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Do Not Use LLM or Generative AI For These Use Cases

Choose correct AI techniques for the right use case families

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The recent hype for Gen AI (Generative AI), especially LLM (Large Language Model), has become extremely high. More and more organizations have already jumped or are planning to jump into this controversial zone. Of course, it is understandable that no one wants to fall behind and lose this revolutionary opportunity. However, as one of the professionals with a Data Science background and who has experienced AI/ML growth for the last 10+ years, I want to write this article to alert decision-makers to think twice about simply starting to implement their AI solutions.

Don't get me wrong. I've always been an advocate of AI and one of those optimistic people. This article has borrowed from an insightful work from Gartner, which aims to educate people about various AI techniques and Use Case families. LLM is not everything about AI, and not all the AI use cases are suitable for Generative AI.

Twelve Use Case Families

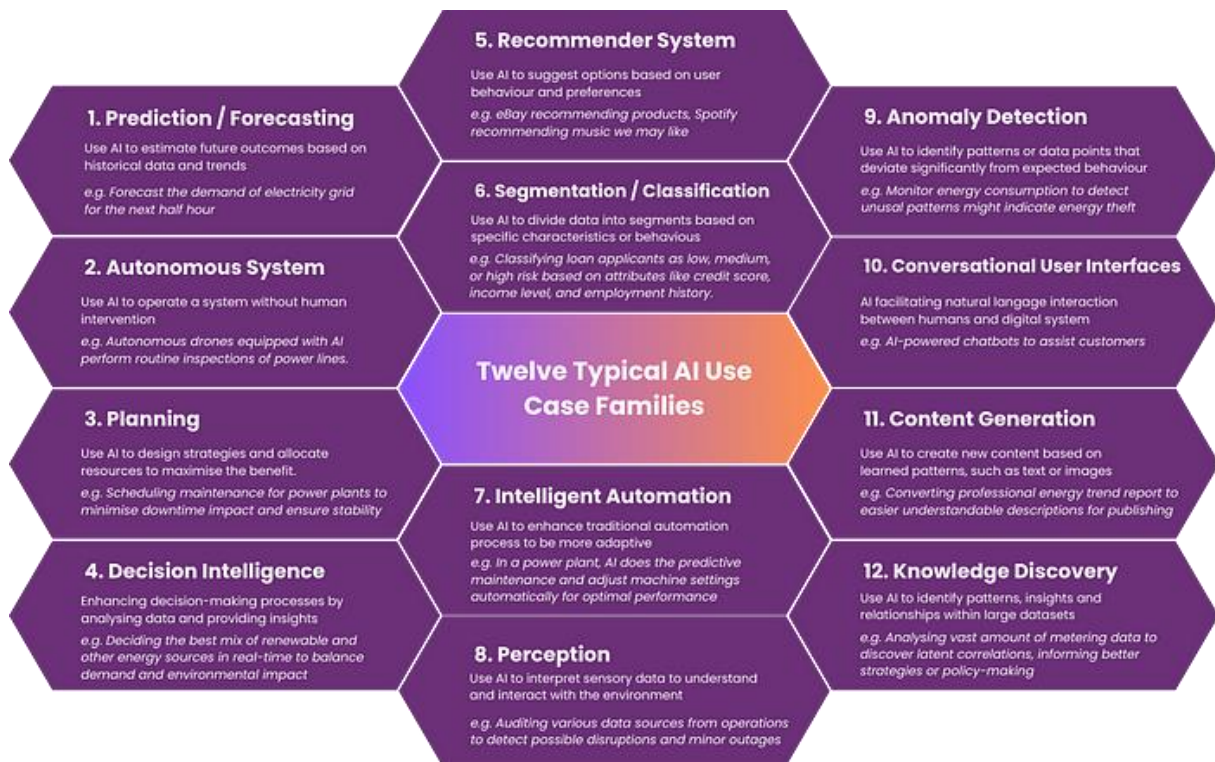


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Firstly, let's explore the typical use case families in practice that are expecting AI techniques to address them.

1. Prediction / Forecasting

This is one of the most common use cases. Suppose we are selling some products, and we collected all the sales data as well as the other features that may relate to the selling activities. Then, we can use machine learning algorithms to predict future sales.

2. Autonomous System

We can also use AI to build such an autonomous system to intelligently do something for us.

One of the examples is using a drone with embedded AI technology to perform routine inspections of power transmission lines.

3. Planning

Sometimes, we may have to work in a complex system that has many interdependencies and constraints. The planning use cases are to find out the best plan to make sure we have maximised the benefits and/or minimised the impact.

For example, we may use AI to analyse the traffic data in urban areas. Then, suppose we are onboarding a road project, and the algorithm can tell us when and where to work for a minimum impact on the daily traffic.

