42™ RULES for Using AI in Your Contact Center

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42 Rules for Using AI in Your Contact Center (Book Excerpt)

An overview of how artificial intelligence can improve your customer experience

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Published by SuperStar Press™, a THiNKaha® imprint
20660 Stevens Creek Blvd., Suite 210, Cupertino, CA 95014
https://42rules.com

First Printing: October 2023
Paperback ISBN: 978-1-60773-126-9 1-60773-126-6
eBook ISBN: 978-1-60773-125-2 1-60773-125-8
Place of Publication: Silicon Valley, California, USA
Library of Congress Number: 2023915330

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Praises for This Book

Geoffrey offers a thorough, powerful, and practical guide for AI implementation and how this powerful technology can revolutionize contact center management and transform the customer experience. He tackles the challenge of AI implementation with a step-by-step analysis and detailed research that offer managers and executives a practical "how to" roadmap to success! "42 Rules for Using AI in Your Contact Center" is a must-read for everyone striving to transform their contact center operations with this emerging, powerful, and advanced technology.
Jim O'Rourke, Former Area President and Customer Call Center Executive, Verizon Communications

Geoffrey has done an outstanding job of outlining the focus points of AI, and how it can and will affect the Contact Center of today and the future. AI is an evolving field in its relative infancy. Understanding the terms, functions, layers, benefits, and pitfalls of AI is critical before undertaking the journey of deployment. As noted in this book, AI should not be a solution in search of a problem but rather an important component of solving unique problems that are already identified. Geoffrey outlines these points and initiates the conversation we should all be having regarding the value-add proposition of AI in the Contact Center.
Russell Gibson, VP, Technology & Operations, ZenQMS

Geoffrey has written a comprehensive resource for understanding how AI is currently being used in contact centers and the future of AI in customer engagements. 42 Rules for Using AI in Your Contact Center provides the advantages of AI from a business perspective and outlines the benefits to customers with insights into the impact AI will have on their experience. Geoffrey not only addresses the right topics, but also the deeper insights into this emerging and formidable technology for managers and executives who will need to deploy AI to stay competitive. I highly recommend this book for anyone contemplating the intricacies of using AI in your contact center.
Bruce Tuck, Contact Center Executive with over 25 years of experience

The most successful men, in the end, are those whose success is the result of steady accretion. It is the man who carefully advances step by step, with his mind becoming wider and wider and progressively better able to grasp any theme or situation, persevering in what he knows to be practical, and concentrating his thought upon it, who is bound to succeed in the greatest degree.
Alexander Graham Bell

Dedication

To my wife, Nurcan, who has always encouraged and supported me to look past today's technology horizon, and to my colleagues, family, and friends who have listened to me talk about artificial intelligence.

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Introduction

Artificial Intelligence (AI) has emerged as a revolutionary force driving the transformation of every industry, reshaping the way we work, live, and interact with technology. With its ability to process vast amounts of data, learn from patterns, and make autonomous decisions, AI has proven itself as a game-changer in the pursuit of efficiency, innovation, and optimization. From healthcare and finance to manufacturing and entertainment, the integration of AI has unlocked unprecedented opportunities, enhancing productivity, personalization, and problem-solving capabilities across the board. The significance of AI in shaping the trajectory of industries cannot be overstated, as it continues to foster breakthroughs and drive us toward what has been called the Fourth Industrial Era.

As part of this transformation, AI has the future potential to revolutionize how businesses interact with their customers and the possibility of not displacing agents with technology but upleveling their roles to new rewarding jobs. Contact centers are critical touchpoints for customer service, sales, and support. AI can enhance operational efficiency while significantly improving the customer experience through a conversational user interface via text or speech.

AI supports a wide range of applications for contact centers, including chatbots, virtual assistants, speech recognition, natural language processing, sentiment analysis, and predictive analytics. These AI-powered tools enable automated interactions, self-service options, and intelligent routing, reducing the need for human intervention, streamlining customer interactions, and providing real-time language translation.

Chatbots and virtual assistants have become prevalent AI applications in contact centers, leveraging natural language processing and machine learning

algorithms to understand customer queries and provide instant responses or guidance. Moreover, chatbots and voice bots allow agents to focus on more complex and value-added tasks. In the near term, AI will assist human agents rather than replace them by providing real-time guidance, relevant information, and suggestions during customer interactions.

Speech recognition and natural language generation enable AI to understand and respond to human emotions and analyze customer sentiment. Emotional intelligence algorithms help gauge customer satisfaction, detect frustration or dissatisfaction, and tailor responses accordingly. This empathetic approach will contribute to more supportive and satisfying customer experiences over various communication channels, including voice, chat, email, and social media, to ensure consistent and personalized experiences regardless of the media chosen.

While AI offers significant benefits, there are challenges to overcome. Contact centers must ensure seamless integration between AI systems and existing applications and infrastructure with clear escalation paths for human intervention in complex inquiries. Moreover, ethical considerations, such as data privacy and transparency, must be addressed to build customer trust.

This book provides the prospective use of AI in contact centers and the impact on your customers. The future of AI in contact centers holds immense potential for delivering exceptional customer experiences, empowering agents, and driving operational efficiencies. Integrating AI with a strong focus on ethical practices can shape how your contact center interacts with your customers. Of course, the rapid pace of advancements in AI will continue, and you will need to define your journey based on the technology available at the time.

Rule

11 Prediction and Machine Learning

Predictive machine learning uses statistical procedures to anticipate trends and behaviors to create models based on analyzing current and historical data and projecting what it learns to forecast likely outcomes.

