# HOW DOES THAT WORK?

# CHATBOTS

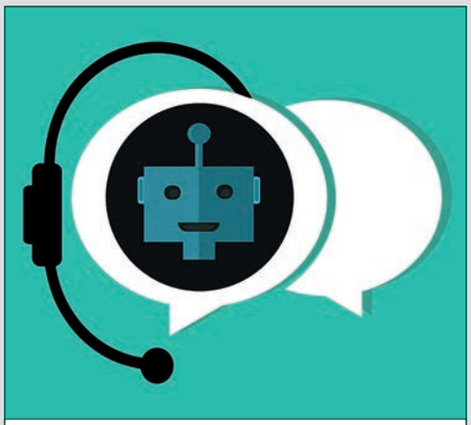
As human interaction online gradually gives way to automated responses, chatbots must impersonate us without attempting to replicate human empathy or enthusiasm.

When visiting a website or online resource, it's increasingly common for a sound effect to herald the appearance of a pop-up window, containing a question like "Can I help?" or "What are you looking for?". It's often accompanied by a thumbnail photo of a person, yet you're actually being greeted by a chatbot – reducing the need for customer-facing staff by delegating basic services to an algorithm.

The word 'bot' describes a piece of software that performs a single repetitive task, and chatbots are designed to simulate human conversation. They provide programmed responses to user inputs, attempting to resolve common queries. The challenge for any chatbot involves interpreting those inputs and questions, before interrogating a database of pre-prepared responses. Having matched the input string to the most appropriate response, the latter is then presented as an answer.

Like many online services, chatbots evolved from rudimentary beginnings. Early examples were notorious for displaying irrelevant responses, while struggling to understand abbreviations or colloquialisms. The introduction of machine learning helped expand the database of predefined scripts chatbots can interrogate. For instance, modern chatbots are programmed to redirect unknown queries to a human, while simultaneously recording this failed interaction. Conversation logs are fed back into the databases powering the bots, so they can see how a transferred query was eventually handled by a human. This helps them to replicate a similar approach in future.

Basic rule-based chatbots allow users to choose from predefined options, following a hierarchical path to ensure every journey reaches a defined (if limited) conclusion. More sophisticated bots support pattern matching for open-ended inputs, with smart feedback loops seeking clarification – "did you mean X?", for instance. Certain words or phrases act as identifying tags, which are linked to pre-programmed responses, and the bot selects what it evaluates to be the most pertinent option. Rules can also help here too; enquiries containing the word 'complain' might lead the bot to automatically defer to a human operator.



**The twin end goals of chatbots are (a) full automation with no staffing input required and (b) consumer convenience. Saying "Uber, get me a cab to the cinema" will one day summon a vehicle to your current location (regardless of where you are right now), with a destination of your favourite or closest cinema pre-selected. There's no further input required from you, and no humans needed at Uber's end to complete the transaction** © Pixabay/mohamed_hassan

Modern chatbots use natural language processing (NLP) to break a statement into structured data pieces – identifying potential spelling mistakes or separating verbs from nouns. They can often distinguish tenses ("I had a booking" versus "I want to make a booking"), or recognise sentiments like frustration, which may benefit from human intervention. NLP involves two processes – converting input strings into the aforementioned structured data, before transforming that data into a written or verbal response. It also involves distinguishing intents (required actions or requested information) from entities such as booking references or account numbers.

Two related branches of software underpin modern chatbots like IBM's Watson and Microsoft's Language Understanding:

- Machine learning allows the bot to learn from available information and make judgements about how to respond, based on identifying tags. Machine learning bots evolve and mature through use.
- Artificial intelligence (AI) powered bots are able to evaluate context and refer back to previous statements in a conversation – such as not requiring someone to input their account details more than once.

Cutting-edge bots combine machine learning, AL and NLP to accurately replicate the forms of interaction you might expect if a person was responding to enquiries. A cognitive behavioural therapy chatbot developed by Stanford University has successfully been used during the pandemic to improve the mental health of young people, while WHO's Health Alert bot on WhatsApp offers everything from international travel advice to fake news myth-busting. Tech giants like eBay and Lyft have developed industry-leading chatbots that work across multiple platforms and minimise the time required to complete an action. It's thanks to the combined power of machine learning, AI and NLP that these conversations can now successfully be outsourced to computers, rather than to people.

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