

Practical Guide to using Artificial Intelligence

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Preface

This book is a journey through the vast and dynamic world of Artificial Intelligence (AI), a technology that is redefining how we live, work, and interact with the world. It was born out of the need to provide a clear and accessible guide for anyone who wants to understand the basics, applications, and implications of AI, whether you're an experienced professional or a curious beginner.

Starting with an introduction to the fundamental concepts of AI in **Chapter 1**, moving through the historical evolution of this field in **Chapter 3**, and reaching practical applications and the most advanced tools in the subsequent chapters, this book aims to offer a comprehensive and up-to-date overview of one of the most revolutionary technologies of our time.

In **Chapter 2**, we explore what Artificial Intelligence is, distinguishing between AI, Machine Learning, and Deep Learning, and analyzing the different types of AI, from narrow applications (ANI) to the ambitious prospects of Artificial General Intelligence (AGI). In **Chapters 4 and 5**, we delve into the heart of Machine Learning and Deep Learning, examining how these technologies enable machines to learn from data and solve complex problems, up to the creation of generative content through advanced algorithms like GANs (Generative Adversarial Networks).

Chapter 6 is dedicated to the practical applications of AI, from medicine to finance, from gaming to robotics, showing how this technology is transforming traditional sectors and creating new opportunities. In **Chapter 7**, we tackle the crucial topic of AI evaluation, discussing methods to measure the effectiveness, usability, and ethics of AI systems, with particular attention to algorithmic biases and

transparency.

Chapters 8 and 9 provide an overview of the leading companies in the AI field and the tools and services available for developers and researchers, from TensorFlow and PyTorch to cloud platforms like Google Cloud AI and Microsoft Azure. Finally, in **Chapter 10**, we explore the potential of AI in content creation, from generating images and music to video synthesis, opening new frontiers for creativity and innovation.

In **Chapter 11**, we explore the complex relationship between artificial intelligence and human society through the reflections of philosophers, psychologists, and contemporary thinkers. From cognitive transformations to ethical issues, the text addresses the challenges and opportunities that AI presents for our understanding of humanity. Through concrete examples, the chapter reflects on how AI is redefining our way of living and our essence as a species, offering both challenges and opportunities.

We conclude with **Chapter 12**, which summarizes the key points of the book and offers resources for further exploration of the topic, including online courses, recommended books, and learning platforms.

This book is not just a collection of technical notions but a practical guide for those who want to understand how AI is transforming the world and how we can best leverage this technology to tackle future challenges. Whether you're an experienced programmer, a researcher, or simply a technology enthusiast, I hope these pages inspire you to explore, innovate, and contribute to the progress of Artificial Intelligence.

Happy reading and enjoy your journey into the world of AI!

Acknowledgments

We are deeply grateful to our families, whose love and unwavering support have made this project possible. Without their patience, understanding, and encouragement, reaching this milestone would not have been achievable.

A special thank you also goes to our friends and colleagues who have supported us along the way, offering valuable advice, constructive criticism, and shared moments that have enriched our work.

Finally, we want to express our gratitude to everyone who, directly or indirectly, contributed to the creation of this book. Every word, every page, is the result of collective effort and shared passion.

"Gratitude is not only the memory of the heart but also the light that illuminates the path ahead." – Anonymous

Thank you from the bottom of our hearts.

Introduction to Artificial Intelligence



Welcome to an extraordinary journey into the world of Artificial Intelligence (AI), one of the most revolutionary and transformative technologies of our time. This book is born out of a passion for innovation and the belief that AI is not just a technical tool, but a force capable of redefining how we live, work, and interact with the world around us.

AI is everywhere: in our smartphones, self-driving cars, medical diagnostic systems, and platforms that recommend movies or music. Yet, behind these everyday applications lies a complex and fascinating universe made up of algorithms, neural networks, data, and ethical challenges. This book is a guide to exploring that universe, to understand how AI works, how it was born, how it has evolved, and most importantly, how it is shaping the future.