Prediction in machine learning is a specific application of predictive analytics that originated in the 1940s for predicting future outcomes from manual data models. Predictive machine learning is a newer, more agile tool for predictive analytics that uses a computer to "learn" patterns from data collected without being defined by humans. Like predictive analytics, predictive machine learning uses statistical procedures to anticipate trends and behaviors to create models based on large historical data sets. It works by analyzing current and historical data and projecting what it learns from a model to forecast likely outcomes. Training models use input features, known as independent variables, and corresponding target values, known as dependent variables. The model learns the patterns and correlations between the input features and target values during the training process.

In contact centers, machine learning can use data models to predict customers' needs, preferences, and behaviors. Data models are not static; they need to be repeatedly validated or revised regularly to incorporate learning. In other words, predictive machine learning is not a once-and-done process. It makes assumptions based on what has happened in the past and what is happening now. If new data changes the data model, the impact on the likely future outcome must be recalculated, too.

The first step in machine learning is to gather relevant data representative of the problem for the model. Data may include features or attributes believed to be the foundation for predictions and corresponding target variables or labels that represent the outcomes you want to predict. Once the data is collected, it often requires preprocessing to clean and certify the contents. This may involve identifying missing values, normalizing or scaling features, encoding categorical variables, and splitting the data into training and testing sets.

The next step is selecting an appropriate machine-learning model. The details and complexity of prediction in machine learning can vary depending on the specific algorithms and prediction techniques used. Different models, such as decision trees, support vector machines, neural networks, or ensemble methods, each have unique characteristics and training procedures.

In the training phase, the selected model is fed with prepared data. The model learns the underlying patterns and relationships in the data by adjusting its internal parameters based on examples. This process typically involves an optimization algorithm, such as gradient descent, to train machine learning models and neural networks to minimize the difference between the model's predicted outputs and the actual target values in the training data.

Once the model is trained, it must be evaluated to assess its performance and generalization capabilities. The model is tested on unseen data from the testing set to measure its predictive accuracy or other relevant metrics. This evaluation helps determine if the model can predict new, unseen data effectively.

Prediction in machine learning is an iterative process. If the model's performance is unsatisfactory, you can refine it by adjusting various aspects such as the choice of features, the model architecture, hyperparameters, or more advanced techniques. This iterative process helps improve the accuracy and reliability of predictions.

Rule

16 Deep Learning

Deep learning models will enable robust conversations in any language with the ability to understand your sentiment and emotions and reply in kind.

Deep learning is a subfield of AI that focuses on training ANN to mimic the human brain's learning processes. Think of AI like a Russian Matryoshka nesting doll, with multiple figures, each one inside another. AI is the largest doll, with machine learning nested inside it. Within machine learning is deep learning, which is further broken down into neural networks, the foundation of deep learning algorithms. Deep learning is a method used to discover knowledge and make predictions. For instance, companies like Netflix and Amazon use deep learning as recommendation engines.

Deep learning models the layers of neurons found in the neocortex of the human brain. This technology is called "deep" because it has multiple hidden layers of neurons, allowing for nonlinear feature transformation states. Deep learning utilizes the multiple layers of ANN to extract and learn hierarchical data representations. These networks consist of interconnected nodes, or artificial neurons, which process and transmit information. Through an iterative process called training, the neural network adjusts the weights and biases of its connections to optimize its performance on a specific task.

AI deep learning can enhance various customer service aspects of the interaction. It can automate repetitive tasks through intelligent chatbots or voice bots, such as routing calls or answering frequently asked questions. Deep learning systems

can understand natural language, interpret customer intent, and provide accurate and timely responses. For instance, chatbots and voice assistants like Siri and Cortana can communicate with users in their specific context.

After a deep learning system has been trained to understand one language, the next logical step is to teach it to understand multiple languages and translate between them. Deep learning models, particularly Recurrent Neural Networks (RNN) and their variant, the Long Short-Term Memory (LSTM) networks, have achieved impressive results in translating one language to another. RNNs employ internal memory that allows them to retain information about previous inputs to influence the current output. The LSTM model utilizes a specialized type of RNN, which enables it to remember and discard information selectively across various time periods.

These models process sequential data, such as sentences, and capture contextual dependencies, making them well-suited for language translation tasks. Translation begins by training a deep learning model on a large data set of parallel texts, where each sentence is aligned in two languages. This data teaches the model to learn the patterns and relationships between words in the source and target languages. Real-time translation systems based on deep learning benefit from their ability to handle complex linguistic structures, idiomatic expressions, and ambiguous sentences. They can capture the nuances of languages and produce more contextually appropriate translations.

Deep learning models can also analyze customer sentiment and emotions by processing voice recordings or text messages. This allows contact centers to proactively identify customer satisfaction levels and address potential issues. Furthermore, deep learning can predict customer behavior, such as churn likelihood and customer retention initiatives.

Rule

28 Understand AI Hallucination

When decisions are made based on past wrong decisions, AI may provide a confident response that isn't supported by its training data, resulting in a distorted perception of reality.

AI hallucination in contact centers refers to a phenomenon where AI systems generate inaccurate information or nonsensical responses with confidence during customer interactions. Contact centers are adopting AI technologies to improve customer experiences and streamline operations for handling inquiries and support requests. However, as AI systems become more advanced, there is a growing concern about their potential to generate hallucinatory experiences that can impact the quality of customer service and expose the business to unnecessary liability.

AI hallucination in contact centers often starts with the dependence on machine learning algorithms that are designed to identify patterns and forecast outcomes based on massive data sets. Although useful in various scenarios, these algorithms may produce results that are not accurate or lack proper context. When confronted with novel or ambiguous customer queries, AI systems may resort to hallucinating responses based on incomplete or incorrect information, and do it with confidence.

Imagine a customer calling a contact center to inquire about a refund for a product they purchased. Based on previous interactions, the AI system may generate a hallucinated response that misinterprets the customer's request or provides inaccurate information about the refund process. AI hallucinations can lead to frustration and dissatisfaction on the part of the customer, as they receive irrelevant or incorrect responses from the AI system.

