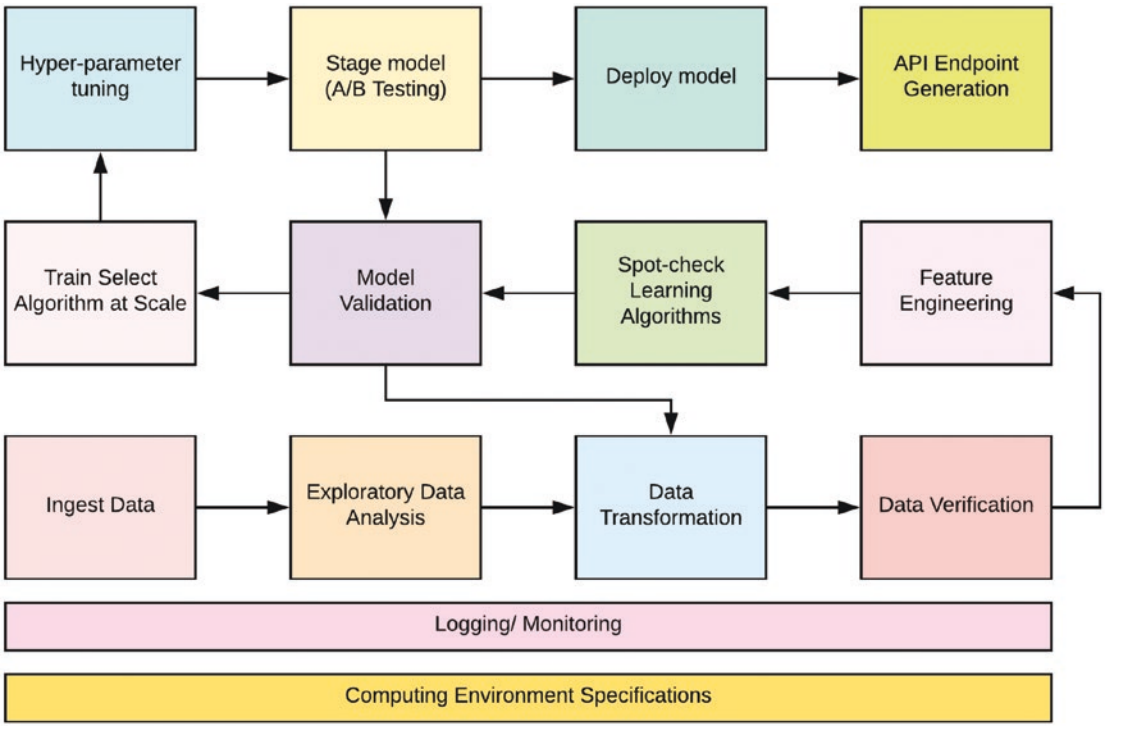

Figure 46-1. *Machine learning production pipeline*

From the preceding diagram, observe that the process flow in the pipeline is iterative. This repetitive pattern is central to machine learning experimentation, design, and deployment.

The Efficiency Challenge

It is easy to recognize that the pipeline requires a significant amount of development operations for the seamless transition from one component to another when building a learning model. This interoperability of parts has given rise to Machine Learning Ops, also known as MLOps. The term is coined as an amalgam of Machine Learning and DevOps.

The conventional way of doing machine learning is to perform all of the Experiment and development work in Jupyter notebooks, and the model is exported and sent off to the software development team for deployment and endpoint generation for integration

into downstream software products, while the DevOps team handles the infrastructure and configuration of the machine for model development. This monolithic style of working results in a machine learning process that is not reusable, difficult to scale and maintain, and even tougher to audit and perform model improvement, and it is easily fraught with errors and unnecessary complexities.

However, by incorporating the microservice design pattern to machine learning development, we can address a host of these concerns and really streamline the productionalization process.

Kubeflow

Kubeflow is a platform that is created to enhance and simplify the process of deploying machine learning workflows on Kubernetes. Using Kubeflow, it becomes easier to manage a distributed machine learning deployment by placing components in the deployment pipeline such as the training, serving, monitoring, and logging components into containers on the Kubernetes cluster.

The goal of Kubeflow is to abstract away the technicalities of managing a Kubernetes cluster so that a machine learning practitioner can quickly leverage the power of Kubernetes and the benefits of deploying products within a microservice framework. Kubeflow has its history as an internal Google framework for implementing machine learning pipelines on Kubernetes before being open sourced late 2017.

Table 46-1 is a sample of some of the components that run on Kubeflow.