# KNOWLEDGE AT HAND

Introduction to Artificial Intelligence in Advertising

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Artificial intelligence (AI) means different things to different people (Sullivan, 2017). Some say that AI is a broad field that includes everything from simple if-then rules for playing Checkers to complex ensembles of deep neural networks for piloting autonomous vehicles. The most important thing to remember is that AI, as it is used in marketing, is a term that is applied to several very different techniques and functions.

Recommendation engines make recommendations based on viewing habits. A relatively simple video example might use your "view through rate" to help determine whether to recommend similar content going forward. Also, AI is used in the creation of dynamic creative by assembling creative elements for a certain profile on a social site and revising its algorithm depending on click through rates associated with that creative design. Simply put, AI is software that learns.

Recommendation Engine
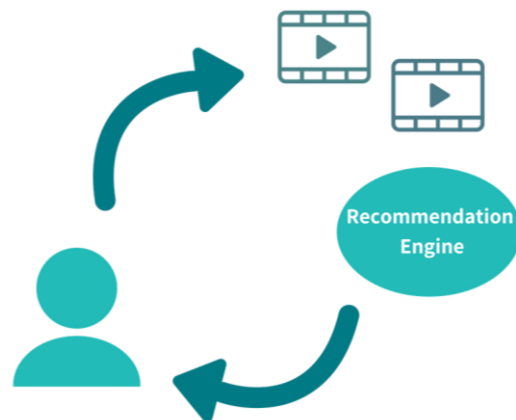
AI provides relevance at scale (Chow, 2017). Some attribution vendors ingest a constant stream of digital data and revise their attribution models real time the way humans ingest a constant stream of stimuli, and that stream is said to contain information[1] if there is any change in their thinking.

While the 90's is referred to as "the winter of AI" because the vision was far ahead of the technology, AI is becoming part of our marketing ecology. Implementing AI solutions in-house may not be an option for every organization, but commercially available solutions and APIs may meet the needs of many businesses. For starters, all businesses of any size should have a considered AI strategy which should determine the role and roadmap for AI in your organization.

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[1] In cybernetics, referred to as negative entropy and the symbol h^2.

What AI Can Do For Your Company

AI is an area of computer science focused on automated decision making based on feedback and learning. This typically involves two components:

1. **Perception** is having awareness and understanding of the environment. An example of this is Google Home's understanding spoken commands, referred to as Natural Language Processing (NLP).
2. **Strategy** is planning actions to achieve an overall goal. An example of this is an attribution algorithm supporting different media plans by constantly adjusting output as a result of a constant stream of responses to the current mix.

Many of the current successes in perception tasks use deep neural networks. Neural networks were inspired by neurons in the brain. Inputs (e.g. social feed images) are connected to outputs (e.g. consumer profiles) via a series of weights and hidden layers, much like the interconnectivity of biological neurons. A large weight between two nodes is analogous to a strong synaptic connection allowing one neuron to excite or inhibit the other neuron. A visual illustration is captioned in the margin.
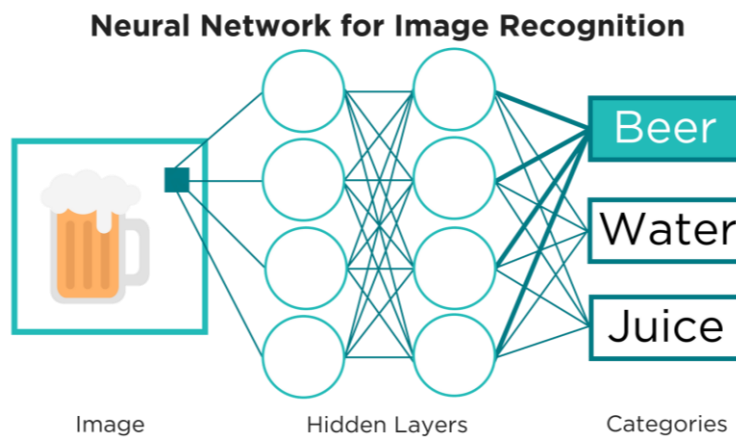
This example shows how a neural network would recognize a product. Heavier lines show that, while multiple products were considered, beer was identified as the image seen.