AI hallucination can also occur when AI systems attempt to simulate human-like conversational abilities. NLP models, often used in chatbots or voice assistants, are trained to understand and generate human-like responses. However, in some instances, they may produce hallucinatory or nonsensical answers that do not align with the context or intent of the customer's query. This can create confusion and undermine the purpose of using AI in contact centers to provide efficient and accurate support.

Addressing AI hallucinations in contact centers is a multifaceted approach. First, ongoing research and development is needed to improve the robustness and reliability of AI systems. This includes improving the quality of training data, refining algorithms to handle novel scenarios, and incorporating safeguards to prevent hallucinatory responses. Moreover, human oversight and intervention should be integrated into the AI systems to ensure that any generated responses are accurate and aligned with the customer's needs.

Another important aspect is transparency and explainability. AI transparency outlines the expected impact and potential biases of an AI model. AI systems need to provide clear explanations of their reasoning and responses to identify and correct hallucinatory outputs. This requires a mechanism for feedback with continuous learning to reduce the occurrence of hallucinations.

This requires human-AI collaboration. While AI systems can handle routine and straightforward customer inquiries, there will always be cases where human intervention is necessary. By augmenting contact center agents with AI tools, they can leverage the AI's capabilities while providing the expertise and contextual understanding that AI systems may lack. This hybrid approach ensures that customer inquiries are handled accurately and efficiently, reducing the likelihood of AI hallucination.

Rule

38 Risks in Data

The adage of "garbage in, garbage out" has always been and will always be prevalent in any system such that the quality of input determines the quality of output.

AI prediction machines carry risks. If your company is, or will be, investing in any form of AI, it will face these risks, and eliminating all of them is impossible. Risks may ensue from input data, training data, or feedback data. These risks can impact the accuracy and reliability of predictions made by machine learning models. Remember that deploying AI in contact centers is where predictive output can be significant for your customers and your business.

A few years ago, incorrect predictions from a machine learning model were normal. Incorrect predictions are now the exception. AI prediction machines are expected to perform flawlessly, especially when deployed in real-world applications such as contact centers.

Risks in input data stem from the old computing adage "garbage in, garbage out." Data collection and input data that is incomplete, insufficient, or lacks relevant information may interact with your customers with inaccurate or incomplete predictions. Inadequate training data that does not adequately capture the diversity and complexity of real-world scenarios can lead to poor generalization, resulting in a failure to learn robust patterns or make accurate predictions in situations that differ from the training data. Your prediction machine may not learn effectively if feedback data does not represent the actual outcomes, limiting the model's ability to improve its predictions over time.

There is plenty of evidence that shows that humans discriminate. Allowing human bias in input data, training data, or feedback data may cause predictions to perpetuate or amplify those biases, resulting in unfair or discriminatory outcomes. There are also liability risks for your AI system if they exhibit profiling of age, gender, or nationality. Your company can be liable for discrimination, even if it is accidental. Hence, it is crucial to carefully evaluate and mitigate bias in the input data to ensure fair predictions.

Noisy or low-quality data with errors, outliers, or missing values can also introduce inconsistencies and distortions. This can lead to unreliable predictions and negatively impact the predictions made by your machine learning model. Erroneous training data can introduce inconsistencies, mislead the learning process, and lead to inaccurate predictions. Noisy feedback can also mislead the model's learning process and hinder its ability to improve accuracy. Proper validation and quality control mechanisms can avoid this and are necessary to address this risk of dirty data.

Ensure your training data is large enough for your data samples to represent all possible input data to avoid data overfitting accurately. Overfitting occurs when a prediction machine is over-designed to specific patterns and noise in training data, resulting in poor generalization to new data. Models that overfit training data may exhibit high accuracy during training but perform poorly on unseen data.

To mitigate these risks, it is essential to carefully curate and preprocess data, address bias and imbalance, employ appropriate regularization techniques, conduct thorough validation and testing, and ensure the representation of relevant features. Regularly monitoring and evaluating the model's performance against diverse and high-quality training data is crucial to building reliable prediction machines.

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Appendix

Three Letter Acronyms & Lexicon

Artificial Intelligence and the contact center industry are full of three or more letter acronyms (TLAs) and jargon that can overwhelm even the most knowledgeable individuals. This appendix summarizes TLAs and terms used in this book, but by no means is it a complete lexicon of all the terms used in either contact centers or the AI industry.

Accelerated Computing	Advances generative AI by significantly reducing training and inference times using specialized hardware such as graphics processing units (GPUs) and tensor processing units (TPUs). Generative models can leverage parallel processing to accelerate computations and efficiently handle complex tasks. This acceleration enables researchers and practitioners to train larger models, explore more sophisticated architectures, and achieve higher-quality outputs in various generative AI applications, ranging from image synthesis to natural language generation.

AI	Artificial Intelligence refers to developing and implementing computer systems that can perform tasks typically requiring human intelligence, such as learning, problem-solving, and decision-making. Examples of AI include understanding human text and speech and detecting and translating languages.
AHT	Average Handle Time is a contact center metric used to measure the average duration of one transaction. It usually starts from the customer beginning the interaction and covers hold time, talk time, and any other related tasks during the conversation.
AI Act	A regulatory framework proposed by the European Union to govern the development, deployment, and use of artificial intelligence systems within the EU. It aims to ensure AI's ethical and trustworthy use while promoting innovation and competitiveness. The Act introduces requirements for high-risk AI systems, including transparency, accountability, and human oversight. It establishes a comprehensive framework for AI governance and market surveillance to protect the rights and safety of individuals.
Algorithm	Algorithms are a set of rules a computer follows while executing operations. Algorithms tell a computer how to act in various situations. Combining multiple algorithms allows applications to perform more sophisticated tasks without human intervention. For example, a chatbot can use algorithms to suggest products based on a shopper's purchase history or route customers to a specific human agent whose specialty best matches the incoming question.

