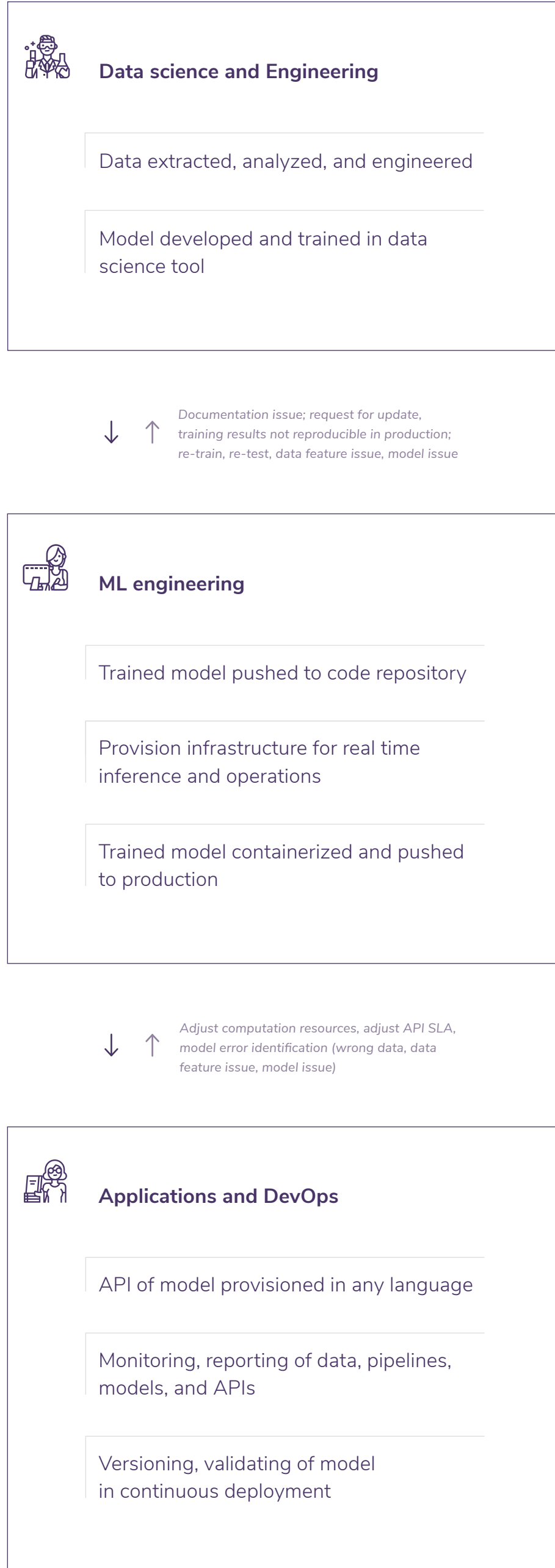


Machine learning drives competitive advantage and is critical to an organization's digital transformation. To succeed, your company needs a solution for ML operations and management.

1. ML lifecycle: how it works

The machine learning lifecycle involves continuous interaction and iteration of several roles. Each role focuses on fulfilling a specific facet of ML management.



2. ML operations and management framework: what to consider

To extract value from machine learning, companies must solve the underlying categorical challenges within the framework of ML operations and management. Those are development, deployment, operations, and governance.

Model development integration						
myClassifierv1.0 myTextOCRv2.4 myLangIdentifierv1.1 myTranslatorv2.0 myTextVectorizerv1.0 myNaturalLanguageProcessorv3.1						
Training integration				Data source types and characteristics		
DataRobot	MLFlow	Caffe2	Jupyter	Keras	Internal primary	External private
OpenCV	Amazon	PyTorch	TensorFlow	Apache Spark	Internal secondary	Unstructured
Kubeflow	SageMaker	H2O	Scikit-learn	Domino	External open	Structured
Model deployment: load, catalog, version, validate model						
Model library	Model version management	Model pipelining	Source code management	Provision API for production	Data sources/connections	
DIY (Excel, DB) Manual Vendor solution Partial model registry	DIY (Excel, DB) Manual Vendor solution Open source	Reuse existing models Choose best models Swap model components Programming language interoperability	GitLab GitHub Bitbucket Git	Rest API CLI API keys API management Backward compatibility	Object storage Data lake Database Log files Streaming	API Block storage Data warehouse Key-value store
Data connections: prepare data sources and pipelines						
Frameworks and libraries		Languages	Processing dependencies (hardware dependencies)		Data pre- and post-processing algorithms (pipeline dependencies)	
TensorFlow TensorRT Spark Scikit-learn Keras Pandas	PyTorch H2O Numpy Nvidia APEX Caffe2	Java Python JavaScript R Scala Rust Ruby	CPU GPU CUDA, OpenCL ASICs		PDF to text Image downscaling Data normalization	
Operations: manage cloud costs and continuous integration, continuous deployment (CI/CD)						
Business application process optimizations and analysis (inbound)		Customer-facing applications (outbound)		Application integrations	BI integrations: visualization	Model management
Fraud detection Financial insight analysis Merchandising insight Consumer insight Image processing Cost optimization Claims processing Route optimization		IOT device Shopping experience Website experience Chatbot Document discovery Marketplace pricing Logistics Financial planning Supply chain optimization		Web Mobile IOT Legacy Desktop Batch processing	Tableau Looker TIBCO Spotfire Mode ThoughtSpot PowerBI Qlik Excel Generic dashboard tools	Auto scaling Model performance Evaluations Drift detection A/B testing Champion/challenger Cloud infrastructure and cost management Model accuracy
CI/CD		Monitoring and alerting		Infrastructure provider		Deployment technology containerization
Jenkins Travis Circle CI gitOPS tooling API-based tools		Infrastructure performance SLA Admin tools Error handling Log management Alerting		AWS Azure Google VMWare Bare Metal Other cloud		Docker DIY Kubernetes Managed Kubernetes VMs Native OS
Governance and security: manage across infrastructure, data, network, and model						
Governance			Security			
Business architecture	Financial	Regulatory	Data	Network	Model	Infosec policy
Performance Technology stack Risk assessment	Chargebacks Showbacks Vendor management Cost reporting	GDPR Audit Tax and transfer Compliance	Encryption at-rest and in-transit Anonymization Model lineage	Authentication Access controls Communication encryption	Algorithm penetration security Static and dynamic code reviews Integrations Version control	Audit Standards Monitoring

3. Model: what to manage and measure

Each ML model has a unique journey from algorithm to application. Monitor and measure all your models at every step to optimize performance and manage outcomes.

