

AI in CRM systems: use cases and efficacy

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Published: November 26, 2021 | By Martin Anderson Independent AI expert



As customer bases have migrated from the high street to online purchase platforms in the wake of the pandemic, the power and utility of customer relationship management (CRM) systems have grown in tandem with this new surge of digital interaction. It's therefore the perfect climate to address the growing scale of customer data with machine learning-driven CRM systems enabled by [AI software development](#).

Since customers have now been forced to engage virtually with brands through digital frameworks for a sustained period of time, it's expected that this migration may become at best permanent, or at worst will have enrolled a higher number of customers into digital channels than would have been possible when face-to-face engagement was more common.

The new tranche of data has brought a notable boost to [CRM consulting](#), which can provide frameworks that offer a complete overview of customer behavior, can forecast sales trends, and also maximize conversion opportunities.

In this article, we'll take a look at how machine learning algorithms are increasingly being integrated into CRM systems, including the increasing use of robotic process automation (RPA) systems that can help to populate AI CRM systems with the latest relevant business data — even where no official means exists to do so.

The rise of CRM software

CRM software is one of the 'hyperautomation' technologies set to reach a worldwide market value of \$596.6 billion in the next 12 months, according to Gartner's April 2021 forecasts. In another 2021 report by Fortune Business Insights, CRM is estimated to rise from \$58.04 billion in 2021 to a revenue stream of \$128.97 billion by 2028, growing at a CAGR of 12.1%.

Supported by the latest machine learning technologies, a modern CRM platform can provide a complete and constantly updating viewpoint of your customer landscape, sales pipelines, inventory frameworks, and many other aspects of operations. Advantages include:

- Access to all relevant information across all platforms, including mobile devices.
- Request-allocation systems capable of prioritizing workloads for support and sales teams.
- Massive capability for customization of dashboards for members of diverse teams with diverse needs, without the need to rewrite or refactor software packages.
- Easy, bespoke visualizations that instantly clarify bottlenecks, issues and variations in performance across the entirety of a company's operations.
- The ability to grant custom levels of access to various strata of data on a need-to-know basis.
- Multichannel integration across a range of popular collaboration tools, such as Slack, and including live transaction data from any segment of the company.

AI and CRM platforms

Sales professionals spent a big portion of their time entering data. Since one of the primary tasks for general machine learning systems is to automate and pre-process data input, this is a great opportunity to leverage a 'native' feature of AI to free up sales people from repetitive tasks of this nature, leaving them more time to interpret and act on analyses that emerge from the data.

This kind of [sales automation](#) can be accomplished as a collaboration between AI-based algorithms and robotic process automation — mechanistic algorithms that can perform data-intensive tasks such as scraping salient information from websites and formatting it correctly for input into a CRM database.

Extraction of live network data into a CRM

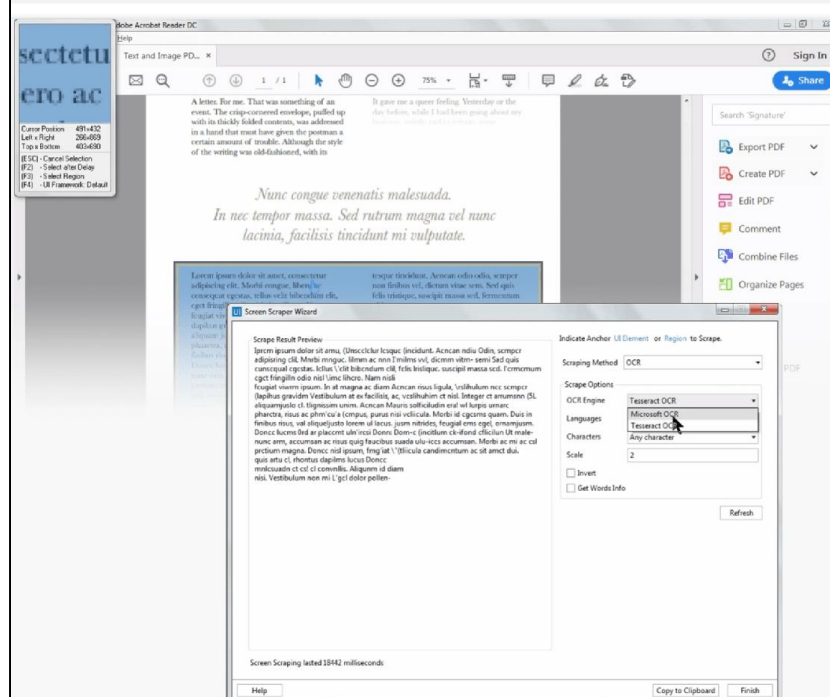
Since public-facing websites do not always offer API access, there may be no other method of extracting data from them except by going to the site and manually updating the pertinent entries in a local .csv or Excel file, or directly into the CRM. At scale, this is not a feasible human activity, without outsourcing to crowdworkers.

