

Machine Learning in Procurement



IN THIS ARTICLE

- How Machine Learning Works
- The Role of Machine Learning in Procurement
- Machine Learning vs. AI: Complementary Technologies
- The Future of AI in Procurement

Procurement has always been a crucial part of any business or organization, and over the years, the procurement process has evolved significantly.

With advancements in technology, procurement professionals now have access to tools and techniques that can help them improve their efficiency, accuracy, and overall results.

Among these transformative technologies, Machine Learning (ML) stands out as a game-changing approach that can redefine procurement as we know it.

How Machine Learning Works

ML is a subset of artificial intelligence (AI), a system of computer algorithms that improve automatically through experience and by the use of data.

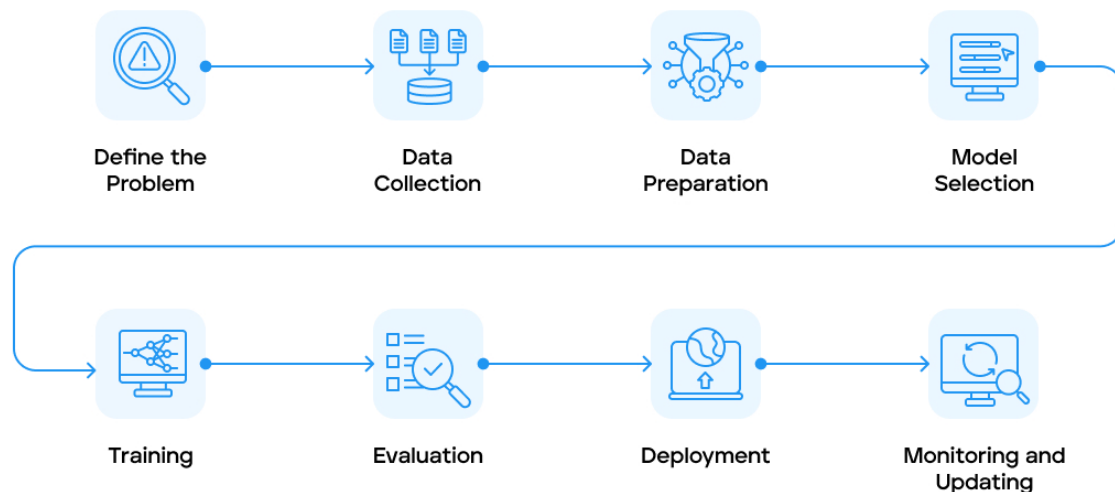
Other subsets of AI include: deep learning, natural language processing (NLP), and robotic process automation (RPA).

Machine learning enables computers to learn from past experiences or patterns and make decisions based on that learning without explicit programming.

It's an essential component of AI technology that allows systems to execute tasks mimicking human intelligence through pattern recognition.

Machine learning is part of the many applications of AI that can give you a competitive advantage.

How Machine Learning Works



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1. Define the Problem

The first step in machine learning is to identify the problem that needs to be solved and determine if machine learning is a suitable approach.

This could be a predictive problem (e.g., predicting stock prices), a classification problem (e.g., spam vs. non-spam emails), or an anomaly detection problem (e.g., detecting fraudulent credit card transactions).

2. **Data Collection**

Machine learning models learn from data. So, the next step is to collect relevant data related to the problem. This could be historical data, real-time data, or a mix of both.

3. **Data Preparation**

The collected data needs to be prepared for the model. This includes cleaning (removing or correcting inaccurate records), normalization (scaling numerical data), and feature extraction (transforming input data into the set of features that best represent the problem to the underlying model).

4. **Model Selection**

There are many different types of machine learning models, each with its strengths and weaknesses.

The model selection depends on the problem's nature, available data, and the desired outcome. Common types include decision trees, neural networks, and support vector machine models.

5. **Training**

During the training phase, the machine learning algorithm uses the prepared data to adjust its internal parameters and improve its performance. This is where the actual "learning" takes place.

The model makes predictions on the training data and adjusts its parameters based on the difference between its predictions and the actual values.

6. **Evaluation**

After training, the model's performance is evaluated using a separate set of data known as the test data. This evaluation helps to ensure that the model has not just memorized the training data (overfitting) and can

generalize well to unseen data.

7. **Deployment**

If the model's performance is satisfactory, it can be deployed to solve the defined problem. This might involve integrating the model into a larger system, setting up a recurring schedule for re-training, or setting up a real-time scoring service.