4. Decision Intelligence

This type of use case aims to enhance the decision-making process by providing insights and predictions.

The difference between this one and the Autonomous System is that this use case family is to help humans make decisions rather than automatically doing it. This is usually because the decision has to take certain preferences or Entrepreneurship into account.

5. Recommender System

A widely applied and mature use case type. If you ever use eBay or Spotify, this use case is to recommend the products you may buy or music you may like.

6. Segmentation / Classification

Sometimes, we don't know the characteristics of the objects we are dealing with. So, we want to classify the entities into different categories or levels to see if we can get some insights.

For example, we can use AI to classify loan applicants into Low, Medium and High-risk levels based on their attributes.

7. Intelligent Automation

This type of use case aims to combine AI with automation technologies to enhance some business processes, such as manufacturing. One of the hot topics, "Digital Twin", belongs to this one.

For example, we may train a model with all the sensor data from a manufacturing plant and alert when a trip is about to happen several days in advance.

8. Perception

This use case type usually refers to those relying on sensory data such as vision, sound and other environmental data.

For example, a camera on the road to detect violating driving activities is one of this use case family.

9. Anomaly Detection

Sometimes, our process goes wrong, but we don't even know it. For example, an electricity grid may source the energy from hundreds of generators. When one of them goes down, it's easy to realise. However, if there are 10 of them fluctuating coincidentally, it will be difficult to be aware. AI can detect such subtle events and alert the Control Room.

10. Conversational User Interfaces

Since this use case family, you might become familiar with it because these are hot topics recently due to the growth of Generative AI technology.

This use case itself can be well defined by the Chatbot for a call centre or a customer support centre. The AI will be trained using lots of product documentation, and it will answer the questions from the customers when they encounter problems. This usually doesn't require human intervention for simple support tickets.

11. Content Generation

Easy to explain. ChatGPT is an application of this use case. However, just need to highlight that the "content" is not limited to text. It can also be an image, video or soundtrack.

12. Knowledge Discovery

Sometimes, we have lots of data in chaos. We don't know what we don't know, but some patterns may hide in this chaos. In this case, we can use AI to try to discover some insights, such as relationships or correlations from a large dataset.

For example, we can use AI to analyse patient data and clinical records to find out some patterns that may help the health industry develop new treatment strategies or effective medicine.

Six Common AI Techniques

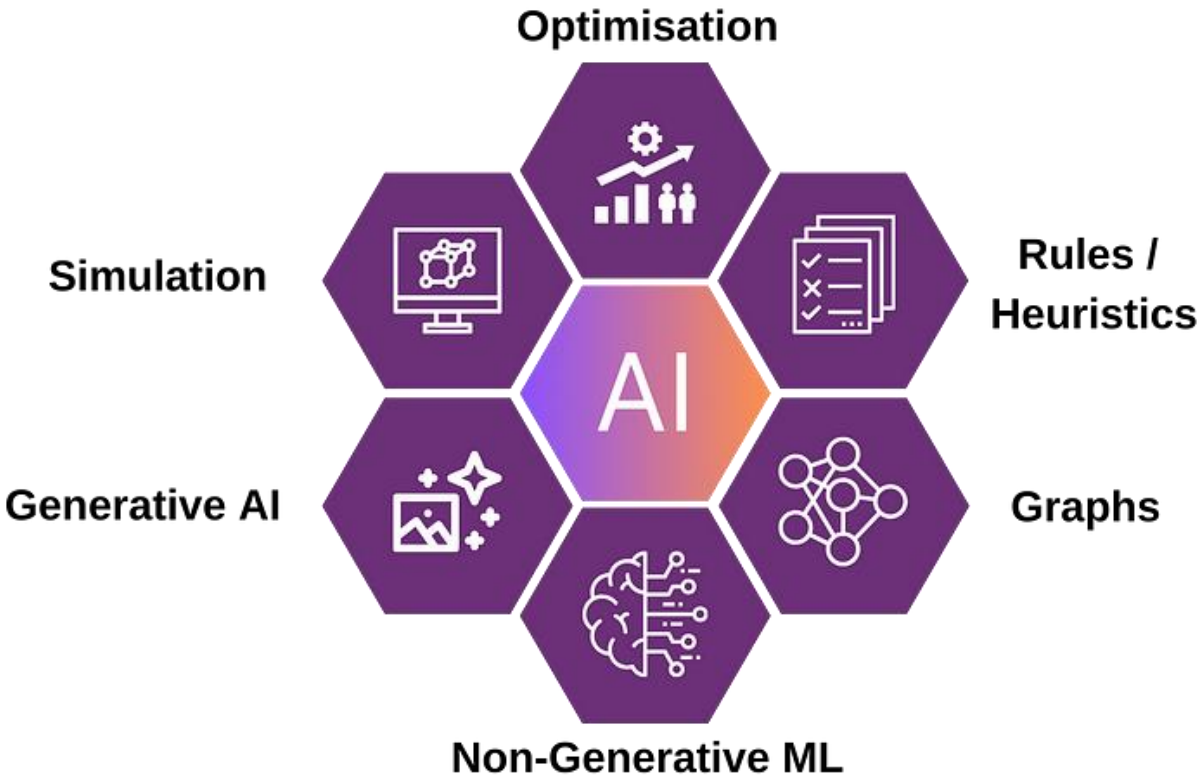


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Now, let me briefly introduce the 6 common AI techniques.

