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Life Sciences

WINNING THE CUSTOMER EXPERIENCE (CX) BATTLE IN LIFE SCIENCES:
The Role of AI Automation with MLOps as the Key Enabler

Kamal Kasi
Vice President – Life Sciences
Course5 Intelligence

Shubham Kansal
Lead Solution Architect – AIML COE
Course5 Intelligence

Harshit Sundriyal
Senior Data Scientist – Life Sciences
Course5 Intelligence

WHY READ THIS PAPER

This whitepaper provides Life Sciences leaders with critical insights on transforming Customer Experience (CX) through Machine Learning Operations (MLOps). Taking cognizance of today's multichannel, non-linear customer journey, the paper defines strategies for bridging the gap between physical and digital touchpoints, leveraging opportunities created by emerging patient/industry data and advanced analytics, using automation to overcome AI deployment challenges, and optimizing the Life Sciences Customer Experience. Addressing the widely prevalent but problematic "use and throw" phenomenon in AI/ML deployments, the authors delve into how MLOps help reduce wasted investments, tap new opportunities, and translate AI/ML models into operational deployment and bottom-line impact. You'll find in this paper a robust roadmap for Operations Excellence in Life Sciences, enabling companies to optimize their AI/ML investments.

The landscape of Customer Experience (CX) in Life Sciences is swiftly evolving, necessitating a continuous learning approach in a hybrid world. The traditional model of physical touchpoints between Life Sciences and its stakeholders – including healthcare providers (HCP), caregivers, patients, and payers – is merging with ever-expanding digital engagement approaches. In order to embrace this hybrid reality, Life Sciences leaders must recognize the importance of a **seamless integration between physical and digital touchpoints, and automate this ongoing integration through AI-driven automation.**

The Role of Data, Analytics, and Technology in Customer Engagement
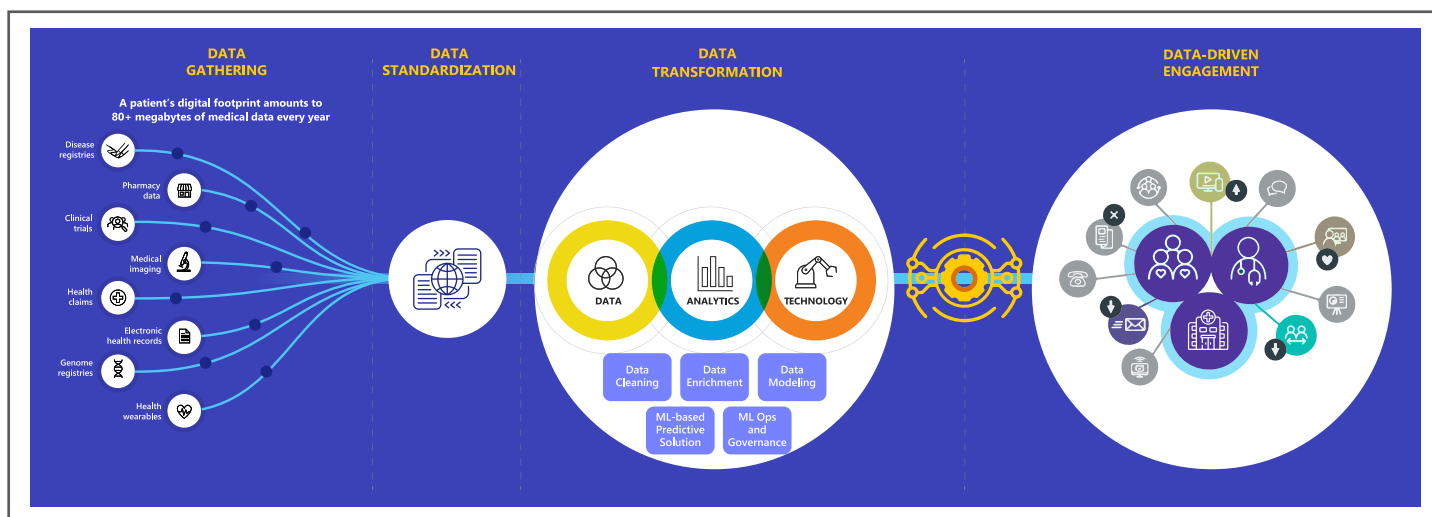
THE CX OPPORTUNITY IN THE AGE OF DATA AND AI