Perception applications include:

- Detecting ad fraud: determines whether ad traffic is legitimate
- Image recognition and classification: determines a category (e.g. 'sunset') or value (e.g. 'brand appropriateness') for an image
- Natural language processing: discovers relevant information in a text, such as the sentiment of an email or review
- Voice recognition: allows machines to accept spoken commands

Recent advances in strategy tasks often use reinforcement learning networks. The difference with reinforcement learning is that the network takes some action (e.g. making an ad placement bid). These networks receive rewards based on the result of their actions. When provided with enough quality data, they learn which actions will result in the largest reward (e.g. RoAS). Strategy tasks include:

- Personalized messaging: determines the optimal message on the level of the user, as well as the time and location to send the message (Chow, 2017)

- Content creation: predicts propensity to click on an ad and optimizes the content of future ads to increase clicks and might also use the context of the ad to create an ad that fits in naturally
- Real-time bidding on programmatic advertising: searches for the lowest winning bid for ad placement
- Recommendation engines: suggests additional products for purchase based on data known about the user

Best Practices

Given that AI is quickly becoming an essential technology in advertising, best practices depend on need and level of possible investment. This includes simply understanding AI, purchasing AI solutions, and implementing AI techniques in-house.

- First, be aware of risks associated with AI (Jercinovic, 2017):
    - AI techniques find an optimal solution to the problem posed. Poorly crafted questions can lead to unintended results. Having chatbots learn from users and optimizing suggested videos for clicks have both proven harmful to brands.
    - Machine learning techniques may have hidden biases due to the data or algorithm used for training (Byrne, 2018). These biases can be negated by modifying the data or the algorithm, if they are identified by human inspection of inputs and outputs.
    - However, because these systems such as an NLP API, learn relationships rather than being coded with rules, diagnosing and correcting errors can be very difficult. This is why such systems are often called a "black box".
    - The amount of automation made possible by AI will likely make some business models obsolete. Assess your vulnerability and take action to stay relevant.
- Make use of freely available resources to learn about the technologies that underlie the most common AI techniques. Many of these are listed in the "Recommended Resources" section below. Recommended curriculum:

    AlphaGo. This highly-regarded 2017 documentary should generate interest in AI research. It is available on NetFlix (Krieg, 2017).

    Machine Learning for Humans. This eBook provides information on all the most common AI techniques today.

    The Best Machine Learning Resources. This blog post lists courses in multiple areas of AI. These courses go beyond teaching theory, getting motivated learners to implement and even deploy state of the art machine learning projects.

    Twitter. AI researchers regularly use Twitter to share links to their most recent research from conferences and arxiv.org.
- Choose AI solution providers carefully. Ask about the techniques used in each solution and insist on an offline demonstration. Bring an expert with you to ensure clear communication.

- Most AI solution providers have a blog on their websites. Read these blogs for some of the details of the underlying technologies of the solutions they offer, as well as use cases that may not have been considered.
- Use AI in situations where the technology is up to the task. Reality does not always live up to the hype. Knowing where to deploy AI is essential. Unlike human intelligence which can understand many types of stimuli, current artificial intelligence applications process one class of stimuli. This is called *narrow AI*.
- Discover experts with proven expertise in AI via online talent platforms. Kaggle competitions and GitHub repositories provide a clearer measure of expertise than a list of skills on a resume.
- Ensure your code of ethics governs the acceptable use of AI. Explaining this clearly to users can engender trust in your organization.

Commercial Solutions

Implementing AI in-house often requires a significant investment to acquire the necessary data, talent, and computational resources. While this investment can be worthwhile, companies seeking to get their toes wet might consider platforms that provide many of the same benefits.

Here are brief summaries of some of the commercially available AI solutions:

- Adobe Sensei: machine learning for attribution, consumer, and journey optimization
- Affectiva: automated facial coding and emotion recognition during focus groups and online
- Albert: artificial intelligence for media buying, audience targeting, cross-channel execution, testing, optimization, analytics and insights
- Google Adsense Auto Ads: machine learning to determine what kind and how many ads to run and where to run them
- GumGum: computer vision for context-based advertising (Puangladda, 2018)
- IBM Watson Ads: natural language processing for, e.g. question answering system implemented into online and in-app ads
- IBM Watson Marketing: machine learning for journey pattern analysis and real-time personalization
- Infinite Analytics: machine learning for determining propensity to click and to improve search and discovery
- Salesforce Einstein: machine learning for finding product images in social media feeds, journey predictions and recommendations
- Xaxis: machine learning for programmatic creative and media buying

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Recommended Resources

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*To access Journal of Advertising Research articles and ARF conference presentations

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