CRACKING THE CODE

PART 1

Your Essential Guide to AI Capabilities in Business
Everyone from Forbes to PCMag to Harvard Business Review is talking about the business potential of AI. Industries from finance to retail to healthcare are embracing AI- and data-led strategies. AI software is the hot topic of the decade.

“71% of businesses plan to use more AI this year.”

“AI is an imperative for businesses that want to maintain a competitive edge.”

“All the world’s tech giants are in a race to become the world’s leaders in AI.”

“AI has the power to change almost everything.”

“Businesses that don’t capitalize on the transformative power of AI risk being left behind.”

“Yes, AI is definitely having its moment.”
What is AI?

Artificial intelligence has come to stand for any and every type of intelligent tech program or automation software.

It’s so broad that, used without context, it doesn’t mean very much at all. It’s also often mixed in with a hodgepodge of related terms, like machine learning, big data, RPA, intelligent automation and more. AI providers vie to own and redefine categories within their individual industries.

Despite the abundance of solutions and implementation strategies, over 70% of digital transformations do not achieve the company’s goals because they don’t have the right combination of technology, expertise and outcome-based strategy.

In fact, 65% of companies saw no business gains from their AI investments. In short, it’s challenging to know with confidence which AI program is right for your business and how it helps you.

On the UST SmartOps team, we live and breathe AI. That’s why we’ve compiled this guide to help demystify AI and all its branches, with a focus on how the right AI programs will ultimately revolutionize business.
The Big Picture of AI

ESTABLISHING A WORKING DEFINITION

According to Merriam-Webster, AI is “a branch of computer science dealing with the simulation of intelligent behavior in computers.” In other words, it’s any program that uses human-like intelligence to solve something — a definition so huge that it’s almost useless.

Instead, let’s look at what AI aims to accomplish. Artificial intelligence is based on one core idea: AI is tech that enables computers to behave and reason like human beings. This can include sight, transcription, logic, heuristics, data processing, analysis, interpretation and even task execution.

However, all of these capabilities are truly defined by the shared goal of using software to complete tasks at a level that matches or exceeds the capabilities of real humans. They also cover an enormous range of techniques, foundations, approaches and cognitive styles. That’s why we define AI as a concept, rather than a particular software or solution.

**AI is a concept based on the goal of using technology to mimic human behavior and cognitive capabilities.**

This definition is much more digestible and commonly accepted across industries. Think of the Turing test, where the ultimate goal of AI is to mimic human activity so precisely that the program can fool a human into thinking the bot was just another human.

This also helps us understand just how many programs fall under the umbrella of AI, including everything from Google Assistant making restaurant reservations to self-driving Teslas to back-end business automation programs.
Where Confusion Arises: Categorizing AI

So, with that foundation in place, we can tackle the next big questions: What are the main types of AI? What technologies fall into the category of AI? What are their main similarities and differences? Which is best for accomplishing your business goals?

THE PUZZLE AS A WHOLE: AI

AI itself is often broken down into categories — types, tribes, hierarchies — without a clear set of rules or standards.

Here’s one used by techies:

“[AI refers] to robots, bots, chatbots, androids and cyborgs, categorized into 3 types of AI: super artificial intelligence (ASI), narrow artificial intelligence (ANI), and general artificial intelligence (AGI).”

And another used primarily by researchers:

“There are four types of AI or AI-based systems: reactive machines, limited memory machines, theory of mind, and self-aware AI... based on their likeness to the human mind, and their ability to “think” and perhaps even “feel” like humans... An AI that can perform more human-like functions with equivalent levels of proficiency will be considered as a more evolved type of AI.”
That means there are (at least) seven classifications of AI out there:

**Technology-Based**
- ASI
- ANI
- AGI

**Proficiency-Based**
- REACTIVE MACHINES
- LIMITED MEMORY MACHINES
- THEORY OF MIND
- SELF-AWARE AI

These can often overlap with each other, and they fail to clarify where related “smart” programs fit into this structure.

As such, these categories aren’t particularly useful for businesses looking to leverage AI: they’re primarily based on how the AI program works, rather than what it can do.
A plethora of terms and technologies have sprung up to fill this gap, driven by the need for software that accomplished particular goals.

These puzzle pieces combine to form a bigger picture and lead us to a key AI concept: modern “AI” programs are merely a subset of the broader capabilities associated with AI.

While these programs are a type of artificial intelligence, they are tied to specific functions and goals; they can’t independently deliver all the benefits you may expect from an AI program.

To put it simply: all squares are rectangles, but not all rectangles are squares. One is a subset of the other. AI programs like machine learning or language processing are a subset of AI, but AI itself is such a broad category that these programs only encompass one facet of it.

