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Improving Remote Customer Interaction Experiences Using Machine Learning

Emmanouil Koukoumidis

Shiblee Hasan

Dustin Abramson

Joseph Edwin Johnson Jr.

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ABSTRACT

A common problem in contact centers is high employee turnover. Artificial intelligence (AI) techniques that have been introduced to smoothen interaction and improve the customer's experience can have opposite effects, e.g., by requiring the customer to navigate complex menu options. This disclosure describes AI-based techniques applied to agent training and customer calls. The techniques can reduce turnover at contact centers and improve the experience of end users who interact with customer service agents. Per the techniques, suitable AI techniques are implemented to train human customer agents, and human feedback is in turn used to train AI techniques. Human-AI augmentation can be used to mirror the communication styles of customers to improve the interaction experience. The techniques can also be used to improve safety, e.g., by automatically detecting scam calls and alerting users. The techniques enable the creation of scalable, standalone, artificial or human-AI augmented customer service agents.

KEYWORDS

- Call center
- Contact center
- Customer service agent
- Customer experience
- Customer service representative
- Social engineering
- Scammer
- Robocaller

BACKGROUND

The purpose of a contact center is to provide customer service, technical support, sales assistance, etc. Customers typically interact with contact center agents to discuss issues that have already caused frustration and that may or may not be solvable. A common problem in contact centers is high employee turnover. Artificial intelligence (AI) techniques that have been introduced to smoothen interaction and improve the customer's experience can have opposite effects, e.g., by requiring the customer to navigate complex menu options.

DESCRIPTION

This disclosure describes AI-based techniques applied to agent training and customer calls that can reduce turnover (and associated costs) at contact centers and can improve the experience of end users who interact with customer service agents.

Per the techniques, with permission, data is collected that provides tips and training to agents. In turn, an agent participating in a call can provide feedback on what was (or not) effective with the customer, along with contextual information relating to the customer. Machine learning (ML) is used to detect patterns or styles of calls and to provide guidance to the human agent on techniques for improving the customer experience. In particular, after detecting the patterns or styles of calls, feedback from customers and customer service agents is noted on how the call went, and such feedback can be used to improve agent communication and train the ML model. When the pattern or style of the call is detected again, the ML model can provide relevant feedback. Use of the techniques can improve diagnoses of issues experienced by customers of a particular call center for a particular product. With guidance from AI, contact center agents can AI adapt their communication style, e.g., to better mirror the customers, which can increase trust.

Having gathered information and feedback from agents on effective strategies and patterns to address customer issues, the techniques enable the creation of a standalone artificial agent or a human-AI augmented agent that can scale to serve more customers with lower wait times while leaving the hardest issues for human agents.

The techniques are illustrated in detail below.

Using AI to improve end user experience

The contact center platform that a customer interacts with can employ machine learning techniques like anomaly detection to detect if the user/customer is either normal or unusual in terms of their use of the platform. For example, does the customer appear to navigate confidently through the menu, or are they wandering aimlessly through the platform (or app) and need help? If they are wandering aimlessly or otherwise exhibiting anomalous behavior (as compared to other typical users as measured by the platform), the customer can be offered a simpler GUI or flow with more guidance; be asked more questions; be sent immediately to a human agent (based on availability); etc. If they are navigating well through the menu, their workflows can be remembered such that on their next visit they can be offered to start from where they stopped at their previous visit (versus starting over), as a sort of autocomplete for navigating voice menus.

Detecting the profile and connecting deeply with a customer can smoothen agent-customer interactions. For example, references to popular culture can create an atmosphere where issues can be more easily diagnosed. Asking if someone has seen a particular set of movies or read certain books might be a way for a customer to express themselves more accurately and to understand what is being asked. An AI trained with a wide range and knowledge of popular culture can map interests to products, which can help the customer and agent find a common vocabulary to communicate.

Using AI to train human customer agents and using human feedback to train AI

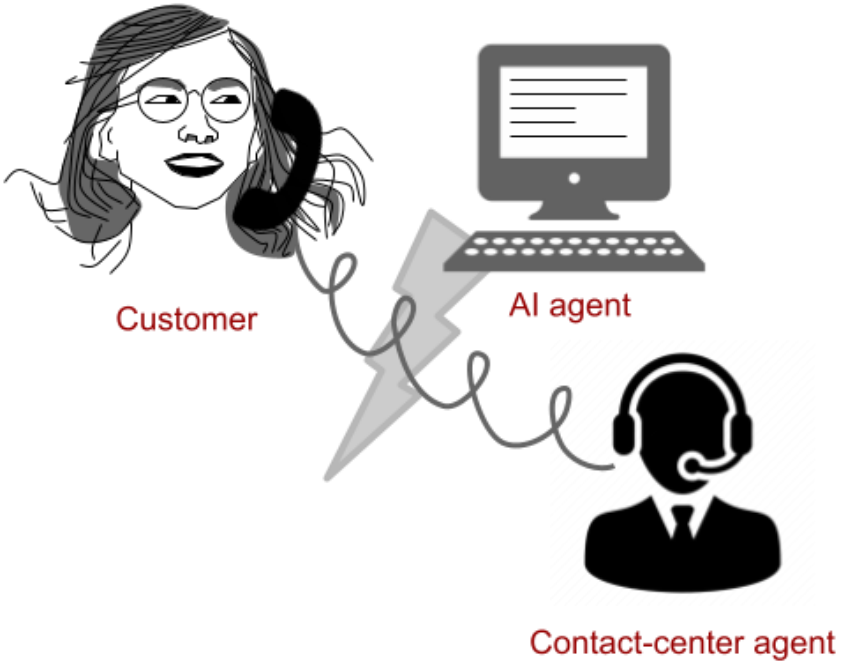

Fig. 1: Using AI to train human customer agents, and using human feedback to train AI