However, the computer vision capabilities of robotic process automation systems can facilitate this (within the bounds of the platform's terms and conditions, naturally), by learning to recognize elements of the site or platform's UI interface, as well as using [optical character recognition technologies](#) to register changes in values and other constantly updating text-based data.

Though such values may be non-selectable in the context of a read-only interface, RPA can effectively 'derasterize' this opaque experience, transforming it into active data and automatically inserting it into your CRM.

Optical character recognition in UiPath

In an RPA workflow with UiPath, a PDF resource with non-selectable text is inserted into an automated routine that will use OCR to extract editable text. The framework allows the user to choose from two OCR algorithms, though a custom framework can include any number of possible algorithms, including custom dictionaries and text-checkers.



Screen Scraping lasted 13942 milliseconds

Data source: youtube.com—UiPath Read PDF with OCR [PDF Automation Chapter 1], 2020

Automating data integrity

A 2019 report by B2B Marketing and dun&bradstreet estimated that 91% of data in CRM systems is not complete, and that 8 out of 10 companies believe that stale or otherwise unreliable data hurts their business workflow. Furthermore, 18% of data in CRM systems was estimated to be duplicated, and 70% of it out of date.

Machine learning offers superior detection of poor-quality data in CRM pipelines. Not least because the field of AI development is so preoccupied with data quality that many common architectures are supported by a wide and well-supported array of tools and methodologies designed to identify outliers, duplicates and other forms of 'dirty' data.

Therefore, AI has an enormous amount to contribute to CRM database maintenance. For one thing, the discriminative powers of AI-based systems in database search far exceed old-style heuristics and won't be deterred when a text-pattern is not exactly matched. Rather, machine learning systems can be trained on historical examples to learn new ways to either flag potentially problematic data for subsequent human oversight or even to automatically remedy the problem.

Automating customer segmentation

Effective customer segmentation is an essential feature of CRM-based insights. Accurate and responsive automated segmentation can:

- Ensure fair treatment (so long as the algorithm is relatively explainable).
- Create complex and navigable hierarchies of customer strata that would be difficult to effect or rationalize manually.
- Automatically update and change the status of customers in response to live data without human intervention.
- Discern profitable patterns in data at scales that make this impossible through mere human oversight.

Derived segments can be used across a CRM for various purposes, including:

