Map of the Field

Guide to AI and Data Courses

Purpose of the guide | AI ⊃ ML ⊃ ANN ⊃ DL | Six parts | Kinds of relation | Comparison criteria | Interactive map

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INTRODUCTION

What Is This Guide About?

Each of **38 courses** on AI and data is introduced in one presentation. The aim is not to teach these courses but to **map them**: what question does each one ask, which tools does it share with others, and where does it part ways?

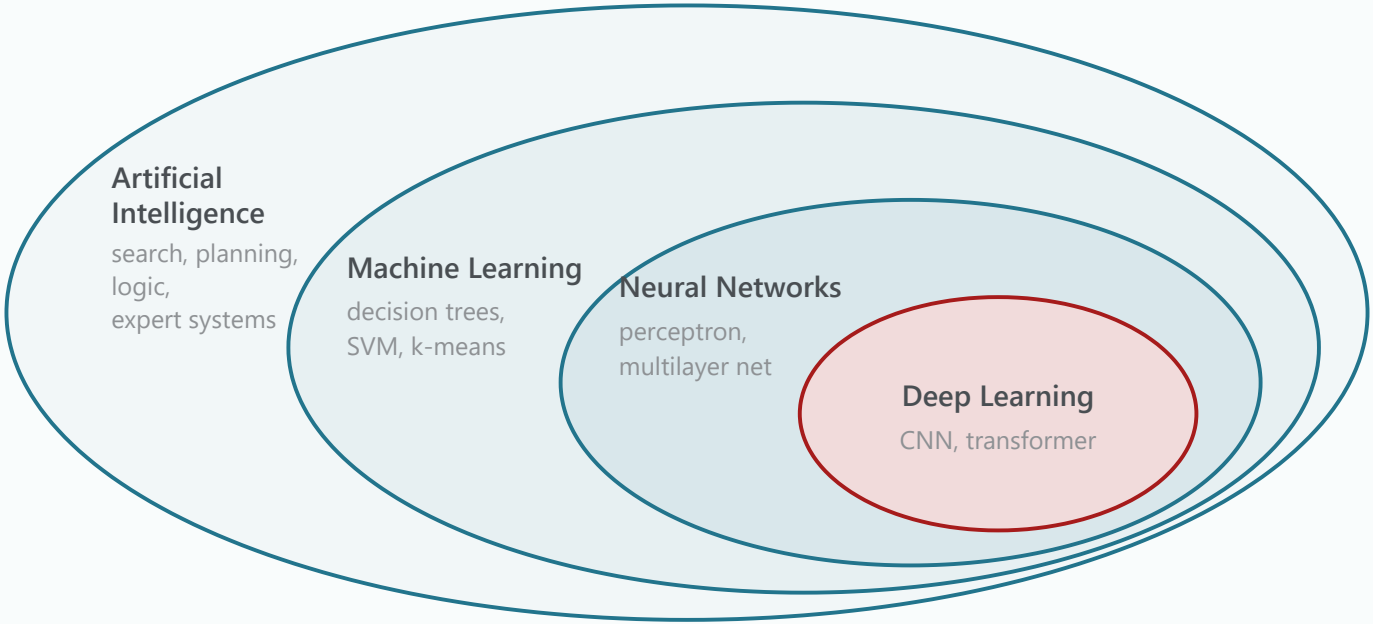
What you will find

+ Each course's core question and concepts
+ A short history and a typical workflow
+ Prerequisites and neighbouring courses
+ Overlap and difference tables
+ Applications and tools

What you will not find

– Lecture notes or a textbook
– Code examples or assignments
– Derivations of formulas
– The full syllabus of any course

Nested Terms: AI ⊃ ML ⊃ ANN ⊃ DL



Each ring is a subfield of the one around it: every deep learning model is a neural network, but not every AI system learns. A chess program that searches is AI, but it is not machine learning.