ANN	Artificial Neural Networks are biologically inspired computational networks which simulate the human brain processes. ANN consists of interconnected nodes, called artificial neurons or units, organized into layers which include an input layer, one or more hidden layers, and an output layer. ANNs can learn from data by adjusting the weights and biases of the connections between neurons, enabling them to process complex information, recognize patterns, and make predictions or decisions. ANNs have been successfully applied to various tasks, such as image recognition, natural language processing, and time series prediction.
AR	Augmented Reality is an interactive experience that enhances the real world with computer-generated perceptual information. Using software, apps, and hardware such as AR glasses, augmented reality overlays digital content onto real-life environments and objects.
ASR	Automated Speech Recognition, also known as speech recognition, computer speech recognition, or speech-to-text, enables a program to process human speech into a written format. ASR uses algorithms and models to analyze and transcribe audio signals into textual representations. ASR applications are in various domains, including voice assistants, transcription services, call centers, and language processing, enabling efficient and accurate conversion of spoken words into text data.
Avatar	A digital representation or embodiment of an entity, often a person or a character that interacts with users in virtual environments or through digital platforms. Avatars can be visual representations in the form of animated characters or graphical icons, or they can be voice-based representations in the case of virtual assistants or chatbots. They are designed to simulate human-like behavior and engage in conversational interactions, providing personalized and interactive experiences for users.

Bias	When an algorithm shows prejudice in favor of or against one thing, person, or group compared with another, usually in a way considered unfair. Bias is a systematic error that occurs because of incorrect algorithm assumptions. For example, if the algorithm only had information on an apple and no other fruit, it would assume that an apple is the only type of fruit. Because of bias, AI tools like chatbots are more likely to give specific responses over others, even when those answers may be false.
Big Data	An enormous data set too large to process with traditional computing. AI software can analyze these large databases through data mining to identify patterns and draw conclusions. Access to big data allows AI solutions to respond with more intelligence and deliver more human-like interactions.
Burst Test	A method used to evaluate the strength and performance of materials or products under high-pressure conditions. It involves subjecting the material or product to increasing internal pressure until it reaches its bursting point. This test helps determine the maximum pressure the material can withstand before failure, providing valuable insights into its durability, reliability, and safety in real-world applications.
CES	Customer Effort Score is a single-item metric that measures how much effort a customer has to exert to resolve an issue, a request, or a question.
Chatbot	An AI program designed to simulate human conversation and provide automated responses to users. It utilizes natural language processing techniques to understand and interpret user input, allowing it to engage in interactive conversations. Chatbots are employed in various applications, such as customer support, virtual assistants, and information retrieval, offering a convenient and efficient way to interact with computer systems through conversation.

ChatGPT	An NLP tool driven by AI technology that allows human-like conversations. The language model can answer questions and assist you with tasks like composing emails, essays, and code.
CML	Continuous Machine Learning helps with continuous improvements. CML's most basic application is in circumstances where the data distributions remain constant, but the data is continuous. It automates your Machine Learning process, such as model training and evaluation, comparing trials throughout your project history, and monitoring dataset changes. If you are familiar with Netflix's recommender system, which has an "Up Next" feature that plays shows similar to the ones you've recently watched, then you have seen a CML model in action.
Conversational AI	The use of AI technologies to enable natural language interactions between humans and machines. It involves the development of intelligent systems capable of understanding and generating human-like speech or text. Conversational AI encompasses various technologies, such as chatbots, virtual assistants, and voice recognition systems, aiming to provide seamless and interactive communication experiences for users across different platforms and applications.
CPU	Central Processing Unit called the "central" or "main" processor is a complex set of electronic circuitries running the machine's operating system and apps. It is the primary component of a computer that acts as its "control center."
CSAT	Customer Satisfaction is a commonly used metric indicating customer satisfaction with a company's products or services. It's measured through customer feedback and expressed as a percentage (100% would be excellent – 0% would be abysmal).

Dialogue Logic	The systematic rules and principles that govern the flow of conversation and interaction between participants in a dialogue. It encompasses the logical structure and coherence of the dialogue, including the organization of topics, the sequencing of turns, and the rules for exchanging information and responses. Dialogue logic aims to ensure meaningful and effective communication by establishing guidelines for logical reasoning, turn-taking, and the coherent exchange of ideas.
Dialogue Management	The process of orchestrating and controlling the flow of conversation between a computer system and a user. It involves coordinating various components, such as natural language understanding, dialogue policies, and system responses to enable effective communication. Dialogue management systems utilize state tracking, user intent recognition, and response generation to maintain context, handle user requests, and provide appropriate and coherent system responses throughout the dialogue.
DL	Deep Learning is a subset of machine learning that utilizes artificial neural networks with multiple layers to learn and extract high-level representations from complex data. Deep learning models can recognize intricate patterns in pictures, text, sounds, and other data to produce accurate insights and predictions. Deep learning methods automate tasks that typically require human intelligence, such as transcribing a sound file into text.
Dynamic AI	The use of artificial intelligence systems that can adapt and evolve in real-time based on changing environments or data inputs. It involves the ability of AI models to update their internal representations, decision-making processes, or behavior dynamically. Dynamic AI enables systems to respond effectively to new information, handle varying conditions, and improve their performance over time, making them more flexible, robust, and capable of learning from dynamic and evolving situations.

