when it comes to designing software systems, detecting, and overcoming software bugs, as well as when it comes to writing code. By utilizing the Throughput Model algorithmic pathways may assist the structure of the code, which can provide the AI system with useful suggestions, not only improving the overall productivity but also assist in reducing wasteful time, confusion as well as ethical dilemmas.

Keywords: Algorithms, Analytical algorithmic pathway, Artificial intelligence, Big data, Biometric technology, Cloud computing, Decision choice, Deep learning, Ethics, Expedient algorithmic pathway, Global perspective algorithmic pathway, Information, Internet of Things, Judgment, Machine learning, Natural language processing, Perception, Revisionist algorithmic pathway, Ruling guide algorithmic pathway, Six dominant algorithmic pathways, Throughput Model, Value driven algorithmic pathway.

INTRODUCTION

AI is a computing concept that involves the creation of an independent non-human agent to carry out tasks. Originally conceived by Alan Turing in the 1950's, artificial intelligence now surrounds us at every turn. All industries utilize some form of artificial intelligence, whether it be through software suites in offices or physical robots in warehouses. While AI is the driving force behind recent economic and technological advancements, there are some ethical concerns worth considering. Privacy, accuracy, and equity are all problems that must be addressed using an ethical framework.

Decades of AI research have confirmed that the difficult tasks, those that require conscious attention, are easier to automate. It is the easy tasks, the things that we

take for granted, that are challenging to automate. The things that individuals perform without much thought such as looking out in the world and making sense of what we view, carrying on a conversation, walking down a jam-packed sidewalk without bumping into anyone appears to be the toughest challenges for machines. While machines can outperform people on particular tasks, AI systems are a bit away from matching the more general human abilities we associate with ordinary tasks. For example, the most advanced language models still struggle with understanding basic concepts that most humans learn at a very young age without being instructed.

That is, today's AI systems can accomplish complex tasks in a variety of areas, such as mathematics, games, and photorealistic image generation. Moreover, some of the early goals of AI like housekeeper robots and self-driving cars continue to fade as we approach them. The speedy stride of development in AI and autonomy around the world drives new developments and in initiatives announced almost daily. As this body of work demonstrates, it is critical that individuals, organizations, nations and policymakers consider prioritize investing in and capitalizing on developments in AI and autonomy. That is to say, that AI is an evolving game changing technology that is been employed in various areas around the globe. Just as the wealthy Italian cities and merchants funded that country's Renaissance, AI has stimulated a renaissance of its own.

Algorithms, machine learning, deep learning, natural language processing, and big data are subsets of AI that focuses on the utilization of data and algorithms mimicking the way people learn. The machines are programmed to use an iterative approach to learn from the analyzed data, making the learning automated and continuous, to enhance explanations, predictions and prescriptions.

Algorithms are an unknown specification that enables a solution to a problem. Algorithms are able to process data, calculations, and even automated reasoning tasks. In short, an algorithm is a sequence of riles that specifies how to solve a problem. You could write a code and the code could technically be considered an algorithm. The advantage of algorithms in general are that they tell you step by step on how to solve a problem. People use algorithms in their everyday lives, for example, every time we brush our teeth, we first water the toothbrush, put tooth paste on the brush, brush our teeth, and then floss. In general, algorithms can be as simple and effective as brushing your teeth. One advantage in algorithms is that you can easily tweak the algorithm for improvement and overall create a more effective procedure.

Machine learning is a study of algorithms and statistical models that computer systems use to complete task without delegating specific instructions. Rather than

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Waymond Rodgers received a Ph.D. in accounting from the University of Southern California, and cognitive psychology postdoctorate from the University of Michigan. He is a certified public accountant in California and Michigan. Professor Rodgers holds a professorship at the University of Texas, El Paso. Professor Rodgers' accounting, banking, and management expertise derives from his employment as an auditor at Pricewaterhouse Coopers and Ernst & Young. He was also a commercial loan officer for Union Bank and his portfolio included Fortune 500 companies.

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