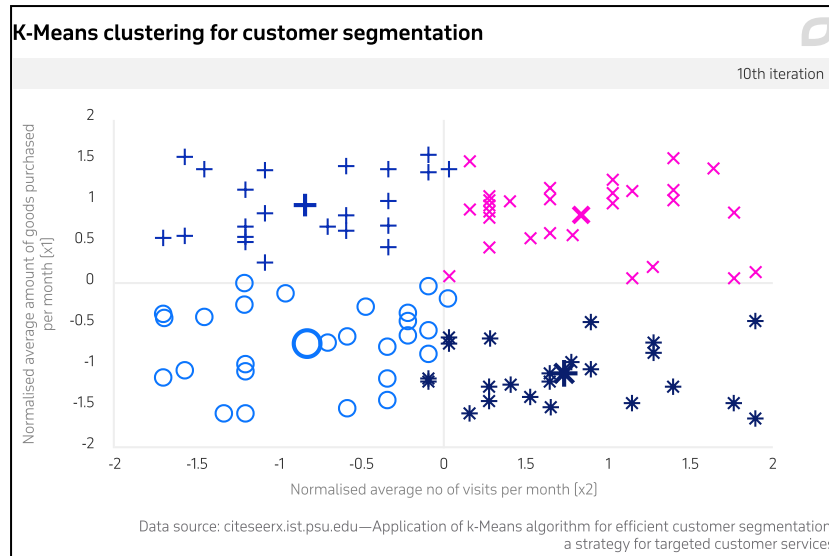
- Marketing
- After-marketing

- General promotional and lead-generating business intelligence

An effective and scalable AI-driven approach to segmentation enables more effective targeting of customers across email and algorithmically-driven advertising campaigns, among many other benefits.

Custom frameworks can incorporate a wide range of popular machine learning modules and systems into a customer segmentation component for your CRM system in a variety of popular programming languages, such as R and Python.

In the below example, we see the popular MatLab programming language using K-Means clustering to achieve a 95% accurate segmentation of customers from a business retail outlet.



Predictive lead scoring

Since lead scoring is essentially a ranking procedure designed to identify the best prospects in a customer database, it's an excellent candidate for predictive analytics tools powered by machine learning. Even AI systems that are not occupied with ranking or filtering are using scoring to optimize their algorithms during model training or to classify the data that's being trained.

Prior to the advent of easily accessible AI analysis functionality, lead scoring methodologies were based on rules-driven principles, where a prospect would be advanced up the rankings based on fixed criteria. Later, automated heuristics systems allowed rules-based scoring to scale better, but still relied on human-defined criteria to define what makes a lead 'actionable'.

The downside of this is that if the principles and core trends that make a rules-based system should shift (as they do in response to major cultural events, such as the financial crisis of 2008, or the COVID-19 pandemic), the underlying assumptions behind the system are too rigid to adapt and reconfigure its upstream logic.

By contrast, machine learning analysis can identify low-level factors and even paradigm shifts and automatically determine new and effective data pipelines capable of maintaining or even improving on the (now-outdated) predictive lead scoring methodology.

Moving from A/B testing to a Champion/Challenger model in a CRM framework means that you can exploit 100% of your data instead of wasting 50% of it on the 'losing' approach in A/B tests. The Champion/Challenger model allows you to test all variations of a strategy across your network until you find the decision logic that leads to the best predictions and the best outcomes.

Champion/Challenger pits a variety of business strategies against each other, whilst allowing a real-time glimpse into the evolving logic that will lead to its final recommendations for optimal strategy.

Additionally, you can exclude a segment of your lead base from its calculations as necessary, such as preferred customers whose relations with the company are to be handled directly by employees.

Sentiment analysis

Insight into the emotional state of a customer can be beneficial in reducing attrition, building long-term retention strategies, and onboarding new leads.

However, the growth of automated communications frameworks can mean that the crucial signals of dissatisfaction or — more positively — a pending conversion, can be lost to the anonymity of chatbot dialogue, support queues, unattended Slack messages, and other relatively 'mechanistic' engagement forums.

Luckily, a variety of machine learning technologies can be applied to CRM frameworks in order to determine sentiment trends in your customer base at both an aggregate and individual level. In this way it's possible not only to intervene organically when a single critical event is flagged but to track the state of customer sentiment year-on-year.

For instance, natural language processing (NLP) techniques can flag escalation of conflict in call center communications by analyzing the sentiment score of text-based exchanges from customers. These technologies can even be used to evaluate how truthful the customer is being during the exchange.