1. Non-Generative Machine Learning

In fact, this category shouldn't have even existed before Generative AI became popular in recent years. When I started to use Data Science in industries, people liked to talk about “**Classic Machine Learning**” and “**Deep Learning**”. Now, because of the Gen AI hype, they all become “**Normal Machine Learning**” techniques.

This category includes basic linear regression, clustering, classification, decision trees, etc.

2. Simulation

This AI technique allows us to create a model for a process or a system in the real world. Then, we can input a lot of combinations of parameters into it. So, it will be able to answer lots of “what-if” questions.

3. Optimisation

This technique helps us find the best parameters in a formula or equation. For example, we know that discounts will attract customers to buy more products from a supermarket. However, if the price is too low, the profit may disappear. Therefore, optimisation techniques can help us to find the “balance point” to maximise our profit.

4. Rules / Heuristics

This AI technique is not necessarily machine learning. We may create a set of pre-defined rules based on scientific evidence or even rules of thumb from the domain experts. Such a “rule-based system” will help us make better decisions.

5. Graphs

Graphs do not refer to any particular algorithms of machine learning but a data structure that represents objects and their relationships in a different way.

For example, a node in a graph stands for a data point, and edges represent the connections between this node and other nodes. Such a data structure could help other processes work more accurately than a tabular-based data structure.

6. Generative Models

I know you are looking for this one :)

This is the AI technique that is able to generate something. It could be text, images, videos, or whatever other artifacts. ChatGPT is definitely using this technique.

The Matrix: Use Case Family × AI Technique

Here is the key takeaway of this article. As I mentioned in the introduction, not all the use case families can be resolved by Generative Models.

The matrix below shows that certain use case families are more suitable for certain AI techniques. The Low (L), Medium (M) and High (H) refer to the stability and reliability of such AI techniques utilised in the corresponding use case families.

Use Case Families	Common AI Techniques					
	Generative Models	Non-Generative ML	Optimisation	Simulation	Rules	Graphs
Forecasting	Low	High	Low	High	Medium	Low
Planning	Low	Low	High	Medium	Medium	High
Decision Intelligence	Low	Medium	High	High	High	Medium
Autonomous System	Low	Medium	High	Medium	Medium	Low
Segmentation	Medium	High	Low	Low	High	High
Recommender	Medium	High	Medium	Low	Medium	High
Perception	Medium	High	Low	Low	Low	Low
Intelligent Automation	Medium	High	Low	Low	High	Medium
Anomaly Detection	Medium	High	Low	Medium	Medium	High
Content Generation	High	Low	Low	High	Low	Low
Chatbots	High	High	Low	Low	Medium	High
Knowledge Discovery	High	Medium	Low	Low	Medium	High

Research Source: Gartner Data & Analytics Summit Conference (2024), *How to Make Your Data AI-Ready and Why It Matters*. Image created by the author of this post.

Based on the above matrix, we should always use the “High” suitable AI techniques on the corresponding use case families. If it is “Medium”, think twice if you really need to use this technique. When it is “Low”, please never use the techniques for the use cases. Sometimes, you will find that it’s not only not suitable but also not feasible.

Generative Models

Since this AI technique is related to Generative AI such as ChatGPT, let’s have a deep dive into it.

According to the matrix, we should never use LLM to help us forecast something that does not exist in the world, nor should we use it for planning.

For example, when we have the sales data for a particular product, it doesn’t make sense to give that to ChatGPT to ask what will be my sales for the next day. However, you may ask it to write some code for you, and the code will use some Non-Generative ML techniques to forecast the data. Therefore, we still use ChatGPT on the “Content Generation” use case.

Summary



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In this article, I have introduced six common AI techniques and 12 typical use case families. Each of them comes with a brief description and an example. I hope this helped to form the AI application scenarios in a better way.

Then, based on the Gartner research result that I have learned from the conference, the Matrix of AI Techniques × Use Case Families was demonstrated. I hope this will provide some useful references for the organizations that are going to invest in AI due to the recent hype.

Source:

<https://pub.towardsai.net/do-not-use-llm-or-generative-ai-for-these-use-cases-a819ae2d9779>