AI can be used in training for human customer agents as follows. As illustrated in Fig. 1, with permission from the customer, an AI agent can listen in to a conversation between a customer and a human contact center agent and suggest strategies for diagnosing customer issues or human strategies for connecting with the customer. If the AI agent detects the user is likely frustrated, it can suggest ways to defuse a tense situation. After the customer call is complete, the human agent can then give feedback to the AI on what worked well (and what didn't) to enhance future suggestions. When the AI has reached a sufficient level of recall and precision it can also be used to train new human agents on how to deal with customers or produce training documents to help understand the products of a business. This approach can improve the AI agent as well as help the human agent improve their performance by learning new techniques and strategies to address various customer service situations.

Using human-AI augmentation to mirror the communications style of customers

Given that customers typically interact with contact center agents to discuss issues that have already caused frustration and that may or may not be solvable, establishing a better connection between the agent and the customer can greatly improve the quality of the interaction, with more efficient (wherever possible) issue resolution and improved overall customer experience and perception of the business that the contact center agent represents. The perceived customer experience when interacting with contact center agents can be improved when agents interact with customers in a way that better matches the communication style of the customer.

The techniques leverage research findings that show that when a human mirrors another human in terms of how they communicate, mutual trust and satisfaction increase significantly. Per the techniques, customer-agent interactions are observed (with permission) and suggestions are made directly to the agent (AI augmentation), or the agent's communication is automatically configured to better match the communication style of the customer. For example, text messages from the agent to the customer can be updated to match the idioms and style of the customer. As another example, in the case of voice interaction between the customer and the agent, the agent's prosody and speech speed can automatically be made to match those of the customer. Besides mirroring communication style, in some cases written and verbal communication of the agent can be adapted to be more inclusive and empathetic towards the customer.

To ensure that the mirroring of a customer's persona doesn't result in discriminatory behavior or questionable/offensive communication style, machine learning (ML) models that have natural language processing (NLP) capability and are utilized to filter offensive speech can be trained on labeled conversational datasets. For example, pattern matching against databases of

known offensive language can detect offensive speech. Lists of known offensive words can also be used in conjunction with trained models and other NLP techniques to detect and avoid mirroring of offensive, questionable, or discriminatory speech.

The AI can also pick appropriate words based on the vocabulary of the user. For example, the complexity of the responses can be tailored to the user's educational profile/background (know your audience). The use of technical jargon, the speed of speech, etc., can be adjusted based on the user's profile and background. Words used by the user in previous conversations with the agent, or, with user permission, phrases whose definitions have been sought in searches or virtual assistant queries can be used to set the context for agent-customer interaction.

AI to create scalable, standalone, artificial agents or human-AI augmented agents

The use of AI to create scalable, standalone, artificial or human-AI augmented customer service agents is illustrated in the context of the use case of hardware troubleshooting. A customer calls a call center about their hardware, e.g., a printer, being broken. A complex piece of hardware like a printer can break down in a variety of ways. Machine learning can be used to examine trends in phone calls and customer agent logs to determine the parts of the printer that tend to break most often and to send automated feedback back to the hardware manufacturer (to improve future versions and release better drivers/fixes for current versions).

Simulations and reinforcement learning can be used to play with the printer to try to get it to break, then figure out how to fix it (simply by, in many cases, reversing the steps taken to cause the breakdown). With good computer-aided design (CAD) models and device driver simulations of a printer and how it interacts with a simulated operating system (e.g., in a virtual machine, for instance), call logs from other similar/related products can be used to determine the

parts tend to break frequently, then randomly cause those problems on the piece of hardware that is being simulated (e.g., corrupting a key driver, for instance, simulating the paper being jammed, etc.).

Generative models such as transformer models can be used for speech generation to generate complaints about the product being broken (with a random seed phrase provided to the generative model). The artificially generated complaint can be fed into the call center platform, e.g., via text interaction with either human agents or AI agents that can simulate the interaction, generating test call logs describing the issue encountered, resolving it via assistance from the AI which, in fact, knows the condition because the random breakage was introduced in a simulation. These logs and experiences can be used to train agents to know how to handle situations that have not yet even occurred but are likely to occur based on similar breakages of similar products or use cases. These simulations can also be done proactively ahead of launching the actual product, or after it is launched but before agents start taking calls for it, or, to reduce call times, improve customer experience or agent performance, after the product has been launched.