But it's not just about technology. AI is also a story of people: researchers, engineers, dreamers who have dedicated their lives to creating machines capable of learning, reasoning, and, in some way, "thinking." It's a story of successes, failures, and discoveries that have led to extraordinary results, but also raise profound questions about what it means to be human in a world increasingly dominated by machines.

This book is not just for those working in the tech field. It's for anyone curious to understand how AI is changing the world, for those who want to be part of this transformation, and for those trying to navigate an increasingly complex landscape with awareness and critical thinking. Through practical examples, reflections, and insights, we will guide you on a journey from the theoretical foundations of AI to its most advanced applications, addressing the ethical and social challenges this technology entails.

But above all, this book is an invitation to look beyond. AI is not just

about algorithms and data: it is a technology that can improve our lives, solve complex problems, and open up new opportunities. However, it also requires responsibility. How can we ensure that AI is used ethically and fairly? How can we prevent it from amplifying inequalities or biases? These are questions without easy answers, but ones we must face together.

Prepare for a journey that will take you beyond code, beyond data, beyond machines. You will learn to think critically, solve complex problems, and imagine a future where AI does not replace humanity but enhances it. Whether you are an experienced professional or a curious beginner, I hope these pages inspire you to explore, innovate, and contribute to building a better world.

1.1 How This Book Came to Be

In response to the rapid spread of AI-based products, we developed a presentation that traces the evolution of this technology and explains the key terms used in the field. Throughout our professional work, we have experimented with various AI solutions that have allowed us to optimize work processes, increasing both efficiency and quality of results. We then enriched the presentation with a practical section dedicated to various AI tools, specifying the ideal field of application for each.

The goal of this work was twofold: on one hand, to highlight the tangible benefits that Artificial Intelligence can bring to professional life, and on the other, to provide a practical guide for choosing the most suitable AI tools for different daily work needs.

This presentation gave birth to the book you are reading, where we have adopted a simpler and more descriptive language, enriching it with new content and insights, to provide a comprehensive overview

of Artificial Intelligence and its practical applications.

If you are curious and want to delve deeper into the topic, we invite you to visit the associated GitHub project that we used as a starting point, where you will find additional resources and insights on various aspects of Artificial Intelligence.

<https://github.com/matteobaccan/CORSOAI>

1.2 Where to Find the Latest Version of This Book

The version of this book you are reading might not be up to date. To download the latest available version, we invite you to visit the official **GitHub project** of this book at

<https://github.com/matteobaccan/CORSOAIBook>

1.3 Versions in Other Languages

This book is also available in other languages. Always refer to the official GitHub project to download the version in other languages.

1.4 Project Goals

- **Educate:** Provide a solid and accessible understanding of AI, from theoretical foundations to advanced applications.
- **Inspire:** Stimulate curiosity and creativity, showing how AI can be used to solve complex problems and open new opportunities.
- **Reflect:** Promote a critical discussion on the ethical and social implications of AI, encouraging responsible use of this technology.

1.5 How to Contribute

If you are interested in contributing to the project, you are welcome! Here's how you can do it:

1. **Feedback:** If you have suggestions or corrections, open an *issue* on GitHub or send a pull request.
2. **Translations:** If you want to contribute to translating the book into other languages, contact us.
3. **Content:** If you have ideas for new chapters or insights, share them with us.

1.6 License

[Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International \(CC BY-NC-SA 4.0\)](#)

1.7 Authors

- **Matteo Baccan:** Software engineer and trainer with over 30 years of experience in the IT sector. Author of numerous articles, books, and online courses.
- **Dario Ferrero:** Collaborator and co-author of the project, with a passion for technological dissemination and innovation.

What is Artificial Intelligence?



2.1 AI - What is it about?

Artificial Intelligence (AI) is a branch of computer science focused on creating systems and algorithms capable of performing tasks that traditionally require human intelligence. These tasks include reasoning, learning, planning, perception, voice and visual recognition, natural language understanding, and solving complex problems.