In a study on Twitter-based customer service dialogues, a Support Vector Machine (SVM) approach was used to rank outcomes of customer interactions with support personnel:

Ranked categories of customer support outcomes on Twitter-based support platforms

Dialogue Act	Example	Position	Outcome	Weight
Offering more help	We can contact you if you like. Please DM us your info.	End	Satisfied Resolved	13.25 8.72
Thanking	Thanks for your reply! We're happy to hear your issue has been taken care of.	End	Satisfied Resolved	8.58 6.77
Answer (Other)	You can view our available selection of iPhone 6 cases here <link> >)	Start	Satisfied Not Frustrated	3.46 3.5
Apology	I do apologize for the inconvenience. Please provide me with the cross streets and zip code, so I can look into this for you.	Mid	Satisfied	3.31
Suggestion	Oh that's odd! Let's start by power cycling your console: <link>	Start	Resolved Not Frustrated	5.98 3.52
Question Yes-No	I'm sorry if you were unable to speak with a manager. Are there any questions I can assist you with?	Start	Resolved Not Frustrated	3.30 3.39
Statement Info	I'm so sorry you were given conflicting info. The discounted iPhone 6 starts at \$199.99 with a new 2-year contract.	Start	Not Frustrated	4.29
Suggestion	We do not DM, but you can send the details to twitter@[agent].com - we should be able to look into this.	End	Unsatisfied Unresolved	5.45 5.98
Request Info	Please DM us your name, state, and policy number so we can have someone review your policy for discounts.	End	Unsatisfied Unresolved	4.32 5.30
Question Yes-No	Hmm, does the messaging showing match any of those on this page: <link>?	End	Unsatisfied	3.19
Complaint	Well what I received last night was not high quality service. Especially for what I pay. You will be hearing from me.	End	Unsatisfied Frustrated	3.00 8.56
Apology	I'm sorry to hear about this. Have you checked your spam mail?	Start	Frustrated	2.92
Statement Info	No, normally you're supposed to receive them within minutes.	End	Frustrated	5.35
Expressive Neg.	I reinstated online. Just mad was told would not be cancelled, and it happened anyway.	Mid	Unresolved	2.58

Data source: arxiv.org—"How may I help you?": modeling twitter customer service conversations using fine-grained dialogue acts

The statistical output of deployed algorithms like this can easily be incorporated into custom CRM systems, allowing for monthly or quarterly reports on your company's effectiveness in customer relationships.

Many NLP systems of this nature use real-time transcription of voice calls to infer sentiment from the resulting text data; but customized CRM systems can also incorporate tonal voice analysis for those frequent cases where intent and delivery do not necessarily match up. A study mentioned below suggested such a system, and this application of audio processing has since become increasingly common in call center monitoring.

Annotating sentiment in a customer's voice

Voices raised in anger: researchers manually annotate perceived anger in a call center dialogue, for the development of an automated system capable of recognizing and reporting customer ire.

Conversation:				
Annotation:	Manually annotated Anger Segment			
Windows:	Window 1 (1 sec) overlap 0%	Window 2 (1 sec) overlap 30%	Window 3 (1 sec) overlap 80%	Window 4 (1 sec) overlap 0%
True category:	Not angry	Not angry	Angry	Not angry

Data source: aueb.gr—Anger detection in call center dialogues

Additionally, in the CRM framework, this can become another of [RPA use cases](#) to trawl public-facing domains to identify sentiment trends and specific instances of satisfaction or discontent in online reviews, allowing your company an opportunity to redress negative publicity in a number of ways, with such reports directly piped into a custom CRM's database.

In 2018 one research project used open-source machine learning frameworks NLTK, Gensim, and Scikit-Learn to detect sentiment temperature feedback across online reviews for hotels, parsing the raw data into an accessible word-cloud and providing an at-a-glance overview of global customer sentiment in the review space, while allowing the user to drill down to specific negative reviews that could be addressed through outreach to the poster or platform.