While **AI-driven customer experiences** promise to be seamless and personalized, some important factors still need to be addressed to achieve true customer-centricity in a hybrid (digital and physical) landscape:

- **Evolving Customer Segments and Information Needs:** There is still a gap in understanding customer segments and their information needs accurately to deliver the right content. Life Sciences can enhance both the speed and quality of customer understanding and be up-to-date in delivering relevant content to HCPs and patients.
- **Connectedness Across Touchpoints:** Organizations need to build the ability to assess audience responsiveness to channels and tactics and leverage that in planning next more quickly to create a seamless customer journey across various touchpoints (such as online platforms, in-person interactions, telemedicine, etc.)

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- **Ability to Leverage Data at Speed:** In the rapidly evolving landscape of healthcare, AI can harness huge amounts of data and predict the right time to engage with HCPs and patients while maintaining accuracy and compliance with regulations. However, organizations will need to scale AI capabilities within the organization to get successful outcomes.

- **Personalization as Scale:** Implementing personalization across multiple touchpoints and interactions with consistency and relevance can be daunting, particularly for large Life Sciences companies with a wide range of products and audiences. Life Sciences organizations need to find ways to efficiently manage ongoing customer engagement with AI-driven recommendations.

Implementing a test-and-learn capability, with Machine Learning Operations (MLOps) as the critical link, in using data, technology, and AI effectively can help mitigate several challenges in delivering outstanding Life Sciences Customer Experience (CX). Here's how:

- **MLOps can enable continuous testing and learning** that can assist in refining communication strategies by analyzing vast amounts of data to understand how different messaging or content formats resonate with specific audiences.

- **MLOps enables fast integration of data** from various customer touchpoints, providing a unified view of customer interactions. This can be leveraged by Life Sciences companies to identify customer patterns and preferences across different channels, ensuring a more connected and consistent customer journey, irrespective of the platform they engage with.

- **MLOps streamlines processes by automating tasks and analyses,** resulting in embedded insights at the point of decision-making, thereby improving speed and responsiveness in customer interactions.

- **Continuous testing and refinement using MLOps** can help fine-tune personalization efforts, striking a balance between customization and respecting privacy boundaries.

By implementing MLOps for test-and-learn capabilities, Life Sciences companies can harness the power of data-driven insights to optimize their CX strategies. However, it's crucial to approach this implementation with a focus on ethical data usage, transparency, and regulatory compliance to ensure that the benefits of MLOps are maximized while maintaining trust and integrity in customer interactions.

FROM POSSIBILITY TO CHAOS: SEVERAL AI/ML MODELS CREATED, WITH FEW EMBEDDED IN DECISION-MAKING

In the dynamic realm of Life Sciences, the exploration of advanced analytics, artificial intelligence (AI), and now Generative AI (GenAI) for optimizing business strategies has reached unprecedented levels. There is a huge a surge in innovation from data science teams in terms of acceleration in the number of AI solutions in Customer Engagement such as the Physician Conversion Model, Physician Penetration Model, Patient Finder Model, Switcher Model, and Market Mix Models. Despite the ingenuity invested in creating state-of-the-art AI/ML models, the reality is that only a few of these models make it to production, where they can influence day-to-day operations.

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The "Use and Throw" Approach

Patterns in data continually shift due to events like the COVID-19 pandemic, new treatments, new patient-level data, and the ever-increasing digital footprint of customers, resulting in the emergence of "Use and Throw" as a substantial challenge. This practice involves creating numerous experimental AI/ML models, briefly utilizing them, and then leaving them inactive. Despite its apparent convenience, this approach not only incurs a high experimentation cost but also results in limited learning opportunities, surrounded by doubts and caution.

