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Machine Learning Fundamentals:
Supervised Learning with Python

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Preface

Artificial Intelligence (AI) has become one of the most transformative technologies of the 21st century. From recommendation systems and voice assistants to medical diagnosis and autonomous vehicles, AI systems are shaping how we live, work, and interact with the world. Yet behind these powerful applications lie fundamental concepts that are accessible, logical, and deeply fascinating.

This book was written to introduce readers to the foundations of Artificial Intelligence and Machine Learning in a clear and structured way. It is designed for students, beginners in data science, and anyone curious about how intelligent systems learn from data.

We begin with an introduction to Artificial Intelligence (AI), its definition, historical evolution, and key areas. We then move into Machine Learning, the core engine behind modern AI systems.

A major part of the book focuses on Supervised Learning, where machines learn from labeled examples. In this chapter, we explore essential algorithms that form the building blocks of modern machine learning: Perceptron, MLP, KNN, Regression. Each concept is explained progressively, combining intuition, mathematical foundations, and practical understanding.

The final chapter introduces Basic Python, providing the programming foundation necessary to implement the algorithms discussed throughout the book. Python has become the language of choice in AI and machine learning, and learning its basics empowers readers to experiment and build their own intelligent systems.

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1 Artificial Intelligence

1.1. Introduction

Artificial Intelligence is one of those terms that almost everyone recognizes, but very few people feel comfortable explaining. It shows up in news headlines, movies, workplace conversations, and everyday products, but it is often wrapped in a fog of exaggeration and misunderstanding. Some people talk about AI as if it were a coming super-intelligence that will replace humans. Others see it as a magical tool that can solve any problem instantly. Beginners often find themselves caught between excitement and unease, unsure of what to believe.

To understand AI properly, the first thing we must do is slow down and remove the drama.

AI is not magic. It is not alive. It is not thinking in the way humans think. And yet, it *does* work remarkably well at certain tasks better than people. This apparent contradiction is what confuses most newcomers.

When you hear that an AI system can recognize faces, translate languages, or recommend music that perfectly matches your mood, it is tempting to assume there must be something like a human happening inside the machine. After all, these are things we associate with intelligence. But what AI does is not human intelligence copied into silicon. It is something far more mechanical, more limited, and at the same time more powerful in very specific ways.