Dynamic AL	Dynamic Active Learning is an approach used in machine learning and data annotation where the selection of informative samples for labeling is adapted dynamically during the learning process. It involves iteratively updating the sample selection criteria based on the current state of the model and the available labeled data. Dynamic AL aims to maximize the learning efficiency by prioritizing the labeling of samples that are expected to provide the most significant improvement to the model's performance, leading to faster convergence and reduced annotation efforts.
EQ	Emotional Quotients, or Emotional Intelligence (EI), acquire data through real-world data, speech science, and deep learning algorithms. The data is processed and compared to other data points to detect important emotions like fear and joy. After finding the correct emotion, the computer interprets it and what it might mean in each situation. Emotional Intelligence becomes more adept at recognizing the subtleties of human communication as the emotion database expands.
FAQ	Frequently Asked Questions generally provide information on frequent questions or concerns and are often organized in articles, websites, email lists, and online forums where common questions tend to recur—for instance, posts or queries by new users related to common knowledge gaps.
FCR	First Contact Resolution is a metric used to measure customer inquiries or problems resolved on the first call or contact with a representative or agent. FCR is one of the most commonly measured metrics in the contact center industry. Ideally, the FCR definition means no repeat calls or contacts are required from the initial call or contact reason from a customer perspective.

Feedback Data	In predictive machines, feedback data refers to the information or evaluations provided to the model after making predictions or decisions. It is used to assess the performance and accuracy of the model's outputs. Feedback data can include ground truth labels, user ratings, error metrics, or other forms of feedback that help refine and improve the model's predictions through iterative learning processes.
Form-Based Model	A type of AI model designed to interact with users through pre-defined form-based inputs and responses. It typically involves structured input formats such as fillable forms or questionnaires, where users provide specific information or answer predefined questions. AI form-based models utilize natural language processing and pattern-matching techniques to understand and process the user's input, generating appropriate responses or actions based on the form data provided. These models are commonly used in applications like surveys, data collection, and automated customer support.
The Fourth Industrial Era	Also known as the fourth revolution in industry because it brings about a significant change in how industries function, much like the previous industrial revolutions. It uses sophisticated algorithms and computing capabilities to automate processes, enhance decision-making, and improve efficiency and productivity in various sectors. Like the earlier industrial revolutions, AI's influence on industries is predicted to be profound and disruptive, transforming society's landscape.
FSM	Finite State Machines, also known as Finite State AL models, are computational models that consist of a finite number of states and transitions between those states. Each state represents a specific condition or configuration of the system, and the transitions represent the actions or events that cause the system to move from one state to another. Finite State AI models are often used in decision-making processes or simple rule-based systems, where the current state and the input received determine the behavior of the AI.

GAN	Generative Adversarial Networks are a type of neural network architecture consisting of two components, a generator and a discriminator, that compete against each other to generate realistic data samples.
Generative AI	A class of AI techniques that focus on generating new content or data rather than just analyzing or classifying existing information. It involves training models to learn patterns and structures from existing data and to use that knowledge to generate new, original content. Generative AI has applications in various domains, such as image synthesis, text generation, music composition, and even video generation, enabling the creation of realistic and novel outputs.
GPT	Generative Pre-trained Transformers are a family of neural network models that uses the transformer architecture and is a crucial advancement in generative AI applications such as ChatGPT, with the ability to create human-like text and content and conversationally answer questions.
GPU	Graphics Processing Unit is a hardware component that accelerates machine learning models' training and inference processes. GPUs excel at performing parallel computations, making them highly efficient for training deep neural networks and processing large datasets. With their massive parallelism and high memory bandwidth, GPUs have become a crucial tool in AI, enabling faster model training and improved performance in various AI applications.
Hallucination	The phenomenon where artificial intelligence systems, particularly generative models, produce imaginative or unrealistic outputs, diverging from the intended or expected results. It can occur when AI models generate highly creative content that lacks fidelity to the real world. AI hallucinations can be observed in various applications, such as image synthesis or text generation, where the models generate outputs that exhibit imaginative elements or distortions not present in the training data.

IHT	Interaction Handling Time refers to the duration it takes to handle a customer interaction or query from start to finish in a contact center or customer service environment. It includes the time spent on activities like greeting the customer, gathering information, providing assistance, resolving issues, and concluding the interaction. Monitoring and minimizing IHT is crucial for improving operational efficiency and customer satisfaction in contact center operations.
Inference	The process of using a trained model to make predictions or draw conclusions from new, unseen data. It involves applying the learned patterns and relationships from the training phase to make informed decisions on input data. During inference, the model takes in input data, processes it, and produces the desired output, such as classification labels or regression values, based on its learned knowledge.
Input Data	In predictive machines, input data refers to the information or features provided to the machine learning model for making predictions or decisions. It is the data that the model uses as input to learn patterns and relationships. The input data can vary depending on the specific problem. Still, it typically includes relevant attributes, variables, or measurements that are expected to influence the outcome or prediction made by the model.
Intent	The goal a human has when interacting with a machine. For instance, when a customer asks a chatbot about the location of their package, an AI tool would recognize the user's intent as requesting information about their order status. Identifying a user's intent enables a chatbot to generate specific responses tailored to a person's unique needs.

IVA	Intelligent Virtual Assistant is a software program or application that uses artificial intelligence and natural language processing to interact with users and provide them with assistance or information. IVAs are designed to simulate human-like conversations and can understand and respond to user queries or commands. They are commonly used in customer service, virtual agents, and chatbot applications to provide automated support and enhance user experiences.
IVR	Interactive Voice Response is an automated telephony system that interacts with callers through voice or keypad inputs. It uses pre-recorded voice prompts and menu options to guide callers through various options and route them to the appropriate department or information. IVRs are commonly used in customer support, call centers, and phone-based services to handle a high volume of calls efficiently and provide self-service options to callers.
KB	Knowledge Base is a set of data available for a program to access to perform a task or give a response. The larger the knowledge base an AI application has access to, the more comprehensive the range of problems it can solve. AI programs can only pull from the knowledge base it has access to.
KPI	Key Performance Indicators are metrics used to assess the performance and effectiveness of a contact center in delivering customer service and achieving business goals. Common KPIs include average handling time (AHT), which measures the average duration of customer interactions; first call resolution (FCR), which tracks the percentage of customer issues resolved in a single contact; and customer satisfaction (CSAT) scores, which gauge customer satisfaction with the service received. Monitoring and improving these KPIs can help organizations enhance operational efficiency, customer experience, and overall contact center performance.