8. **Monitoring and Updating**

Once in use, the model's performance should be monitored. Over time, as new data becomes available and the world changes, the model may become less accurate and need to be updated or replaced.

The Role of Machine Learning in Procurement

In the procurement sector, machine learning has been a game-changer. It's being used to streamline processes, increase efficiency, and reduce costs.

There are several use cases to leverage AI and machine learning.

The Role of Machine Learning in Procurement

- Better Spend Management with Spend Analytics
- Automated Supply Assignment Sourcing
- Predictive Analytics for In-Transit Stock
- Better Negotiations
- Anomaly Detection
- Fraud Detection and Risk Management
- Invoice Processing
- Contract Management and Analysis
- Predictive Analytics
- Demand Forecasting
- Inventory Optimization
- Minimizing Downtime
- Automated Inventory Management
- Capabilities Matching
- Monitoring and Tracking Efficiency
- Compliance Management
- Big Data Analysis in Procurement

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• Better Spend Management with Spend Analytics

One area where ML has shown a significant impact is spend analysis.

For instance, IBM's procurement division utilized machine learning to analyze their spending patterns.

ML algorithms were used to classify spend data into categories, identify anomalies, and provide insights into potential cost savings opportunities.

There are three spend classification techniques you can use, including:

Better Spend Management with Spend Analytics



Supervised Learning
for Spend Classification



Unsupervised Learning
for Vendor Matching



Classification
Reinforcement Learning

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▪ **Supervised Learning for Spend Classification**

Here, humans train algorithms to find patterns in spend. This removes the hassle of repetitive new spend classification.

▪ **Unsupervised Learning for Vendor Matching**

With this approach, algorithms are programmed to find new patterns in vendor relationships without the need for human intervention.

For instance, if you have multiple iterations of DHL (DHL, DHL Express, and DHL Freight), then the algorithms can consolidate them together for better data visibility and coherence.

▪ **Classification Reinforcement Learning**

With reinforcement learning, the machines do the initial work of classifying the spend data. Then, humans review the results, and the algorithm receives “rewards” for correct classification and “punishments” for incorrect actions.

Over time, the AI algorithm learns how to behave, which improves your overall workflows.

Automated Supply Assignment Sourcing

By placing more effort in automating supply assignment sourcing, you can reduce the need for manual interactions while ensuring you still get the goods and services you need for the best possible price, highest quality, and fastest delivery time.

The AI mimics human behavior by sending the bid invitation to your defined list of preferred vendors for more strategic sourcing.

From there, you can have humans focus on supplier selection based on your chosen metrics.

By saving time on manual tasks, your team can spend time on more value-added tasks, making it easier to keep stakeholders happy.

▪ **Predictive Analytics for In-Transit Stock**

Companies that send and receive goods must follow the progress of the materials in transit to address potential delays or other issues before they occur.

By ensuring all orders are delivered on time, you can avoid speeding up the process across the supply chain. This eliminates unnecessary spending on payroll and logistics.

▪ **Better Negotiations**

Using machine learning algorithms that look through free text responses, you can compare those requests to historical description patterns.

This allows you to recommend they add a product or service to the catalog so you can negotiate better pricing.

▪ **Anomaly Detection**

Using machine learning AI technology, you can get notifications of any anomalies, new opportunities, and suggested courses of action directly on your procurement dashboards.

You'll be able to instantly and precisely detect all changes - and when something out of the ordinary happens, you'll receive an alert with an immediate recommendation of what to do.

You can also use AI to demonstrate possible simulations and new opportunities thanks to the data you have available to leverage.

With this information, your procurement professionals will be more aware of what's happening, allowing them to make better decisions faster.

Since the AI uses facts, rather than human speculation, to produce its suggestions, you can trust that the recommendations are accurate.

Procurement leaders get the assurance that their decision-making is based on concrete information, thereby eliminating uncertainties and promoting confidence.

• **Fraud Detection and Risk Management**

Fraud in procurement is a serious issue faced by many organizations. Machine learning models can be trained on historical data to detect fraudulent activities.

This allows procurement professionals to identify potential risks early on and take necessary actions to prevent them.

• **Invoice Processing**

Machine learning algorithms can help automate the invoice processing cycle, which is often a time-consuming task for accounts payable professionals.

