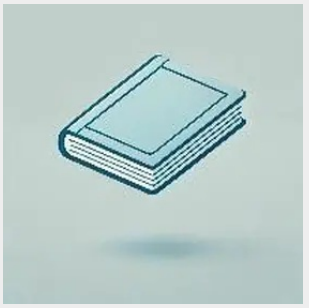
Guerard

The Complete Machine Learning Handbook

A Practical Guide to Building, Deploying, and Monitoring Real-World Machine Learning Systems



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Moving a machine learning model from a research notebook to a robust, real-world application is one of the most significant challenges in modern technology. Many practitioners can build a model, but few master the end-to-end process required to deploy, monitor, and maintain it responsibly and at scale. The Complete Machine Learning Handbook provides graduate students and beginning professionals with a comprehensive, hands-on roadmap for the entire machine learning lifecycle. This handbook is designed for engineers, developers, and applied researchers who want to bridge the gap between theory and production. In this book, readers will learn how to: Structure a machine learning project from data ingestion to deployment; Implement a robust MLOps pipeline for continuous integration, delivery, and training; Identify and mitigate bias and fairness issues at every stage of development; Deploy models as scalable, reliable services; Monitor, maintain, and retrain models in a production environment. This handbook directly solves the most common and costly problems that organizations and individuals face when learning to build AI systems. It solves the "Lab to Production" Gap, by providing the answer to the critical question: "I've built a great model in a notebook, now what?" The book gives students and practitioners the concrete steps and best practices to turn that model into a scalable, reliable, and valuable product. The book solves the problem of Inefficiency and Technical Debt. By providing a structured MLOps pipeline and proven engineering methods, the book helps readers avoid ad-hoc, brittle workflows that are impossible to scale and maintain. This saves significant time and resources in the long run. The book solves the Risk of Irresponsible AI, by providing a clear framework for building fairness, transparency, and accountability into the development process, helping organizations avoid the reputational, ethical, and financial damage that can result from deploying biased or unreliable models. Finally, the book solves the Skills Disconnect, by providing a common vocabulary and mental model for diverse teams (Software, Data Science, DevOps, Product), enabling them to collaborate more effectively on complex AI projects. The Complete Machine Learning Handbook is a durable, long-term resource. The MLOps tool landscape changes every year, but the core engineering principles remain constant. The reader will gain foundational knowledge that will outlast any single technology, making them a more adaptable and fundamentally skilled practitioner for years to come.

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