STRUCTURE

Six Parts, 38 Courses

I. Core

Artificial Intelligence, Machine Learning, Neural Networks, Deep Learning

II. Branches of AI

NLP, Reinforcement Learning, Pattern Recognition, Fuzzy Logic, Evolutionary Optimization, Expert Systems, Graphical Models, Generative Models, Multi-Agent Systems, Explainable AI & Ethics

III. Signals, Images and Audio

Signal Processing, Image Processing, Computer Vision, Speech and Audio, Medical Imaging, Remote Sensing, Computer Graphics, Robotics, Biometrics

IV. Data

Data Mining, Data Science, Big Data, IR & Recommenders, Time Series, Social Network Analysis

V. Mathematical Foundations

Linear Algebra, Probability & Statistics, Optimization, Information Theory

VI. Systems and Applications

MLOps, Embedded AI, GPU & Parallel Computing, AI in Cybersecurity, Bioinformatics

STRUCTURE

Four Kinds of Relation Between Courses

subfield

Deep Learning → Neural Networks
Inherits all of its concepts and adds new ones of its own.

builds on

Computer Vision → Image Processing
The other course comes first; this one is built on top of it.

shares methods

Data Mining ↔ Machine Learning
They use the same tools but ask different questions.

application

Medical Image Processing → Computer Vision
Applies the other course's methods to one domain, under that domain's rules.

STRUCTURE

Criteria for Comparing Courses

Core question
The course's reason to exist, in one sentence.

Approach
The way of thinking it brings to a problem: search, statistics, logic, transforms…

Input
What kind of data or specification does the course start from?

Output
What comes out at the end: a decision, a model, an image, a report…

Success measure
How do we tell that a solution is good?

Math load
How much mathematics does it rely on, and which kind?

Data needs
How much data does it need; can it work without data?

MAP

Interactive Map

CORE

Artificial Intelligence | Machine Learning | Neural Networks | Deep Learning

BRANCHES OF AI

NLP | Reinforcement Learning | Pattern Recognition | Fuzzy Logic | Evolutionary Optimization | Expert Systems | Graphical Models | Generative Models | Multi-Agent Systems | Explainable AI & Ethics

SIGNALS, IMAGES AND AUDIO

Signal Processing | Image Processing | Computer Vision | Speech and Audio | Medical Imaging | Remote Sensing | Computer Graphics | Robotics | Biometrics

DATA

Data Mining | Data Science | Big Data | IR & Recommenders | Time Series | Social Network Analysis

MATHEMATICAL FOUNDATIONS

Linear Algebra | Probability & Statistics | Optimization | Information Theory

SYSTEMS AND APPLICATIONS

MLOps | Embedded AI | GPU & Parallel Computing | AI in Cybersecurity | Bioinformatics

Click a course: its neighbours light up and its relations are listed here.

MAP

Links Between Parts

	I	II	III	IV	V	VI
I. Core	**3**	13	2	3	8	5
II. Branches of AI	13	**7**	9	3	5	2
III. Signals, Images and Audio	2	9	**10**	2	3	3
IV. Data	3	3	2	**5**	5	4
V. Mathematical Foundations	8	5	3	5	**2**	·
VI. Systems and Applications	5	2	3	4	·	**2**

Each cell counts the relations between two parts; the diagonal shows links within a part. The core and the mathematical foundations connect to every part, while the systems courses rest mostly on the core.

MAP

Hub Courses: The Most Connected

Course	Links	Some neighbours
Machine Learning	15	Artificial Intelligence, Neural Networks, Linear Algebra, Probability & Statistics …
Deep Learning	9	Neural Networks, GPU & Parallel Computing, NLP, Reinforcement Learning …
Artificial Intelligence	8	Machine Learning, Probability & Statistics, Optimization, NLP …
Computer Vision	8	Image Processing, Deep Learning, Computer Graphics, Pattern Recognition …
Data Mining	8	NLP, Machine Learning, Big Data, Probability & Statistics …
Probability & Statistics	8	Artificial Intelligence, Machine Learning, Pattern Recognition, Graphical Models …
NLP	7	Artificial Intelligence, Deep Learning, IR & Recommenders, Data Mining …
Linear Algebra	7	Machine Learning, Neural Networks, Computer Graphics, Robotics …

Machine learning and the mathematical foundations (linear algebra, probability, optimization) are the hubs of the map: most other courses rest on one of them.

HOW TO USE

How to Read This Guide

Front to back

The core courses (Chapters 2–5) are the common language of the whole map; read them first.

From an interest

Images, language, data or robotics: start from the part that interests you and follow the prerequisite tables backwards.

By comparison

Open the "Where It Differs" slides of two courses you tend to confuse side by side.

Choosing electives

The roadmaps in the last chapter suggest groups of courses that make sense together.

The End

Chapter 1: Map of the Field

Next chapter: Chapter 2: Artificial Intelligence