LLM	Large Language Models are deep-learning algorithms that recognize and generate content after training on massive amounts of data. The larger the dataset is, the more effective a language model will be at understanding, translating, and predicting text. LLM utilizes deep learning techniques like transformer architectures to generate human-like text and understand natural language. LLMs can perform various language-related tasks, including text generation, translation, summarization, and question answering, and have been influential in advancing natural language processing applications.
Load Test	A type of performance testing that evaluates the behavior and performance of a system under specific anticipated loads or stress conditions. It involves subjecting the system to simulated user activity or traffic to measure its response time, throughput, and scalability. Load tests help identify potential bottlenecks, performance limitations, or areas of improvement in the system, ensuring it can handle expected loads effectively and maintain optimal performance.
LSTM	Long Short-Term Memory is a type of recurrent neural network (RNN) architecture specifically designed to address the vanishing gradient problem and capture long-term dependencies in sequential data. It utilizes memory cells, input, and forget gates to regulate the flow of information, making it capable of learning and retaining information over long sequences. LSTMs have proven effective in various tasks involving sequential data, such as speech recognition, machine translation, and sentiment analysis.

ML	Machine Learning is a branch of artificial intelligence that focuses on developing algorithms and models that allow computers to learn from and make predictions or decisions based on data. It involves using statistical techniques and algorithms to automatically enable computers to identify patterns and extract meaningful insights from large datasets. Machine learning algorithms can adapt and optimize their predictions or actions over time by iteratively improving their performance through data exposure.
NCP	Non-Player Characters are characters in video games or virtual environments controlled by the game's artificial intelligence rather than a human player. They are designed to interact with the player or other characters, often serving specific roles within the game's storyline, quests, or gameplay mechanics. NPCs can range from friendly allies to neutral bystanders or hostile enemies, providing a dynamic and immersive experience for the player.
NER	Named Entity Relationships is an NLP method that extracts information from text, detecting and categorizing pertinent information known as "named entities." Named entities refer to the key subjects of a piece of text, such as names, locations, companies, events, and products, as well as themes, topics, times, monetary values, and percentages.
Neural Networks	A class of machine learning models inspired by the structure and function of the human brain. They consist of interconnected nodes, called neurons, organized into layers. These networks learn from data by adjusting the weights and biases of the connections between neurons, enabling them to capture complex patterns and relationships in the data and make predictions or decisions. Neural networks have shown remarkable performance in various domains, including image recognition, natural language processing, and pattern classification.

NLG	Natural Language Generation is a field of AI that focuses on generating human-like natural language text or speech based on structured data or other input forms. It is the opposite of NLU transforming structured information into coherent and understandable human spoken words mimicking natural language patterns and conventions. NLU can be combined with other AI technologies, such as natural language understanding and dialogue systems, to create interactive conversational agents or chatbots.
NLP	Natural language processing has existed for over 50 years and has roots in linguistics. In AI, NLP is a program's ability to interpret written and spoken human language, allowing computers to understand text and spoken words like human beings, including their tone and intent. NLP combines computational linguistics for rule-based modeling of human language with statistical, machine learning, and deep learning models. There are two main phases to natural language processing: data preprocessing involves preparing and "cleaning" text data for machines to be able to analyze it, and algorithm development. NLP enables chatbots to detect customer sentiment, including determining if the customer is frustrated, complaining, or simply completing a request.
NLU	Natural Language Understanding is a branch of AI focusing on the interaction between computers and human language. It is a subfield of NLP that enables computers to understand, interpret, and derive meaning from language similarly to humans. NLU involves developing algorithms, models, and systems to process and comprehend natural language inputs, such as text or speech, extract relevant information, understand the context, and derive the intended meaning.

NPS	Net Promoter Score is a metric used in contact centers to measure customer loyalty and satisfaction. It is based on the question, "On a scale of 0 to 10, how likely are you to recommend our company/service to a friend or colleague?" Customers are then categorized into promoters (rating 9-10), passives (rating 7-8), or detractors (rating 0-6). The NPS is calculated by subtracting the percentage of detractors from the percentage of promoters, providing an overall indication of customer sentiment and loyalty.
PBX	Private Branch eXchange is a small version of a telephone company's central office. PBXs can handle both inbound and outbound calls but are more flexible and can be programmed to meet your business requirements.
Prediction Machines	Computational systems or algorithms designed to make predictions or forecasts based on available data. They utilize machine learning and statistical techniques to analyze patterns, correlations, and trends in data and generate predictions about future outcomes. Prediction machines have diverse applications across industries, including finance, healthcare, weather forecasting, and sales forecasting, providing valuable insights for decision-making and planning.
Predictive Analytics	A machine learning technique to predict future outcomes or behaviors using historical data and statistical algorithms. It involves analyzing past patterns and trends to make informed predictions about future events, behaviors, or probabilities. By leveraging data-driven insights, predictive analytics enables organizations to anticipate outcomes, make proactive decisions, and optimize strategies across various business, finance, marketing, and healthcare domains.