AI is not a new concept: its roots go back to the 1950s when Alan Turing proposed the famous **Turing Test** as a criterion to determine whether a machine can be considered "intelligent." However, it is only in recent decades, thanks to advances in computing power, the availability of large amounts of data, and the development of advanced algorithms, that AI has begun to achieve significant results and become an integral part of our daily lives.

2.1.1 Definition of Artificial Intelligence

AI can be defined as the ability of a machine to mimic human cognitive functions, such as learning and problem-solving. This includes the ability to analyze data, recognize patterns, make decisions, and adapt to new situations without being explicitly programmed for each specific task.

2.1.2 Difference between AI, Machine Learning, and Deep Learning

- **AI (Artificial Intelligence):** This is the broader field that encompasses all technologies and methods for creating intelligent machines.
- **Machine Learning:** A subfield of AI that focuses on developing algorithms that allow machines to learn from data without being explicitly programmed.
- **Deep Learning:** A subfield of Machine Learning that uses artificial

neural networks with many layers (hence the term "deep") to solve complex problems, such as image recognition or natural language processing.

2.1.3 Types of Artificial Intelligence

AI can be classified into three main categories based on its capabilities and level of autonomy:

1. **ANI (Artificial Narrow Intelligence)**: This is AI specialized in a specific task, such as facial recognition or automatic translation. It is the most common form of AI today.
2. **AGI (Artificial General Intelligence)**: This is AI that possesses general intelligence similar to human intelligence, capable of performing any intellectual task that a human can do. This type of AI has not yet been realized but is the goal of many researchers.
3. **ASI (Artificial Super Intelligence)**: This is AI that surpasses human intelligence in all fields, including creativity, problem-solving, and reasoning. This is a theoretical concept and has not yet been achieved.

2.2 What contributes to AI?

Artificial Intelligence is an interdisciplinary field that draws from various disciplines to develop intelligent systems. Here are some of the main areas that contribute to AI:

- **Computer Science**: Provides the theoretical and practical foundations for developing algorithms, data structures, and computational systems.
- **Mathematics**: Concepts such as linear algebra, calculus, probability theory, and statistics are fundamental for understanding and improving AI models.

- **Neuroscience:** Studies the functioning of the human brain and provides inspiration for developing artificial neural networks.
- **Psychology:** Contributes through the study of human behavior and cognitive processes, helping to develop AI systems that can interact with humans more naturally.
- **Linguistics:** Essential for developing natural language processing (NLP) systems, which allow machines to understand, interpret, and generate human language.
- **Engineering:** Crucial for designing and implementing AI systems, both at the software and hardware levels.

2.3 Applications of AI in Daily Life

AI is now an integral part of our daily lives, even if we often don't realize it. Here are some of the most common applications:

- **Virtual Assistants:** Like Siri, Alexa, and Google Assistant, which use AI to understand and respond to user requests.
- **Facial Recognition:** Used in many applications, from unlocking smartphones to public surveillance.
- **Personalized Recommendations:** Platforms like Netflix, Spotify, and Amazon use AI to analyze user behavior and provide personalized recommendations.
- **Autonomous Driving:** Self-driving cars, like those developed by Tesla, use AI to perceive the surrounding environment and make real-time decisions.
- **Medical Diagnostics:** AI is used to analyze medical images, such as X-rays and MRIs, and help doctors diagnose diseases more accurately.

- **Automatic Translation:** Services like Google Translate use AI to translate text and speech in real-time, making communication easier between people who speak different languages.

2.4 Ethics and Challenges of AI

AI offers enormous opportunities but also raises important ethical issues and challenges that need to be addressed:

- **Privacy and Security:** AI requires large amounts of data to function, raising concerns about privacy and the security of personal information.
- **Bias and Discrimination:** AI algorithms can be influenced by biases present in training data, leading to discriminatory or unfair decisions.
- **Impact on Employment:** AI-driven automation could lead to job losses in some sectors while creating new ones in others.
- **Control and Transparency:** As AI becomes more powerful, it is essential to ensure that AI systems are controllable and transparent.

