1. **Introduction to AI & Machine Learning**
   * **Overview of AI and ML**

AI vs. machine learning vs. deep learning vs

<https://www.ibm.com/think/topics/ai-vs-machine-learning-vs-deep-learning-vs-neural-networks>

The History of AI: A Timeline of Artificial Intelligence

<https://www.coursera.org/articles/history-of-ai?msockid=17ba5b394d956add34a84eb94c7b6b95>

The Evolution of Machine Learning: A Brief History and Timeline

<https://machinelearningmodels.org/the-evolution-of-machine-learning-a-brief-history-and-timeline/>

7分钟讲解所有类型的人工智能

https://www.bilibili.com/video/BV1Db421J7zb/

* + **Types of Machine Learning: Supervised, Unsupervised, Reinforcement Learning**

Types of Machine Learning

<https://www.geeksforgeeks.org/types-of-machine-learning/>

Types of Machine Learning: Mastering with Examples

<https://www.iquanta.in/blog/types-of-machine-learning-algorithms-mastering-with-examples/>

17分钟讲完所有的机器学习模型

https://www.bilibili.com/video/BV1GgkSYBEpD/

* + **Applications of AI and ML in Real-World Scenarios**

Real- Life Examples of Machine Learning

<https://www.geeksforgeeks.org/real-life-applications-of-machine-learning/>

1. **Machine Learning with Neural Network**
   * **History of Neural Network**

Neural Networks - History

<https://cs.stanford.edu/people/eroberts/courses/soco/projects/neural-networks/History/history1.html>

The Evolution of Neural Networks: From Perceptrons to Deep Learning

<https://theneuralwirenewsletter.substack.com/p/the-evolution-of-neural-networks>

* + **Understanding Artificial Neurons and Neural Network**

The Concept of Artificial Neurons (Perceptrons) in Neural Networks

<https://towardsdatascience.com/the-concept-of-artificial-neurons-perceptrons-in-neural-networks-fab22249cbfc/>

But what is a neural network?

<https://www.youtube.com/watch?v=aircAruvnKk>

五分钟秒懂神经网络原理

https://www.bilibili.com/video/BV1mu411x7VD/

* + **Activation Functions in Neural Networks**

Activation Functions - EXPLAINED!

<https://www.youtube.com/watch?v=s-V7gKrsels&t=85s>

Activation functions in Neural Networks

[https://www.geeksforgeeks.org/activation-functions-neural-networks/#](https://www.geeksforgeeks.org/activation-functions-neural-networks/)

激活函数

<https://www.bilibili.com/video/BV1qB4y1e7GJ/>

为什么神经网络，必须使用非线性的激活函数

<https://www.bilibili.com/video/BV1Yh4y1c7sT/>

* + **Loss Functions and Optimization**

Loss Functions in Machine Learning Explained

https://www.datacamp.com/tutorial/loss-function-in-machine-learning

Loss Functions - EXPLAINED!

https://www.youtube.com/watch?v=QBbC3Cjsnjg

Optimizers - EXPLAINED!

<https://www.youtube.com/watch?v=mdKjMPmcWjY&t=8s>

6分钟理解机器学习核心知识之<损失函数>

<https://www.bilibili.com/video/BV1vg411172u/>

优化器 ｜SGD ｜Momentum ｜Adagrad ｜RMSProp ｜Adam

https://www.bilibili.com/video/BV1jh4y1q7ua/

* + **Hands-on: Building a Simple Neural Network**

1. **Deep Learning & Deep Neural Network**
   * **Introduction to Deep Learning**

Machine Learning vs Deep Learning

<https://www.youtube.com/watch?v=q6kJ71tEYqM>

Deep Learning Definition

<https://deepai.org/machine-learning-glossary-and-terms/deep-learning>

为什么深度学习会兴起

<https://www.bilibili.com/video/BV1FT4y1E74V?spm_id_from=333.788.videopod.episodes&p=4>

人工智能的基石，深度学习“深”在哪里？

<https://www.bilibili.com/video/BV1PYAKe4E5h/?spm_id_from=333.337.search-card.all.click>

* + **Deep Neural Networks and Architecture**

Deep Neural Network Introduction

<https://www.datacamp.com/tutorial/introduction-to-deep-neural-networks>

How Deep Neural Networks Work

<https://www.youtube.com/watch?v=ILsA4nyG7I0>

Why are deep neural networks hard to train?

<http://neuralnetworksanddeeplearning.com/chap5.html>

Deep Learning architectures

https://developer.ibm.com/articles/cc-machine-learning-deep-learning-architectures/

<https://www.koombea.com/blog/deep-learning-architectures/>

Recurrent Neural Networks (RNNs), Clearly Explained!!!