This "Use and Throw" phenomenon leads to a cluttered landscape, where promising AI/ML solutions often find themselves stuck in an ongoing cycle of experimentation. This not only shortens the lifespan of models but also hampers their transition to operational deployment, resulting in a slowdown of potentially revenue-generating models.

Impediments to the Success of AI/ML Projects

The 'Use and Throw' approach in AI/ML projects within the life sciences, especially the Life Sciences domain, can be attributed to inherent complexity and variability. Here's why:

- **Unpredictable Data Patterns:** Navigating through AI/ML projects becomes challenging due to the unpredictable nature of data patterns. The ever-shifting landscape, influenced by factors like the dynamic Life Sciences market, evolving medical practices, changing HCP prescribing behavior, patient engagement drivers, etc., adds a layer of complexity.
- **Dynamic Business Requirements:** Changing strategic objectives, new business hypotheses, emerging new and richer datasets, and other factors put AI/ML solutions in a constant state of flux. This dynamic environment makes it challenging to smoothly integrate AI/ML models into the decision-making process.
- **Common Pitfalls in AI/ML Solution Development:** The absence of standardized practices, poor scalability, and operational challenges are common pitfalls that intensify other challenges. Non-uniform practices hinder efficiency, scalability issues pose barriers to seamless model deployment, and operational challenges complicate the overall AI/ML project landscape.

These challenges extend project timelines, increase costs, and contribute to operational inefficiencies, impacting the overall efficacy of AI/ML initiatives within the Life Sciences industry and any other industry.

Navigating Daily Challenges: A Realistic Example of a Data Scientist's Struggle

Meet a skilled data scientist dedicated to enhancing the Physician Conversion Model that aims to improve Sales Force targeting efforts. In the early stages, the model looks promising as our data scientist diligently takes care of various feature groups crucial for predicting physician conversion. These include claims features, prescription details (Rx, TRx, etc.), procedure specifics, demographic information, and factors like physician affiliations, along with promotional activities. Our data scientist goes through the routine of training, tuning, and evaluating the model, ensuring it's ready for the client's use in making informed decisions.

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However, challenges emerge during the operational phase – feature drifts, the need for new features, lack of model monitoring post-deployment, and handing over the model to a new associate. These challenges, stemming from the absence of standardized practices and version control, highlight the real-world hurdles faced by data scientists. The consequences of poor deployment become apparent when models lack proper monitoring and maintenance. Without the support of MLOps, even the right tools and processes can lead to extended periods of inaccurate predictions or API failures, all due to undetected issues – a scenario many data scientists can relate to in their day-to-day work. Until these challenges are addressed, even the most state-of-the-art models crafted by data scientists are bound to fall into the "use and throw" approach after a few cycles.

Operations Excellence is the Answer

Introducing Operations Excellence is crucial to bringing method to this madness, similar to how DevOps transformed the landscape of software engineering. In the realm of AI/ML, the concept of MLOps (Machine Learning Operations) plays a pivotal role. MLOps ensures a streamlined and efficient process from model development to deployment, addressing the challenges posed by the inherent complexities of AI/ML projects.

Harnessing the true value of AI solutions requires embracing Operations Excellence through MLOps. This strategic shift is not just a solution to the existing challenges but a pathway to unlocking the full potential of AI/ML technologies within the Life Sciences industry and beyond.