2.5 The Future of AI

The future of AI is full of promises but also uncertainties. Here are some of the trends and challenges that could shape the future of this technology:

- **General AI (AGI):** One of the long-term goals of AI is the development of **Artificial General Intelligence** (AGI), capable of performing any intellectual task that a human can do.
- **Human-Machine Collaboration:** In the future, AI will not replace humans but will collaborate with them to enhance human capabilities.

- **Ethics and Regulation:** As AI becomes more pervasive, it will be necessary to develop norms and regulations to ensure that this technology is used ethically and responsibly.
- **Sustainability:** AI can be used to address some of the most urgent challenges of our time, such as climate change and resource scarcity.

2.6 Conclusion

Artificial Intelligence is a powerful and transformative technology that is changing the way we live, work, and interact with the world. While it offers enormous opportunities, it also raises important ethical issues and challenges that need to be addressed. Understanding what AI is, how it works, and its implications is essential to navigate this new technological landscape and make the most of its potential.

Evolution of Artificial Intelligence



3.1 Introduction

Artificial Intelligence (AI) has been one of the most innovative fields in science and technology over the past few decades. The history of AI can be divided into four main periods, each marked by significant advancements, challenges, and shifts in how AI is conceived and developed. This chapter explores the evolution of AI, from its theoretical origins to the most recent developments, and how this technology has transformed the world.

3.2 The Initial Phase (1948-1965)

3.2.1 Theoretical Origins

The roots of AI can be traced back to the 1940s and 1950s, when early pioneers began exploring the idea of creating intelligent machines. A key moment was the publication of Alan Turing's chess-playing program in 1948, known as **Turochamp**. This program was the first to use a search algorithm to find the best move in a chess position, demonstrating that machines could be programmed to perform complex tasks.

3.2.2 The Turing Test

In 1950, Alan Turing proposed the famous **Turing Test**, a criterion for determining whether a machine can be considered "intelligent." According to Turing, if a machine can deceive a human into believing it is another human during a conversation, then it can be considered intelligent. This test laid the groundwork for AI development and remains an important benchmark in the field.

3.2.3 Early Chess Programs

Following Turing's work, other researchers began developing chess

programs. In 1950, **Claude Shannon** created **Shannon's Chess Program**, one of the first chess programs based on search algorithms. In 1951, **John McCarthy** developed **McCarthy's Chess Program**, which used more advanced techniques to evaluate moves.

3.2.4 The Birth of AI as a Discipline

In 1956, the **Dartmouth Conference** was organized by John McCarthy, Marvin Minsky, Nathaniel Rochester, and Claude Shannon. This event is considered the moment when AI was formally recognized as a scientific discipline. During the conference, participants discussed the possibility of creating machines capable of simulating human intelligence, laying the foundation for future research.



Dartmouth Conference - source ieee.org

3.3 The Simulation Period (1965-1980)

3.3.1 The Era of Expert Systems

During this period, researchers began developing **expert systems**, programs designed to solve specific problems using logical rules and specialized knowledge. One of the first expert systems was **DENDRAL**, developed at Stanford University in the 1960s, which used AI to analyze chemical data and identify molecular structures.