It’s important to keep this relationship in mind to understand and compare the benefits of different programs.
Rather than provide a full AI glossary, we pulled out some of the most common AI programs used in business.

Keep in mind that different AI providers may adapt these definitions to match their offering; you may even see some of these programs with the term “cognitive” tossed in front to emphasize its intelligence.

It’s also important to note that these tools may be used in combination or individually: the more specialized the tool, the narrower its business uses. We strove to pull aside the curtain and provide consensus- and research-backed definitions.

- Cognitive Computing
- Machine Learning
- Deep Learning
- Natural Language Processing
- Optical Character Recognition
- Robotic Process Automation
- Business Process Management
- Intelligent Process Automation
Occasionally mistaken for AI, cognitive computing is a blanket term that combines a few AI categories, including machine learning and deep learning.

IBM defines cognitive computing as “systems that learn at scale, reason with purpose and interact with humans naturally.” Other experts assert that cognitive computing “uses a blend of artificial intelligence, neural networks, machine learning, natural language processing, sentiment analysis and contextual awareness.”

If AI is a concept, cognitive computing is more or less the technological equivalent to that concept. It refers to programs that try to do everything promised by AI and truly mimic human capabilities.

But cognitive computing is still just a subset of the broader AI field rather than a true synonym, because it does not accomplish the core goal of AI: automation.

Cognitive computing programs are great at data analysis, business assessments, transcriptions and more. They’re a powerful tool to help master and understand business data. They can scale their learning to broader pools of data and gain deeper, more informed insights as they go. But they can’t deliver a whole suite of business outcomes alone because they don’t come with built-in automation capabilities.

“Cognitive Computing does not accomplish the core goal of AI: automation.”
Machine Learning

Machine learning is a technique of statistical analysis that enables machines to improve on tasks based on experience and patterns.

An ML program can discover correlated patterns and draw conclusions by forecasting predictions from those patterns; it then learns and improves its algorithms based on whether it was right or wrong.

According to Towards Data Science, ML refers to “algorithms whose performance improves as they are exposed to more data over time.” Essentially, ML programs use an advanced form of “if-then” learning to test various hypotheses: “if I were to do this, would I still get that?”

Or, as a writer for Forbes put it:

“Machine Learning is a current application of AI based around the idea that we should really just be able to give machines access to data and let them learn for themselves.”

Many experts see machine learning (ML) as the heart of all AI. Some even see AI as a subset of ML, rather than the other way around — though that depends on how you define each term. Since we’ve defined AI as a concept, we categorize ML as a subset of that concept.

It’s important to note that, due to its incredible data processing and analysis capabilities, machine learning is the core engine of the majority of AI tools.
Researchers often categorize the methodologies and use of data within ML into five “tribes,” again based on how the program works, rather than what it can accomplish. These tribes are:

Symbolists | Connectionists | Evolutionaries | Bayesians | Analogizers

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**Evolving Structures**

**Learning Parameters**

**Composing On the Fly**

**Weighing Evidence**

**Mapping to New Situations**

Image based on celebrated book *The Master Algorithm*
The ability to learn is what makes ML the heart of most AI.

Where less intelligent software can simply follow a set task based on parameters designed by a human, ML programs can accomplish more complex data processing by learning through experience.

Spam filters are a great example of machine learning. You can build a set of rules into the filter (if it detects the phrase “you’ve won the lottery,” it should mark as spam) but the program can also learn based on your behavior or data trends to forecast the likelihood that you would consider a particular email spam.

"Due to its incredible data processing and analysis capabilities, machine learning is the core engine of the majority of AI tools."
Deep Learning

Deep learning is a subset of machine learning that relies on layers of neural networks to analyze data.

Neural networks are “designed to continually analyze data with a logic structure similar to how a human would draw conclusions.” In other words, they are machine learning programs structured similarly to the human brain: densely packed, interconnected neurons linked by dendrites (inputs) and axons (outputs).

It’s important to note that deep learning isn’t necessarily more “intelligent” than machine learning. Deep learning programs are simply better at specific tasks — like recognizing patterns — and worse at others when compared to traditional machine learning. In this sense, deep learning is really a technique for applying machine learning to particular types of problems.

The general breakdown between the application of ML vs. deep learning is the level of flexibility required. Is your data well-organized into clear categories, or structured in a machine-friendly way? ML can do the job. Is your data unstructured or more convoluted, like language or images instead of numbers? Turn to deep learning. As one data scientist puts it:

“Deep Learning models are usually applied to problems that deal with data that do not have a simple row-column structure, like image classification or language translation, as they are great at operating on unstructured and complex-structure data these tasks handle — images, text, and sound. There are problems with handling data of these types and sizes with classical Machine Learning algorithms.”
Let’s take the classic problem of training a software program to identify whether a picture contains a cat or a dog.