Using Optical Character Recognition (OCR), machine learning algorithms can automatically extract data from invoices, reducing the time and effort required for data entry and reducing the risk of human errors.

AI in accounts payable has been incorporated into AP automation software, like PLANERGY, for many years.

This improves invoice scanning, coding of invoices, and matching them against upstream data and greatly reduces invoice cycle times and the cost of processing invoices.

▪ **Contract Management and Analysis**

Machine learning algorithms can also be used to analyze contracts and automatically extract important information such as payment terms, delivery dates, and penalties for breaches.

This saves procurement professionals time in the contract management process and effort and helps prevent discrepancies in payments and deliveries.

▪ **Predictive Analytics**

Machine learning algorithms can analyze large volumes of data and identify patterns that might not be apparent to humans.

These patterns can be used to predict potential risks and threats, allowing organizations to take preventive measures before any harm occurs. Predictive analytics in procurement can be a very powerful tool.

This predictive capability is particularly useful in sectors like banking and finance, where it can help predict loan defaults or fraudulent transactions.

This real-time risk management can be helpful in multiple ways.

▪ **Demand Forecasting**

One of the primary applications of machine learning in inventory management is demand forecasting.

Machine learning models can analyze past sales data and consider factors like seasonal trends, promotional activities, and market changes to predict future demand accurately.

This can include various types of demand forecasting, trend analysis, and spend forecasting methods.

This helps businesses prepare for fluctuations in demand and avoid stockouts or excess inventory.

▪ **Inventory Optimization**

Machine learning can help optimize inventory levels by analyzing sales patterns, supplier lead times, and other relevant factors.

It aids in maintaining optimal stock levels, preventing dead stock, and improving the overall customer experience.

▪ **Minimizing Downtime**

By predicting maintenance needs and potential failures, machine learning can help minimize downtime in inventory management.

This ensures that essential equipment needed for production or inventory management is always in optimal working condition, thus avoiding unexpected operational disruptions.

Real-time monitoring of virtual and real-world devices via The Internet of Things (IoT) and other Industry 4.0 applications can be very powerful.

▪ **Automated Inventory Management**

Machine learning enables inventory management automation, eliminating human bias and reducing the likelihood of errors.

Better management of inventory will result in better performance against key inventory management KPIs including inventory cycle time.

This includes tracking inventory levels, orders, and sales to perform predictive analysis and forecast demand, helping to reduce overstock and understock situations.

▪ **Capabilities Matching**

Machine learning can also help in terms of capabilities matching. All buyers want their suppliers to be able to fully meet current and expected

needs while delivering exceptional service.

However, it can be tough to determine reality from all of the marketing hype.

Machine learning can scan the industry for new competencies and align them with business requirements so procurement can develop the process is to continuously test the ability of both existing and new partnerships.

• **Monitoring and Tracking Efficiency**

With machine learning, organizations can track and monitor the efficiency of every organization within the supply chain and rate suppliers based on their performance.

This allows procurement to hold vendors accountable while also ensuring operations continue to run at peak standards.

• **Compliance Management**

For organizations that have issues with contract compliance or regulatory compliance concerns, machine learning can find hidden patterns in the data sets that indicate whether a supplier is not meeting their regulatory requirements.

Machine learning can do this much faster and more efficiently than any human. This can help track key performance indicators for compliance.

With the data available, the procurement function can discuss these issues with suppliers much easier and in a manner that is decisive and productive.

Classifying spend into various procurement categories is one of the oldest standing challenges in procurement spend Analytics. It is one of the first applications where artificial intelligence is widely used today.

▪ **Big Data Analysis in Procurement**

Another crucial area where ML comes into play is procurement big data analytics.

Procurement generates massive amounts of data. Turning big data into good data or turning data into actionable insights can be a challenge when working manually. ML can help make sense of it all.

By analyzing this data, ML can identify patterns, trends, and correlations that would be impossible for humans to detect.

Google, for example, uses ML to analyze supplier performance data, helping them make better procurement decisions.

Procurement encompasses vast amounts of data sets, which, when leveraged correctly, can be useful for forecasting.

▪ **Purchase Records**

These include data about what has been purchased, when, by whom, and at what cost. This data can help identify purchasing patterns and trends.

▪ **Sales Records**

Sales data can provide insights into customer preferences and demand trends, helping procurement teams plan their buying accordingly.

▪ **Sales Reports and Annual Reports**

These reports can offer a wealth of information on company performance, market trends, and potential areas of improvement in procurement processes.