3.3.2 Natural Language Processing

In the 1970s, natural language processing (NLP) became an important area of research. One of the early examples of NLP was **ELIZA**, a chatbot developed by **Joseph Weizenbaum** in 1966. ELIZA simulated a conversation with a Rogerian therapist, using simple rules to analyze and respond to user statements. Despite its simplicity, ELIZA demonstrated that machines could interact with humans in an apparently intelligent manner.

```
Welcome to
      EEEEEE  LL      IIII    ZZZZZZ  AAAAAA
      EE      LL      II      ZZ      AA      AA
      EEEEEE  LL      II      ZZZ    AAAAAAAA
      EE      LL      II      ZZ      AA      AA
      EEEEEE  LLLLLL  IIII    ZZZZZZ  AA      AA
```

```
Eliza is a mock Rogerian psychotherapist.
The original program was described by Joseph Weizenbaum in 1966.
This implementation by Norbert Landsteiner 2005.
```

```
ELIZA: Is something troubling you ?
YOU: Men are all alike.
ELIZA: What is the connection, do you suppose ?
YOU: They're always bugging us about something or other.
ELIZA: Can you think of a specific example ?
YOU: Well, my boyfriend made me come here.
ELIZA: Is it important to you that your boyfriend made you come here ?
YOU: He says I'm depressed much of the time.
ELIZA: I am sorry to hear that you are depressed.
YOU: It's true. I am unhappy.
ELIZA: Can you explain what made you unhappy ?
YOU:
```

[Eliza - source Wikipedia](#)

3.3.3 Computer Vision

Computer vision, the ability of machines to interpret images and videos, began to develop during this period. Early computer vision systems could recognize simple shapes and objects, paving the way for more advanced applications like facial recognition and autonomous driving.

3.3.4 The AI Winter

Despite the progress, the 1970s were also marked by a period known as the **AI Winter**, where initial enthusiasm clashed with technological limitations and a lack of tangible results. Funding for research decreased, and many projects were abandoned. However, this period also led to a greater awareness of the challenges and complexities of

AI.

3.4 The Distributed Intelligence Phase (1980-1990)

3.4.1 The Rise of Neural Networks

In the 1980s, **artificial neural networks** began to gain popularity as an approach to AI. Neural networks mimic the functioning of the human brain, using layers of artificial neurons to process information and learn from data. This approach led to significant advancements in areas like pattern recognition and image classification.

3.4.2 Machine Learning

Machine learning became a central area of research during this period. Machine learning algorithms, such as **recurrent neural networks** (RNN) and **convolutional neural networks** (CNN), enabled machines to learn from large amounts of data and improve their performance over time.

3.4.3 Probabilistic Reasoning Systems

In the 1980s, researchers began developing probabilistic reasoning systems, which used probability theory to make decisions under uncertainty. This approach was particularly useful in applications like medical diagnostics and planning.

3.4.4 The Rise of Commercial AI

During this period, AI began to be used in commercial applications, such as recommendation systems, spam filters, and financial trading systems. This marked the beginning of AI's integration into everyday life and the global economy.

3.5 The Modern Phase (1990-Present)

3.5.1 The Era of Big Data

With the advent of the Internet and the increasing availability of data, AI entered a new era. Machine learning models could now be trained on massive datasets, significantly improving their performance. This led to advancements in areas like speech recognition, machine translation, and image recognition.

3.5.2 Deep Learning

Deep learning, a subfield of machine learning that uses neural networks with many layers, became dominant in the 2010s. Models like **convolutional neural networks** (CNN) and **recurrent neural networks** (RNN) achieved remarkable results in complex tasks, such as image recognition and text generation.

3.5.3 Generative AI

Generative AI, which uses algorithms to create new content like images, music, and text, has seen rapid growth in recent years. Models like **ChatGPT** and **DALL-E** have demonstrated the ability to generate high-quality content, opening new possibilities for art, creativity, and entertainment.

3.5.4 Autonomous Driving and Robotics

Autonomous driving and robotics have become important research areas, with companies like **Tesla** and **Waymo** developing self-driving cars. AI-powered robots are used in industries such as manufacturing, logistics, and healthcare.

3.5.5 AI in Medicine

AI has been widely adopted in the medical field, with applications ranging from image-based diagnostics to drug discovery. AI models are used to analyze medical data and provide recommendations to doctors, improving the accuracy and efficiency of care.

