

MLOps

101



AGILE | DATA | DIGITAL | MODERNIZATION

What is MLOps?

MLOps comprises the tools, technologies, and practices that allow end-to-end operationalization of Machine Learning (ML) algorithms. ML models and Artificial Intelligence (AI) applications can provide innovative solutions to modern business problems, but to gain consistent benefit at scale, ML models have to be effectively managed using repeatable processes that cover their entire lifecycle, from creation to training, validation, deployment, and monitoring.

The need for MLOps is growing.

According to Forbes, the MLOps market will be over **\$4 Billion** in just a few years and promises to be a major component of the AI solution landscape.

It's already a major trend, as more and more organizations seek to benefit from AI and ML applications.

Read this eBook to learn about:

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“MLOps is a must-have capability to operationalize AI at scale. MLOps comprises tools, technologies, and practices to enable organizations to deploy, monitor, and govern machine learning models and other analytical models in production applications.”

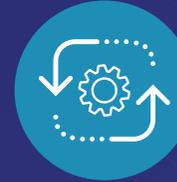
– [Forrester](#)

WHY MLOps

ML and AI have the potential to move your organization ahead by creating new insights and new opportunities. To maximize on their potential, you need to develop processes that allow you to repeatably and reliably train, validate, and deploy your ML algorithms. You need MLOps!

MLOps is a force-multiplier. It takes your sophisticated algorithms and ensures they are always ready, up to date, and performant by creating sustainable processes around their deployment and use. With MLOps, your organization can democratize machine learning, empower a community of data practitioners, and maximize business impact. MLOps makes ML efforts more efficient and effective, allowing them to scale to meet the largest challenges.

With MLOps, your AI applications will:



Consistently deliver the best recommendations through repeatable, consistent, and well-monitored processes for training, deployment, and production release of your ML models



Enjoy more opportunities for reuse through well-documented learning and hypothesis testing of ML models and their evolution



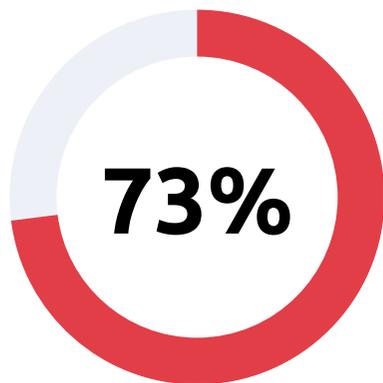
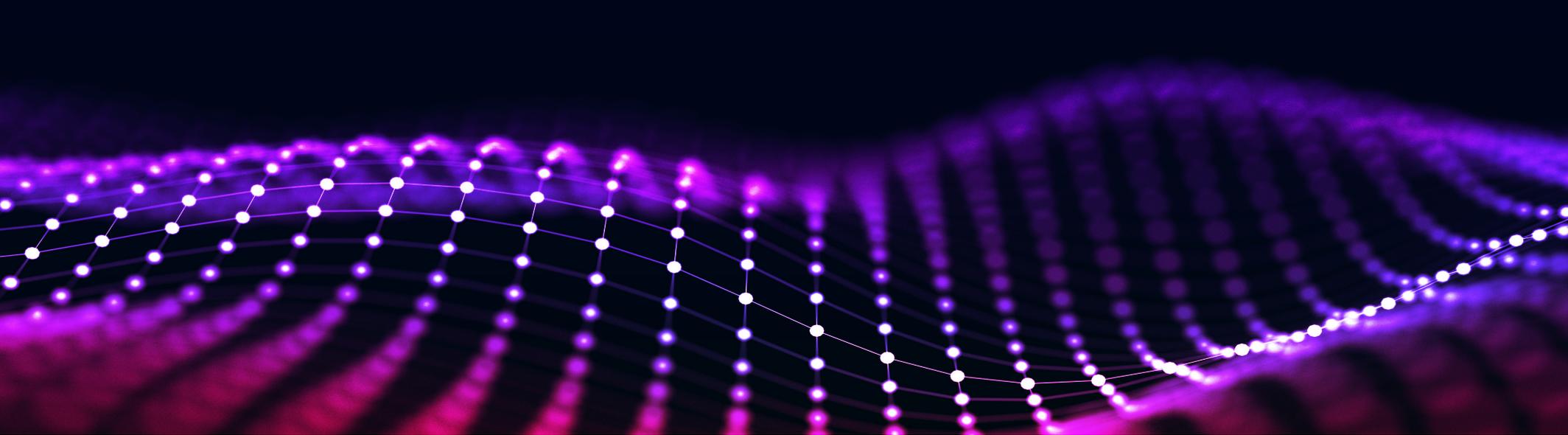
Always perform safely and securely through repeatable validation and testing procedures



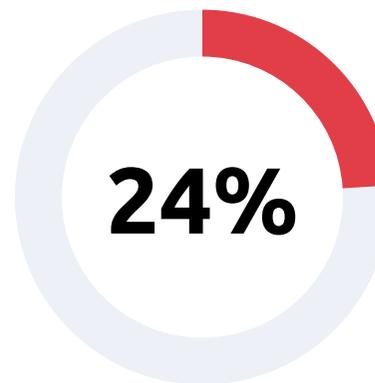
Continually improve through rapid feedback loops employing automated tooling and reliable infrastructure



Meet your business needs through effective metrics that track model accuracy, bias, and production readiness



MLOps adoption
would keep them
competitive



MLOps would
make them an
industry leader

In a recent study, Forrester found that **73 percent** of respondents said MLOps adoption would keep them competitive, while **24 percent** said it would make them an industry leader.