Probabilistic Model	A mathematical framework used to represent uncertainty and randomness in data. It assigns probabilities to different outcomes or events based on available information or prior knowledge. By capturing the probabilistic relationships between variables, a probabilistic model enables reasoning, prediction, and inference about uncertain quantities and allows for probabilistic reasoning in decision-making processes.
Regression Testing	A software testing technique to ensure that recent changes or modifications to a system have not introduced new defects or caused unintended side effects in previously functioning features. It involves retesting the existing test cases to verify the system's behavior and confirm that it still operates as expected after the changes. Regression testing helps maintain the stability and reliability of the software by catching any regressions or issues that might have been introduced during the development process.
Reinforcement Learning	A machine learning paradigm that involves an agent learning to make sequential decisions through interaction with an environment. The agent receives feedback through rewards or punishments based on its actions, allowing it to learn optimal strategies through trial and error. Maximizing cumulative rewards over time, the agent aims to find the best course of action in a given environment, making reinforcement learning well-suited for tasks such as game-playing, robotics, and autonomous decision-making.
Request Technologies	Request Technologies combined with NLG responses allow customers to interact in two-way conversations between the customer and an AI-powered prediction machine.

RLHF	Reinforcement Learning from Human Feedback is an approach in ML where an agent learns from feedback provided by human trainers to improve decision-making capabilities. It involves a human providing evaluations or demonstrations to guide the agent's learning process. RLHF leverages the expertise of human trainers to accelerate the learning process and enhance the performance of the agent in complex and dynamic environments.
RNN	Recurrent Neural Networks are a class of artificial neural networks designed to process sequential data by utilizing feedback connections. They can retain information from previous inputs in their hidden states, allowing them to capture temporal dependencies and contextual information. RNNs have found applications in various tasks such as natural language processing, speech recognition, and time series analysis, where the order and sequence of the data play a crucial role in the analysis and prediction.
Rule-based Systems	Rule-based Systems are a type of knowledge-based system that utilizes a set of predefined rules to make decisions or perform actions. These systems consist of a rule base containing a collection of if-then statements or conditions and an inference engine that applies these rules to process input data and generate output. Rule-based Systems are commonly used in domains where expert knowledge can be explicitly represented, such as in expert systems, decision support systems, and diagnostic systems.
Semi-supervised Learning	Machine learning paradigm that combines elements of both supervised and unsupervised learning. It involves training a model using a small amount of labeled data and a larger amount of unlabeled data. The labeled data helps the model learn from explicit examples, while the unlabeled data aids in discovering underlying patterns and structures in the data. This approach is useful when labeled data is scarce or expensive to obtain, allowing for more efficient and cost-effective training of models.

Slots	Slots are variables or placeholders used to store information during the processing of input data. Slots are associated with specific states in the model and can be filled with different values as the AI system encounters and processes various inputs. By utilizing slots, the AI model can retain context and make decisions based on the accumulated information within the states.
SLU	Speech Language Understanding is a subfield of natural language processing (NLP) that focuses on interpreting and understanding spoken language by machines. It involves analyzing and processing spoken utterances to extract meaning, intent, and context. SLU techniques are used in applications such as voice assistants, speech recognition systems, and automated call centers to enable machines to effectively comprehend and respond to human speech.
SMS	Short Message Service is a communication protocol for sending short text messages between mobile devices. It enables users to exchange text-based messages, typically limited to 160 characters per message, over cellular networks. SMS is widely used for personal and business communications, providing a quick and convenient way to send messages between mobile devices.
Static AI	Artificial intelligence systems or models trained on fixed, pre-existing datasets that do not dynamically adapt or update based on real-time information or feedback. These AI models operate based on a predetermined set of rules and patterns and do not actively learn or evolve from new data. Static AI is commonly used in scenarios where the underlying data is relatively stable and there is no need for continuous learning or adaptation.

Stress Test	A type of performance testing that evaluates the behavior and stability of a system under extreme or peak load conditions. It aims to identify a system's breaking point or maximum capacity and assess its response to heavy traffic or stress factors. By simulating high user volumes or intensive workloads, stress tests help uncover performance bottlenecks, resource limitations, or system failures, providing insights into the system's robustness and resilience.
Supervised Learning	Machine learning approach where a model is trained using labeled data, consisting of input samples and corresponding output labels. The goal is to enable the model to learn the mapping between input features and their corresponding target values. During training, the model generalizes from the labeled data and can predict unseen data by inferring patterns and relationships learned from the training examples.
TPS	Transactions Per Second in an AI interaction refers to measuring how many individual transactions or interactions can be processed by an AI system within one second. It quantifies the system's capacity to handle incoming requests, such as user queries, predictions, or data processing tasks. Higher TPS values indicate a greater ability to handle a larger volume of interactions efficiently, enabling real-time or high-speed AI applications.
TPU	Tensor Processing Units are specialized hardware accelerators designed by Google for machine learning workloads. They excel in processing and manipulating large-scale tensor operations, prevalent in deep learning models. TPUs offer high performance and energy efficiency, enabling faster training and inference times for AI tasks, and they are particularly effective in handling computationally intensive tasks such as neural network training and inference.

Training Data	In predictive machines, training data refers to the labeled dataset used to train a machine learning model. It consists of input samples and their corresponding known output or target values. The model uses Training Data to learn patterns, correlations, and statistical relationships between the input features and the target variable, allowing the model to make accurate predictions on new, unseen data.
Transformative Technology	Innovations that significantly alter the existing market landscape and create new opportunities, often by displacing established technologies or industries. They typically introduce novel approaches, products, or services that offer superior performance, efficiency, or cost-effectiveness compared to traditional solutions. Transformative technologies have the potential to reshape industries, drive market shifts, and bring about transformative changes in business models and consumer behavior.
Transformers	A type of deep learning model architecture that revolutionized natural language processing tasks. They utilize self-attention mechanisms to capture relationships between words or tokens in a sequence, allowing for parallel processing and capturing long-range dependencies. By leveraging attention mechanisms, transformers excel in tasks like machine translation, text generation, sentiment analysis, and more, surpassing the previous sequential approaches and achieving state-of-the-art performance in many language-related tasks.
TTS	Text-To-Speech is a technology that converts written text into spoken audio. It involves the synthesis of human-like speech from text input using computational algorithms and linguistic models. TTS systems are utilized in various applications, such as voice assistants, accessibility tools, e-learning platforms, and entertainment, to provide natural and intelligible speech output from written content.