3.5.6 Ethics and Regulation

As AI becomes more powerful and pervasive, ethical and regulatory issues have become increasingly important. Topics such as privacy, algorithmic bias, and the impact on employment are at the forefront of public debate, with governments and organizations working to develop standards and guidelines for the responsible use of AI.

3.6 Conclusion

The evolution of Artificial Intelligence has been a fascinating journey, characterized by extraordinary advancements and significant challenges. From Alan Turing's early theories to today's advanced deep learning models, AI has transformed the way we live, work, and interact with the world. As we look to the future, it is essential to continue exploring the potential of AI while addressing the ethical and social issues it raises.

Biography

Matteo Baccan is a software engineer and professional trainer with over 30 years of experience in the IT sector. He has worked for various companies and organizations, focusing on the design, development, testing, and management of web and desktop applications, using a range of languages and technologies. He is also a passionate educator and computer science teacher, having authored numerous articles, books, and online courses for all skill levels. Matteo runs a website and a YouTube channel where he shares video tutorials, interviews, reviews, and programming tips. Actively involved in open-source communities, he regularly participates in programming events and competitions. He describes himself as a "realistic dreamer" who loves to experiment, innovate, and share his knowledge and passions, following the motto: "Never stop learning, because life never stops teaching."

Dario Ferrero began his career in the computing world with programming in Basic, Pascal, Clipper, and C++, later moving on to PHP, Python, and MySQL, as well as editing software like Photoshop and Lightroom, and using Artificial Intelligence applications for multimedia content production. As a trainer, he has conducted courses on the mindful use of the Internet and prepared candidates for the European Computer Driving License (ECDL). He is the author of the book "European Computer License: Practical Strategies and Exercises to Easily Pass the ECDL Exam," published by Bruno Editore, which encapsulates his teaching experience in a practical and accessible guide. As a co-founder and manager of verbanianotizie.it, he created an online news platform that, with over 2 million visitors since 2012, has become a reference point for events, politics, and news in Verbania and its province. The portal is distinguished by its particular attention to the voices and concerns of citizens, collaborating with various

professionals to develop thematic columns. His social commitment has materialized in a digital volunteering initiative: the free creation of websites for about 20 local associations, ranging from sports to elderly support, assistance for women in difficulty, health prevention, and aid for local children. A significant project was the development and management of content for a portal dedicated to hiking in the province of Verbano-Cusio-Ossola, which has contributed to promoting the area and its natural beauty.

Glossary

A

- **AI (Artificial Intelligence)**

A branch of computer science that creates systems capable of performing tasks that require human intelligence, such as reasoning, learning, and problem-solving.

Example: A virtual assistant like Siri that answers users' questions.

- **AGI (Artificial General Intelligence)**

An AI with general intelligence similar to that of humans, capable of performing any intellectual task. It has not yet been realized.

Example: A hypothetical AI that can write a novel, solve mathematical problems, and drive a car.

- **Algorithm**

A set of instructions that a computer follows to solve a problem or perform a task.

Example: An algorithm that sorts a list of numbers in ascending order.

- **ANI (Artificial Narrow Intelligence)**

An AI specialized in a specific task, such as facial recognition or machine translation. It is the most common form of AI today.

Example: A voice recognition system like Alexa.

• Machine Learning

A subfield of AI that enables machines to learn from data without being explicitly programmed.

Example: A model that predicts house prices by analyzing historical data.

• Deep Learning

An advanced form of Machine Learning that uses neural networks with many layers to solve complex problems.

Example: A facial recognition system that identifies people in a photo.

• ASI (Artificial Super Intelligence)

An AI that surpasses human intelligence in all fields, including creativity and problem-solving. It is a theoretical concept.

Example: A hypothetical AI that solves complex scientific problems in seconds.

B

• Backpropagation

A learning algorithm that adjusts the weights of a neural network to minimize the error between predictions and desired outcomes.

Example: A neural network learning to recognize images of dogs and cats.

• Algorithmic Bias

A systematic error in the results of an AI model, caused by biases in the training data.