▪ **Marketing Data**

This includes historical data on campaigns, customer responses,

and market trends. It can help procurement teams understand the market better and make informed decisions.

- **HR Data**

Information on employee performance, hiring needs, and workforce trends can inform procurement strategies, especially when it comes to procuring services or outsourced labor.

- **Supplier Data**

Data about supplier performance, reliability, and cost-effectiveness is crucial for making informed procurement decisions and managing supplier relationships effectively, especially when it comes to adding new suppliers to your roster.

- **Contract Data**

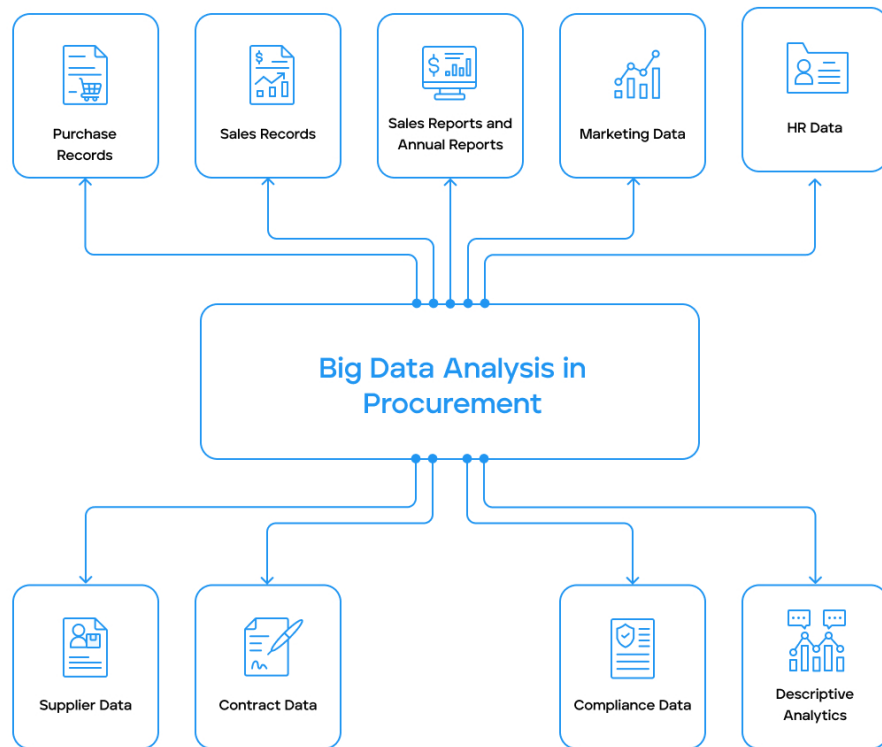
Information about contracts, such as terms, duration, cost, and performance, can help manage contractual obligations and identify opportunities for negotiation or renewal.

- **Compliance Data**

This includes data on regulatory compliance, which is crucial in industries where procurement must adhere to strict regulations.

- **Descriptive Analytics**

Analyzing procurement data to describe what has happened in the past can help identify trends, challenges, and opportunities.



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Machine Learning vs. AI: Complementary Technologies

While machine learning is a part of AI, they are not the same thing.

AI is a broader concept that refers to machines capable of carrying out tasks in a way that we would consider “smart.”

Meanwhile, ML is a specific subset of AI that involves the principle of getting machines to learn and make decisions from data.

Together, they offer immense possibilities for procurement professionals.

AI technologies can automate repetitive tasks, freeing up time for strategic activities.

They can also provide predictive analytics, giving procurement professionals insights into future market trends.

However, there is a risk of over-reliance on AI, as it's still crucial for humans to oversee and make the final decisions.

The Future of AI in Procurement

The future of AI solutions in procurement looks promising.

With advancements in technology, AI will continue to evolve and become more sophisticated, further enhancing its capabilities in procurement.

We can expect to see more personalized vendor interactions, automated negotiations, and even AI-powered procurement chatbots that can process orders and handle queries.

Machine learning is vital in procurement, providing valuable insights, improving efficiency, and reducing costs.

As part of the broader AI technology, ML complements other AI technologies to revolutionize procurement processes.

As we look towards the future, the impact of these technologies on procurement will only continue to grow.

As new technologies and data sources become available, AI tools will become more sophisticated, and necessary to stay competitive.

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