Turing Test	Designed by Alan Turing in 1950, the Turing Test is a test of a computer's ability to display intelligence that is indistinguishable from human intelligence. The test theorized that the software's intelligent behavior could be measured against human intellectual efficiency. The software is intelligent when a human does not know if they are chatting with the software or with another human. Unfortunately, access to computers combined with their functional limitations blocked the development of any proof of concept until recently.
Unsupervised Learning	Machine learning approach where the model learns patterns and structures in data without explicitly labeled examples. It aims to uncover hidden relationships, clusters, or patterns within the input data. Unlike supervised learning, there are no predefined target labels, and the model relies on inherent structures or similarities in the data to identify meaningful insights and make sense of the data.
VAR	Variational Autoencoders are generative models in artificial intelligence that combine elements of both autoencoders and probabilistic models. They aim to learn a compact and continuous latent representation of input data by simultaneously training an encoder and decoder network. VAEs introduce a probabilistic approach to autoencoders, allowing for the generation of new data samples by sampling from the learned latent space, making them useful for tasks like data generation, dimensionality reduction, and unsupervised learning.
Voice Bot	An artificial intelligence system that interacts with users through voice commands and responses. Also known as a voice assistant or voice-enabled chatbot. It leverages natural language processing and speech recognition technologies to understand and interpret spoken input. Voice bots are commonly used in applications like virtual assistants, customer support, and smart home devices, offering a hands-free and intuitive way to access information and perform tasks using voice interactions.

Voice-First	Where the voice interaction takes precedence over other forms of input, such as text or touch, and is prioritized as the primary mode of communication between the customer and the system.
VR	Virtual Reality is the technology that creates simulated environments and experiences, often using computer-generated visuals and audio. It aims to immerse users in a virtual world, stimulating their senses and enabling interactive experiences. AI techniques can be employed in VR systems to enhance aspects such as realistic graphics, natural language interactions, and intelligent behavior of virtual entities, making the virtual experience more immersive and engaging.
Wake Word	Also known as a trigger word or hotword, the term refers to a specific word or phrase that acts as a signal to activate a voice-controlled system or virtual assistant. It is a starting point for initiating a conversation or interaction with the system. Request technologies listen for user input in a continuous process. This analyzes audio or text data to detect if the wake word has been spoken or mentioned. Once the wake word is recognized, the system activates and begins capturing and processing subsequent commands or queries. Well-known examples of a wake word are "Hey Siri" in Apple products and "Alexa" used by Amazon.
XAI	Explainable AI is an approach in artificial intelligence that emphasizes the transparency and interpretability of AI models and their decision-making processes. It aims to provide understandable explanations for the outcomes or predictions generated by AI systems. By enabling humans to comprehend and trust the reasoning behind AI decisions, explainable AI promotes accountability, fairness, and the identification of potential biases or errors in the decision-making process.

XR	Mixed Reality is the merging of real and virtual worlds to create new environments and visualizations where physical and digital objects coexist and interact in real time. It combines virtual reality (VR) and augmented reality (AR) elements, allowing users to interact with virtual objects while maintaining a connection to the real world. AI technologies play a significant role in MR by enabling object recognition, spatial mapping, and real-time tracking, enhancing the realism and responsiveness of the mixed-reality experience.

About the Author

Geoffrey A. Best started in the computer industry in the 1970s and has worked with contact centers for over 30 years. His career has taken him from computer-aided mapping and 911 emergency dispatch systems to computer telephony applications and today's contact center systems. Geoffrey has worked and consulted worldwide with utilities, communications, manufacturing, banking, and insurance companies. His experience has given him insight into companies' systems and methods to operate their contact centers and service their customers effectively. This experience has given Geoffrey a unique perspective on how customer expectations have changed over the past decades and how contact center solutions have evolved to satisfy them. His latest book introduces how the use of artificial intelligence will impact contact center operations and this new technology's impact on the customer experience.

"Geoffrey offers a thorough, powerful, and practical guide for AI implementation and how this powerful technology can revolutionize contact center management and transform the customer experience. He tackles the challenge of AI implementation with a step-by-step analysis and detai led research that offer managers and executives a practical "how to" roadmap to success! *42 Rules for Using AI in Your Contact Center* is a must-read for everyone striving to transform their contact center operations with this emerging, powerful, and advanced technology."

Jim O'Rourke, Former Area President and Customer Call Center Executive, Verizon Communications

"Geoffrey has done an outstanding job of outlining the focus points of AI, and how it can and will affect the Contact Center of today and the future. AI is an evolving field in its relative infancy. Understanding the terms, functions, layers, benefits, and pitfalls of AI is critical before undertaking the journey of deployment. As noted in this book, AI should not be a solution in search of a problem but rather an important component of solving unique problems that are already identified. Geoffrey outlines these points and initiates the conversation we should all be having regarding the value-add proposition of AI in the Contact Center."

Russell Gibson, VP, Technology & Operations, ZenQMS

"Geoffrey has written a comprehensive resource for understanding how AI is currently being used in contact centers and the future of AI in customer engagements. *42 Rules for Using AI in Your Contact Center* provides the advantages of AI from a business perspective and outlines the benefits to customers with insights into the impact AI will have on their experience. Geoffrey not only addresses the right topics, but also the deeper insights into this emerging and formidable technology for managers and executives who will need to deploy AI to stay competitive. I highly recommend this book for anyone contemplating the intricacies of using AI in your contact center."

Bruce Tuck, Contact Center Executive with over 25 years of experience

Geoffrey A. Best has over 30 years of experience with contact centers worldwide. His background and knowledge have given Geoffrey insight into the latest contact center technologies and how to optimize performance metrics and customer expectations.

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