Example: A recruitment system that favors a specific gender due to skewed historical data.

- **Big Data**

Large volumes of data, often too complex to be handled with traditional tools, used to train AI models.

Example: A company analyzing millions of transactions a day to predict purchasing trends.

C

- **Chatbot**

A program that simulates a conversation with humans, often used for customer support.

Example: A chatbot on an e-commerce site that helps customers find products.

- **Clustering**

An unsupervised learning technique that groups similar data into clusters.

Example: An algorithm that groups a company's customers based on their purchasing behavior.

- **Cross-Validation**

A technique for evaluating Machine Learning models by dividing the dataset into multiple parts to ensure the model generalizes well.

Example: A weather prediction model tested on different parts of the dataset.

D

- **Dataset**

A collection of structured data, often used to train Machine Learning models.

Example: A dataset of images of dogs and cats used to train a recognition model.

- **Deepfake**

A technique that uses AI to create fake but realistic videos or images.

Example: A deepfake video of a politician appearing to make statements they never made.

- **Deep Learning**

See **Apprendimento Profondo**.

E

- **AI Ethics**

A field of study that deals with the moral and social implications of AI use, such as privacy, bias, and impact on employment.

Example: The discussion on how to ensure AI systems do not discriminate against certain groups.

F

- **FrontierMath**

A benchmark for testing the mathematical reasoning capabilities of AI models, with complex and original problems.

Example: An AI model that solves extremely difficult mathematical problems.

G

- **GAN (Generative Adversarial Networks)**

A machine learning architecture composed of two neural networks (generator and discriminator) that compete to create realistic synthetic data.

Example: A GAN that generates photorealistic images of human faces.

I

• **Inference**

The phase where a trained AI model is used to make predictions or decisions on new data.

Example: An image recognition model identifying a cat in a new photo.

• **Interpretability**

The ability of an AI system to explain its decisions in a way that is understandable to humans.

Example: A medical diagnosis system explaining why it classified an image as a "benign tumor."

L

• **LIME (Local Interpretable Model-agnostic Explanations)**

A technique for explaining the predictions of complex AI models by showing which data features influenced the decision.

Example: A model classifying images and showing that it looked at the ears and nose to decide if an image represents a cat.

M

• **Machine Learning**

See **Apprendimento Automatico**.

• **Modal Collapse**

A problem that occurs during the training of GANs, where the generator always produces the same output.

Example: A GAN that always generates the same image of a face.

N

• **NLP (Natural Language Processing)**

A field of AI that deals with the interaction between machines and human language.

Example: Google Translate, which translates text from one language to another.

O

• **Overfitting**

A problem that occurs when a Machine Learning model learns the training data too well, losing the ability to generalize to new data.

Example: A model that perfectly recognizes faces in the training dataset but fails with new faces.

P

• **Prompt**

A request or instruction given to an AI to generate a specific output.

Example: "Write a poem about autumn" is a prompt for a text-generating AI.

R

• **Neural Network**

A computational model inspired by the human brain, composed of layers of artificial "neurons" that process information.

Example: A neural network used to recognize handwritten numbers.

• **Convolutional Neural Networks (CNN)**

A type of neural network designed to process grid-structured data, such as images.

Example: A CNN used to identify tumors in medical images.

• **Recurrent Neural Networks (RNN)**

A type of neural network designed to process sequences of data, such as text or time series.

Example: An RNN used to predict the next word in a sentence.

S

- **SHAP (SHapley Additive exPlanations)**

A technique for explaining the predictions of AI models by showing how each data feature contributes to the final decision.

Example: A loan approval model showing that age contributed +10% and income -5% to the decision.

T

- **Turing Test**

A criterion for determining whether a machine can be considered "intelligent." If a machine can trick a human into believing it is another human, it can be considered intelligent.

Example: A chatbot convincing a human it is another person during a conversation.

V

- **Vanishing Gradient**

A problem that occurs during the training of deep neural networks, where the gradients become so small that the model stops learning.