The simulations can be self-sufficient, e.g., via reinforcement learning, bots can talk to other bots, where, perhaps, each bot is a specialist in its own area, e.g., a different kind of printer, a different product category, a related product category, etc. The bots can work together as a team in a simulation to try to resolve a problem, or adversarially against each other, where one bot breaks something randomly and the other bot attempts to determine the fix, encouraging spread and generalization of knowledge across domains. These random breakages could happen in a chain; e.g., something in the OS may break that causes the printer not to work; the simulated customer calls in with that scenario, and the printer bot has to figure out where upstream the breakage happened in order to resolve it. It may consult with the OS-specific bot to resolve the

problem. These simulations not only make the bots stronger, but the learnings can also be used to train human agents, send data back to the manufacturer, etc.

The bots themselves can listen in virtually like a mentor/assistant, suggesting approaches during or after the call. This can come in the form of group-based speech recognition driven transcriptions, by analyzing call log data either during the call or after the fact for context, with or without the aid of the transcriptions. The AI assistant can be transferred to the user's home, asking questions to the human customer, helping directly, and feeding the responses back to the call center human and/or bots (some of which may be more specialized and in different areas).

Conversely, human agents can listen to the bot and help train the ML models used by the bot, e.g., by generating labels used for training as in the case of supervised machine learning approaches/datasets, which can be used to train supervised classifiers to solve various tasks, e.g., detecting that this is one type of issue versus another, routing it to the proper specialist as necessary, classifying support documents and sending them over for either the customer or human agent to try, etc.

Human agents can label the audio/transcription in various ways, including in a sentiment-based approach e.g., "going good, getting worse, getting better, now worse, worse, badly, terribly, off the rails." etc. Time-based transcriptions can help the agent figure out the steps that were the wrong ones to take, for instance, in a hidden Markov model learner, or via deep learned, recurrent neural networks (LSTM, GRU), transformer-based approaches, etc.

The sentiment can also be based on the detected emotion of the customer, e.g., "happy, happy, sad, sad, angry, angry," where the task is to ensure the customer's tone is neutral or better, and never sad or angry, for instance. A contact center objective can be to leave the customer feeling happy, so the last state can be maximized for the customer's happiness. This

can be accomplished, for instance, by playing a hardware test on a scanner that plays a song in mechanical noises as it runs. Alternatively, intermediate states can be maximized for customer happiness. With permission, the resulting sentiment data can be aggregated across agents, call centers, products, over time, etc., to look for trends that can assist human agents, help train classifiers, etc. Spikes in happiness, for instance, can provide useful hints that agents can use to achieve the same result.

With user permission, by measuring the time between the user's action (e.g., clicking a button on the UI) and the user's reaction (e.g., user curiously saying “oh wait, something is happening”), the bot can determine the lag or delay in the user’s computer (or other device being diagnosed), which in turn can be indicative of problems in the user’s computer (e.g., memory running low).

Example use-case: AI for detecting and hardening against call center scams

Call center scams (e.g., that utilize social engineering) have become more prevalent in recent years, with vulnerable individuals or computer-illiterate people targeted and tricked into losing money. To combat call-center scams, decoy AI targets can be deployed that provide the general feel of a targeted customer, but being AI agents, wouldn’t actually be in harm's way. To help law enforcement catch scammers, or simply as a way to waste time and make the scamming industry less profitable, these decoy agents can be the reverse of robocallers in the form of robo-answerers. Robo-answerers can go a long way in balancing the scales to protect the most vulnerable.

Further, call-center scams can be detected as follows. With permission, an agent or app can listen to phone calls and inform a potential victim of the dubious nature of the caller. Detection can be easier for an AI compared to a technology-illiterate individual who may be

duped more easily. An AI agent can be trained to recognize parts of the process of typical scams, e.g., enabling remote desktop, the sending of money, etc., to alert individuals that are being targeted by a scammer, perhaps suggesting they talk to an expert.

Further to the descriptions above, a user may be provided with controls allowing the user to make an election as to both if and when systems, programs, or features described herein may enable the collection of user information (e.g., information about a user's phone calls and other interactions with a business, or a user's preferences), and if the user is sent content or communications from a server. In addition, certain data may be treated in one or more ways before it is stored or used, so that personally identifiable information is removed. For example, a user's identity may be treated so that no personally identifiable information can be determined for the user, or a user's geographic location may be generalized where location information is obtained (such as to a city, ZIP code, or state level), so that a particular location of a user cannot be determined. Thus, the user may have control over what information is collected about the user, how that information is used, and what information is provided to the user.

CONCLUSION

This disclosure describes AI-based techniques applied to agent training and customer calls. The techniques can reduce turnover at contact centers and improve the experience of end users who interact with customer service agents. Per the techniques, suitable AI techniques are implemented to train human customer agents, and human feedback is in turn used to train AI techniques. Human-AI augmentation can be used to mirror the communication styles of customers to improve the interaction experience. The techniques can also be used to improve safety, e.g., by automatically detecting scam calls and alerting users. The techniques enable the creation of scalable, standalone, artificial or human-AI augmented customer service agents.