FROM CHAOS TO VALUE REALIZATION: UNLOCKING HIGH RETURNS ON AI/ML INVESTMENTS THROUGH MLOPS

MLOps, or Machine Learning Operations, isn't just a technical methodology; it's a strategic approach that enhances the entire machine learning lifecycle, ensuring efficiency, standardization, and automation. It's the bridge that spans the gap between the chaos of model development and the realization of tangible value for the organization.
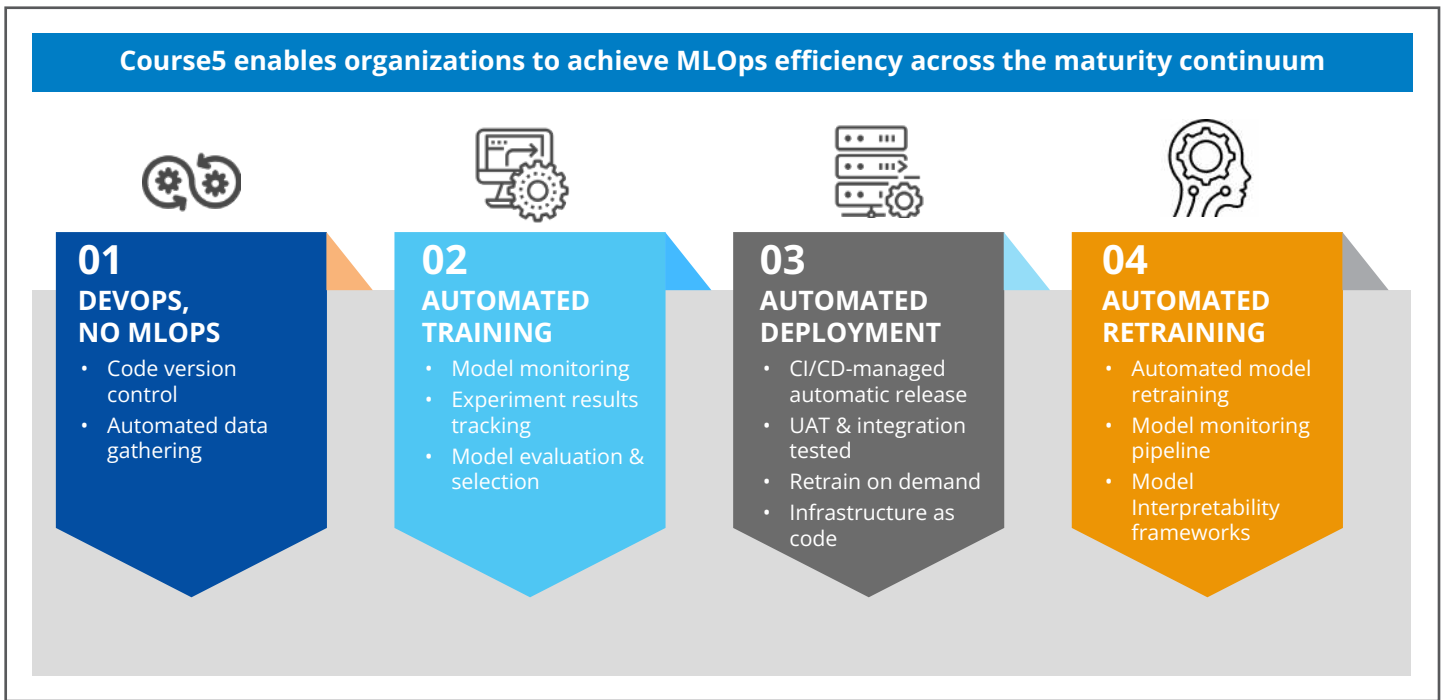
Assessing the Maturity Level of Your AI/ML Solution Portfolio Management

In preparation for the MLOps journey, understanding your organization's current position serves as a starting point to determine the desired MLOps maturity level of your organization. Whether you're manually managing ML models, implementing DevOps without MLOps, or incorporating MLOps components partially, recognizing the present maturity level is pivotal for a successful MLOps implementation.

The next foundational element is a well-defined vision that acts as the guiding North Star. Crafting goals that seamlessly align with organizational objectives and technology initiatives is important. Given the multi-dimensional nature of MLOps as a solution, clarifying aims is imperative. This clarity ensures strategic alignment and targeted actions to fulfill identified goals.

In our experience, leaders in the Life Sciences industry have sufficiently dabbled in the first two stages of the maturity continuum and are progressing towards the third stage and institutionalizing practices on this journey.