Example: A neural network that does not improve its performance during training.

X

- **XAI (Explainable AI)**

A field of AI focused on creating models and systems that can explain their decisions in a way that is understandable to humans.

Example: A medical diagnosis system explaining why it classified an image as a "benign tumor."

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4. Online Resources and Platforms

<https://github.com/matteobaccan/CORSOAIBook>
<https://github.com/matteobaccan/CORSOAI>
<https://openai.com/blog>
<https://arxiv.org>

5. Videos and Online Courses

<https://www.youtube.com/watch?v=sVvGZDoEEeQ>
<https://www.youtube.com/watch?v=D9hiuVmtyAU>
<https://www.coursera.org>
<https://www.edx.org>

6. Articles and Blogs

<https://flowgpt.com>
<https://aaronsim.notion.site>
<https://arstechnica.com>

7. Additional Resources

<https://www.tensorflow.org>
<https://pytorch.org>
<https://www.kaggle.com>

Disclaimer

This book was created with the support of advanced Artificial Intelligence (AI) technologies. Specifically, the author utilized **GPT**, the large-scale language generation model developed by OpenAI, **Claude**, an advanced AI assistant, and **DeepSeek**, a model specialized in text research and rewriting.

After generating the initial draft, the author reviewed, modified, and refined the content to ensure accuracy, consistency, and quality. The introductory images for the chapters were created using **LeonardoAI**, an AI-based image generation platform.

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The author is committed to ensuring the integrity and reliability of the information contained in the book, while acknowledging that the use of AI technologies may introduce limitations or imperfections. Readers are encouraged to view this work as a starting point for further exploration of the topics discussed, using the resources and bibliographic references provided.

Indice

Preface	2
Acknowledgments	4
Introduction to Artificial Intelligence	5
1.1 How This Book Came to Be	7
1.2 Where to Find the Latest Version of This Book	8
1.3 Versions in Other Languages	8
1.4 Project Goals	8
1.5 How to Contribute	8
1.6 License	9
1.7 Authors	9
What is Artificial Intelligence?	10
2.1 AI - What is it about?	11
2.1.1 Definition of Artificial Intelligence	11
2.1.2 Difference between AI, Machine Learning, and Deep Learning	11
2.1.3 Types of Artificial Intelligence	12
2.2 What contributes to AI?	12
2.3 Applications of AI in Daily Life	13
2.4 Ethics and Challenges of AI	14
2.5 The Future of AI	14
2.6 Conclusion	15
Evolution of Artificial Intelligence	16
3.1 Introduction	17
3.2 The Initial Phase (1948-1965)	17
3.2.1 Theoretical Origins	17
3.2.2 The Turing Test	17
3.2.3 Early Chess Programs	17
3.2.4 The Birth of AI as a Discipline	18

3.3 The Simulation Period (1965-1980)	19
3.3.1 The Era of Expert Systems	19
3.3.2 Natural Language Processing	19
3.3.3 Computer Vision	20
3.3.4 The AI Winter	20
3.4 The Distributed Intelligence Phase (1980-1990)	21
3.4.1 The Rise of Neural Networks	21
3.4.2 Machine Learning	21
3.4.3 Probabilistic Reasoning Systems	21
3.4.4 The Rise of Commercial AI	21
3.5 The Modern Phase (1990-Present)	22
3.5.1 The Era of Big Data	22
3.5.2 Deep Learning	22
3.5.3 Generative AI	22
3.5.4 Autonomous Driving and Robotics	22
3.5.5 AI in Medicine	22
3.5.6 Ethics and Regulation	23
3.6 Conclusion	23
Biography	24
Glossary	26
A	26
B	27
C	28
D	29
E	29
F	30
G	30
I	30
L	31
M	31

N	32
O	32
P	32
R	33
S	33
T	34
V	34
X	35
Bibliography	36
Disclaimer	38
Indice	39