- [RTInsights.com](https://www.rtiinsights.com)

ESSENTIAL **MLOps**

The best way to get started with MLOps is to recognize that it covers many different aspects of AI/ML work. There are six different areas an effective MLOps approach will cover. Make progress in each of them and you will start to see benefits, even if you do not fully automate your processes right away.

Start your MLOps initiative by addressing each of these six areas:



Understanding
business needs



Model
development



Monitoring



Data governance
and ingestion



Model
operationalization



Security





UNDERSTANDING **BUSINESS NEEDS**

Make sure you have a clear cut business case for your AI/ML solution before embarking on an MLOps effort. To build effective ML solutions and the operations behind them, you need to understand the business problem they will solve.

That understanding will guide the development approach, influence the design of algorithms, and provide evaluation criteria for model development and monitoring. ML algorithms are sophisticated tools, and for any specific job, some tools fit better than others. Drills are better at making holes than hammers, for example; algorithms have similar specializations.

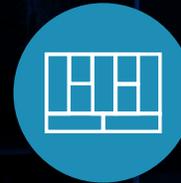
If you're uncertain about how best to determine business needs, there are many useful tools to consider, including:



Impact Mapping



Value Proposition Canvas



Business Model Canvas

You can find more details [here](#).



DATA GOVERNANCE AND INGESTION

ML solutions are only as good as their underlying data. MLOps puts processes in place to ensure data is effectively managed and governed, so that your models remain as accurate as possible.



“To achieve ML at scale, enterprises must achieve MLOps capabilities”

– Forrester

Ensure your processes address how you will:



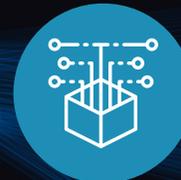
Identify new data sources and **validate** they are a good fit for the business problem



Validate the quality and **applicability** of those data sources to ensure they will enhance the performance of the underlying model



Control access to those data sources so data quality can be maintained



Ingest those data sources and make use of them for the enhancement of the model and the solutions it provides



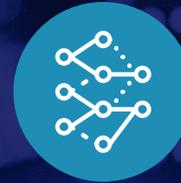
Maintain the quality, accessibility, and trustworthiness of those sources so undesirable biases can be avoided



MODEL DEVELOPMENT

ML models are developed by data scientists through an exploratory process of investigation and hypothesis testing. An effective model not only solves the business problem, but does it in a scalable, reproducible, and accurate way. This inspires confidence. Reproducibility is particularly important, as this means the model will consistently and reliably solve the target business problem.

MLOps ensures reproducibility through:



Managing training environments



Controlling model parameters



Managed approaches to ML training

As models evolve, the process needs to be managed effectively so that we can confidently know if a new model is an improvement. Without this knowledge, we cannot know if we should move new models to production or not. Will they improve the applications we're offering to end users? We need to be confident they will.



MODEL OPERATIONALIZATION

Skilled data scientists will explore the underlying data, investigate the business problem, and develop ML models to solve it, but for those models to be useful, they need to be placed in production. They need to become operational.

MLOps introduces repeatable processes for taking ML models from development and into production, so that you can be confident that when a new, improved model is ready, you can take full advantage of it, with confidence that it was trained and deployed correctly.



ML accuracy, bias, and interpretation can all drift as input data changes. Monitoring and validation are essential to maintaining production-worthiness.

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“Much like software, machine learning improves through iteration and regular production releases.”

– Forbes



MONITORING

Once they're in production, your ML models must reliably meet expectations. As the data fed into them changes, their performance can drift away from established baselines. Effective monitoring ensures that your ML models and AI applications continue to meet the needs of customers and end users.



“Most businesses lack mature MLOps. Only six percent say they have mature capabilities. The majority, 41 percent, said they have struggled to operationalize.”

– Forrester

There are three main categories of performance metrics required for MLOps. Each of them should be monitored:



Performance requirements
(e.g., speed, availability, scaling)



Accuracy measures
(e.g., overall accuracy, false positives and negatives)



Use (e.g., frequency of use and how it is used)



SECURITY

The value of your ML Models and AI applications directly correlates to how trustworthy they are. If they cannot predictably and reliably deliver on expectations, trust will be undermined. That's why security—of the data, the models, and the code supporting them—is so important. Monitoring can help proactively identify if a model has been corrupted or compromised, but it is essential to integrate security throughout your entire MLOps infrastructure, so that models, data, and all the code supporting them are controlled and properly protected.



SUMMARY

MLOps is essential to providing deeper, richer, and more consistent insights with your ML applications. It is the bridge between the exploratory work of data scientists, who pursue the development of the most effective algorithm, and real solutions, built on those algorithms, for end users and customers. MLOps is what turns your creativity and vision for AI/ML into sustainable products and solutions.

Contact us to learn more about how **Excella can help you get the most out of your ML applications through MLOps!**

[Contact Us](#)

About Excella

Excella is an Agile technology firm helping leading organizations realize their future through the power of technology. We work collaboratively to solve our clients' biggest challenges and evolve their thinking to help them prepare for tomorrow. Together we transform bold ideas into elegant technology solutions to create real progress. [Learn more at www.excella.com](http://www.excella.com).



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