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Course5 enables organizations to achieve MLOps efficiency across the maturity continuum

01 DEVOPS, NO MLOPS
- Code version control
- Automated data gathering

02 AUTOMATED TRAINING
- Model monitoring
- Experiment results tracking
- Model evaluation & selection

03 AUTOMATED DEPLOYMENT
- CI/CD-managed automatic release
- UAT & integration tested
- Retrain on demand
- Infrastructure as code

04 AUTOMATED RETRAINING
- Automated model retraining
- Model monitoring pipeline
- Model Interpretability frameworks

Key Components of MLOPs

As you navigate the transition of your ML model from development to deployment, integrating various components is pivotal for a successful MLOps framework. Here are key elements to consider:

- **IaaC (Infrastructure as Code):**
  - Automates infrastructure deployment and facilitates recovery management
  - Ensures repeatability and reproducibility

- **Version Control:**
  - Ensures a systematic approach to managing code versions
  - Crucial for traceability and reproducibility in ML model deployment

- **CI/CD (Continuous Integration/Continuous Deployment):**
  - Automated tests triggered on pull request creation
  - Allows production deployment exclusively through the CD pipeline

- **Feature Store:**
  - Centralizes features, ensuring consistency and reusability
  - Plays a crucial role in managing and serving features for ML models

- **Model Monitoring:**
  - Triggers automated alarms to maintain optimal model performance
  - Addresses eventual degradation of models over time

- **Feedback Mechanism:**
  - Ensures models adapt to changing requirements
  - Incorporates user feedback and real-world data for model evolution

Depending on the stage in the journey, it may not be necessary to include all these components. Tailoring the integration of these components in alignment with specific requirements ensures a streamlined and efficient MLOps journey, paving the way for enhanced AI/ML capabilities and organizational success.

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MLOps Architecture: A Sample Leveraging Azure Native services
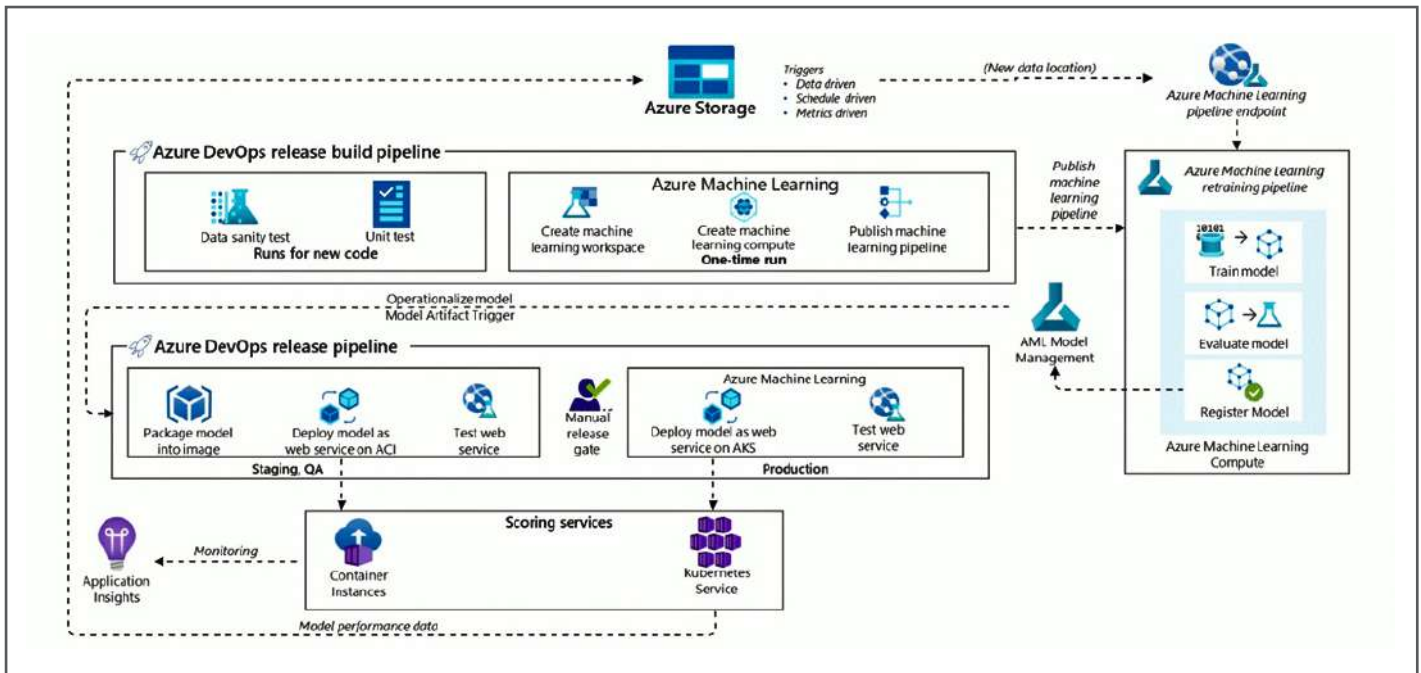
MLOps in Action: Unveiling the Value