A task that’s easy for a human can stump a machine because there isn’t one set of clear rules to follow — both animals have four legs, fur, whiskers, etc. Even colors wouldn’t help.

By contrast, deep learning programs can monitor as a human categorizes those photos. They can extract information based on which photos are labeled cats and which dogs, then begin to make guesses.

The human then reinforces those guesses by confirming or rejecting them. Soon, the deep learning program achieves near-perfect accuracy and can automate that task with relative independence.

It doesn’t just follow the rules that have been set for it; it extracts and applies its own rules.
A Powerful Combination

Used in tandem, Cognitive Computing, Machine Learning and Deep Learning deliver the intelligent, scalable processes and capabilities that define AI.
Natural Language Processing

Natural Language Processing draws on both linguistics and AI techniques to enable software to understand language with near-fluency (for instance, Google Translate works incredibly well, but may struggle with context, colloquialisms and dialect).

NLP typically uses **machine learning** to understand, interpret and manipulate human language — it's an application of, rather than a type of, AI. As a result, NLP enables software to understand language on a more human level, including contextual definitions, synonymous terms or even dialects.

Optical Character Recognition

Optical Character Recognition, or OCR, is a data ingestion technique in the computer vision family that enables software to accurately identify printed characters. Essentially, it’s a way for software programs to read as well as a human can, even in unstructured formats like a PDF or an image, and convert that data into text.

Similar to NLP, it draws on techniques from machine learning to mimic the human ability to read and recognize data. When combined with NLP, OCR can then understand that data — just like a human.
Robotic Process Automation

Robotic Process Automation falls on the less intelligent end of the AI spectrum; you could even argue that it’s not true AI, though it is a form of software that mimics human behavior.

RPA refers to software that automates low-level processes and workflows, which you can train to follow a set of predetermined steps to accomplish a manual task (following an “if-then” pattern). This type of program is great for menial tasks that always follow the same structure, like pulling data from invoices and entering it into your ERP system.

Business Process Management

One step above RPA is Business Process Management, or BPM. BPM refers to a system of processes that can be documented with code and that don’t require human extrapolation or thought. For instance, in the same example of pulling data from invoices, BPM might automate the phase of passing data between an Excel sheet and accounting software by matching codes with ledger entries.

While intelligent processes like cognitive computing can be added to the front or back end of BPM, this tool itself is not “intelligent” in the human sense.
Intelligent Process Automation

Intelligent Process Automation (IPA), sometimes referred to as cognitive automation, is a comprehensive approach to business automation that draws on a variety of intelligent solutions, from machine learning to natural language processing to deep learning. In the simplest terms:

**Data + RPA + ML = IPA**

IPA aims to be a combination of tools like RPA and cognitive computing that is more than the sum of its parts. It’s a type of artificial intelligence that leverages the best features of common AI technologies to create automated, intelligent processes. Digital Workforce puts it well:

"Intelligent Processes Automation means maximizing business value with the help of process automation. The role of an IPA-service company is to figure out to what extent, and with which tools, the client’s processes can be automated in efficient and high-quality manner.

The automation of a single process may require the use of multiple different technologies: RPA, image recognition, chat bots, machine learning... the list goes on. The term ‘Intelligent Process Automation’ refers to the ultimate goal of applying several technologies rather than a specific technology."
How to Choose the Right Program

The takeaway from all this? There are a great many tools out there, but if you drill into what the program can accomplish — rather than the complex details of how it’s built — you’ll gain a better understanding of its business uses. This focus will help you cut through the tremendous noise and hype surrounding AI programs to highlight exactly how a program could benefit your business.

There’s also a common thread in all these programs: automation. For many businesses, the end goal of implementing AI is automating time-consuming tasks, thus creating cost-savings.

To see the most impact from a proposed AI solution, it’s crucial to understand what the program can automate on its own, without the support of additional tools or human supervision. Most businesses therefore see the most ROI from programs that intentionally combine the functions of numerous AI tools, such as IPA.

You should also ensure that your vendor fully understands the problem you’re trying to solve with AI.

An expert service provider will be able to match that need with the right AI program, leveraging their own internal expertise to customize a solution.
When it comes to real, material business benefits through the use of AI, UST SmartOps is the best in the business.

Our platform centralizes various AI tools to intelligently automate your business processes, and is backed by expert knowledge and implementation support to ensure that our solution delivers the value you’re looking for.

This guide is part one of two in the series Cracking the Code of AI in Business. Check out part two here: How to Maximize the ROI of Your AI Investments.

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