<https://www.youtube.com/watch?v=AsNTP8Kwu80>

深度学习【九大深度神经网络】

<https://www.bilibili.com/video/BV1PL411R73F/>

**Attention Mechanism & Transformer**Attention mechanism: Overview

<https://www.youtube.com/watch?v=fjJOgb-E41w>

The math behind Attention: Keys, Queries, and Values matrices

<https://www.youtube.com/watch?v=UPtG_38Oq8oTransformer>

How Attention Mechanism Works in Transformer Architecture

<https://www.youtube.com/watch?v=KMHkbXzHn7s>

全网最透彻的注意力机制的通俗原理与本质

<https://www.bilibili.com/video/BV1nL4y1j7hA/>

**Optional**

Attention for RNN Seq2Seq Models

<https://www.youtube.com/watch?v=B3uws4cLcFw>

From RNNs to Transformers

<https://www.baeldung.com/cs/rnns-transformers-nlp>

The Ultimate Guide: RNNS vs. Transformers vs. Diffusion Models

<https://medium.com/@roelljr/the-ultimate-guide-rnns-vs-transformers-vs-diffusion-models-5e841a8184f3>

1. **Computer Vision in Deep Learning**
   * **Introduction to Computer Vision**What is computer vision?

https://www.ibm.com/think/topics/computer-vision

Computer Vision: Past, Present, and Future

<https://www.youtube.com/watch?v=jqhGAHMe2d4>

Computer Vision Tasks

https://www.geeksforgeeks.org/computer-vision-tasks/#object-detection

* + **Convolutional Neural Networks (CNNs)**

Understanding Convolution: A Key Concept in Image Processing and Machine Learning — Machine Learning Site

<https://machinelearningsite.medium.com/understanding-convolution-a-key-concept-in-image-processing-and-machine-learning-machine-fba7ee99acb8>

Introduction to Convolution Neural Network

<https://www.geeksforgeeks.org/introduction-convolution-neural-network/>

What are Convolutional Neural Networks (CNNs)?

<https://www.youtube.com/watch?v=QzY57FaENXg>

* + **CNN Architectures (ResNet, AlexNet, VGG)**

Convolutional Neural Network (CNN) Architectures

https://www.geeksforgeeks.org/convolutional-neural-network-cnn-architectures/

Evolution of Convolutional Neural Network (CNN) architectures

https://medium.com/@cpt1995daas/evolution-of-convolutional-neural-network-cnn-architectures-44f2109268a1

CNN Architectures

<https://www.youtube.com/watch?v=DAOcjicFr1Y&t=21s>

Build and Train Convolutional Neural Networks in Python(PyTorch)

<https://www.datacamp.com/tutorial/pytorch-cnn-tutorial>

* + **Hands-on: Image Classification with CNN**

1. **NLP in Deep Learning**
   * **Introduction to NLP**

Introduction to Natural Language Processing (NLP)

https://www.geeksforgeeks.org/introduction-to-natural-language-processing/#:~:text=Natural%20Language%20Processing%20(NLP)%20enables,text%2C%20speech%2C%20etc.)

What is NLP (Natural Language Processing)?

https://www.youtube.com/watch?v=fLvJ8VdHLA0

The Evolution of NLP from 1950 to 2022

https://www.analyticsvidhya.com/blog/2022/07/the-evolution-of-nlp-from-1950-to-2022/

A Complete Guide to Natural Language Processing

<https://www.deeplearning.ai/resources/natural-language-processing/>

* + **Text Vectorization and Word Embeddings**

Vectorization Techniques in NLP

https://www.geeksforgeeks.org/vectorization-techniques-in-nlp/

Word Embeddings in NLP

https://www.geeksforgeeks.org/word-embeddings-in-nlp/

Word Embedding and Word2Vec, Clearly Explained!!!

https://www.youtube.com/watch?v=viZrOnJclY0

* + **Text Generation**

Text Generation using RNN

https://www.tensorflow.org/text/tutorials/text\_generation

Text Generation with Attention Mechanism

https://www.tensorflow.org/text/tutorials/nmt\_with\_attention

Sequence-to-Sequence (seq2seq) Encoder-Decoder Neural Networks, Clearly Explained!!!

https://www.youtube.com/watch?v=L8HKweZIOmg&t=778s

Encoder-decoder architecture: Overview

https://www.youtube.com/watch?v=zbdong\_h-x4&t=95s

Illustrated Guide to Transformers Neural Network: A step by step explanation

https://www.youtube.com/watch?v=4Bdc55j80l8

Transformer Model Tutorial in PyTorch: From Theory to Code**(Optional)**

<https://www.datacamp.com/tutorial/building-a-transformer-with-py-torch>

* + **Hands-on: Build a simple Text Classification model**

1. **Reinforcement Learning**
   * **Introduction to Reinforcement Learning**

<https://www.geeksforgeeks.org/what-is-reinforcement-learning/>

* + **强化学习入门**

<https://www.bilibili.com/video/BV13a4y1J7bw/>

* + **10分钟强化学习系列**

<https://space.bilibili.com/346591207/lists/1935816?type=season>

* + **Deep Q Learning (DQN) with PyTorch**

<https://pytorch.org/tutorials/intermediate/reinforcement_q_learning.html>

**Optional**

* + **Mathematical Foundations of Reinforcement Learning**

<https://www.youtube.com/playlist?list=PLEhdbSEZZbDaFWPX4gehhwB9vJZJ1DNm8>

* + **强化学习的数学原理**

<https://www.bilibili.com/video/BV1sd4y167NS/>

* + **Reinforcement Learning Tutorial (Hugging Face)**

[Welcome to the 🤗 Deep Reinforcement Learning Course - Hugging Face Deep RL Course](https://huggingface.co/learn/deep-rl-course/unit0/introduction)

1. **Large Language Models**
   * **What are Large Language Models (LLMs)?**
   * **Pre-Training vs. Fine-Tuning**
   * **Retrieval Augmented Generation**