Leading companies in the Life Sciences space have embraced MLOps to navigate the complexities of Customer Experience needs and strategies, ensuring precision and maximizing the impact of their tactics. The table below explores how MLOps components contribute to overcoming challenges and realizing business benefits in the context of Life Sciences' marketing.

EXISTING STATE	MLOPS COMPONENTS	BUSINESS BENEFITS
Inefficient Run: Data Scientists spend significant hours on execution	Automated Pipelines / IaaC	Efficiency Gains: Up to ~60% reduction in run time
Automation Hurdles: Lack of code versioning and refactoring practices hinder automation	Code Versioning/ Refactoring	Proper packaging and reusability of code
Recreating pipelines for managing and serving features even for similar models	Feature Store	Accelerated time-to-market for new models, up to ~20% time reduction for deploying similar models
Minimal Monitoring: Lack of components leads to unnoticed data and model drift	Model Monitoring	Robust AI/ML Portfolio: Models perform as expected in real-world scenarios
Manual Deployment: Dependence on manual steps for model deployment	CI/CD, Automated Deployment	Streamlined Operations: Increased efficiency through automated deployment processes

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Navigating Challenges and Course5 Best Practices

At Course5 Intelligence, our experience across various Life Sciences engagements has given us the expertise to handle common challenges during MLOps implementation. Here are some best practices you can use to drive success in your AI/ML initiatives:

- **Collaboration:** An interdisciplinary team of solution architects, data scientists, ML engineers, and IT must work closely with business teams for holistic success.

- **Standardization:** Transitioning from old approaches in coding practices documentation and embracing newer approaches to managing features and frameworks for model monitoring should be considered in the overall change management approach.

- **Fit-for-purpose approach:** Small organizations can leverage cloud-based MLOps pilot solutions for scalability without significant infrastructure investment, while large organizations might need to prioritize integration with existing systems and make investments in training and change management as they scale capabilities.

In implementing MLOps, the roadmap is not just a guide; it's a dynamic plan that adapts to the unique needs and scale of each organization, ensuring a successful and impactful journey towards optimized AI/ML operations.

In the dynamic landscape of AI and ML, Course5 Intelligence stands as your strategic partner, offering expertise and solutions to navigate the complexities and unlock the full potential of your AI/ML investments. Embrace the power of MLOps and embark on a transformative journey with Course 5 Intelligence. Partner with us and, together, let's turn possibilities into reality.

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About Course5 Intelligence

Course5 Intelligence Limited ("Course5") focuses on helping organizations drive digital transformation using artificial intelligence ("AI"), advanced analytics and insights. Course5's AI-driven products and solutions and IP-led solutions are supported by industry-specific domain experience and the latest technologies and aim at enabling organizations to solve complex issues relating to their customers, markets and supply chain at speed and scale. Course5 combines a multi-disciplinary approach to data integration across structured and unstructured data sources to help businesses grow through informed decision-making.

Course5 caters to some of the world's largest enterprises, including many Fortune 500 companies. The company's clients span Technology, Media and Telecom (TMT), Pharma & Lifesciences, CPG, Retail, and other sectors. Course5 Intelligence has been recognized by leading industry analysts like Gartner and Forrester for its Analytics and AI capabilities and proprietary AI-based platforms.

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