

Meta Interview 2025-04-07

Preparation 2025-04-02

**Building Advanced DL and NLP Projects – Educative**

## **Overview**

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Overview

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Welcome to the Course

Overview

Project: Build a COVID-19 Detection System Using X-Rays

Project: Building a Pokemon Classifier Using Transfer Learning

Project: Text Generation Using Markov Chains

Word Embedding: Two Mini Projects

Project: IMDB Reviews Sentiment Analysis


Project: Deciphering

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Overview

In this lesson, we will discuss the course and the pre-requisites for the course.

Who should take this course?




This course aims at building real-world applications that are being used in the industry and will help you to build your own application easily. If you are a beginner, then this course is not for you. This course dives straight into practical, hands-on usage of deep learning algorithms in the industry without wasting any time. You should have a basic understanding of the following:

1. Python basics
2. How a neural network works ?
3. How to build a multi-layer perceptron ?

What you'll learn in this course

This course focuses on more advanced topics in building applications using deep learning and NLP. We will start from CNNs, go into some advanced topics like transfer learning, and then, build some cool projects.




What projects will we be building in this course?

In this course, we will be building these eight projects:


1. A COVID-19 detection system.
2. A Pokemon image classifier.
3. An automatic text generator.
4. An odd word picker.
5. Word analogies.
6. An IMDB movie reviews analyzer.
7. A text decrypting AI model.
8. An emoji predictor from text.

Apart from these, you will build four projects in the assignment sections. So, you'll complete a total of 12 projects.



How to complete this course and get the most out of it?

We recommend reading one chapter per week because there are a lot of things to learn for each particular topic, so it would be a good idea to explore each one in detail. For that reason, we have also provided supplemental reading materials and assignments after each chapter (although they are not compulsory, you are encouraged to try them out). We also suggest you take your time and take all the quizzes that are provided in this course. We hope you will follow all the guidelines for this course and enjoy your journey with us.



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## Do we get the code files?



We will go over the code for each project step-by-step, with the aim that you build the applications in this course with us. If you get stuck at any place, you can always ask us for help.

## Tips to learn the most from this course

- Try to do hands-on coding along with the lessons.
- Always try to achieve a perfect score when taking the quizzes. Don't skip any quiz.
- Complete all the tasks and assignments that are suggested in between the chapters and lessons.
- Take a look at each of the lessons' *supplemental materials* to get an in-depth understanding of various topics discussed in this course.



## Important packages

We will be using the following packages in the course:

- `numpy`
- `matplotlib`
- `sklearn`
- `tensorflow==1.14.0`
- `gensim`
- `emoji`
- `pickle`

Note that we are using `Tensorflow 1.x` version in this course. You can even use the `Tensorflow 2.x` with some minor update in the code snippets.

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# Introduction to Convolutional Neural Networks

## Introduction to Convolutional Neural Networks

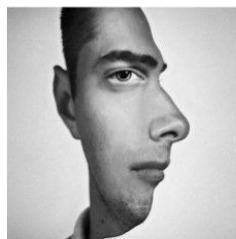
In this lesson, we are going to discuss the workings of a Convolutional Neural Network.

Welcome to the first chapter. In this chapter, we are going to discuss the workings of a Convolutional Neural Network, and, in the latter part of the chapter, we will be building a real-world project that you can even take to the next level!

Before starting, let's learn how the human brain reads an image.

## How does the human brain read an image?

To understand CNNs, we must understand how our own human brain works or, more specifically, how it reads an image. Our brain depends on detecting features and categorizing the objects we see accordingly. You must have been in a situation where once you saw an image, you perceived it to be something, and, then, after looking at it again more thoroughly, you judged or perceived the image in a different manner. Let's see this with an example below:



### Optical illusion

What did you see at first glance in the above image? Did you see a person's face looking sideways or a person looking at you?

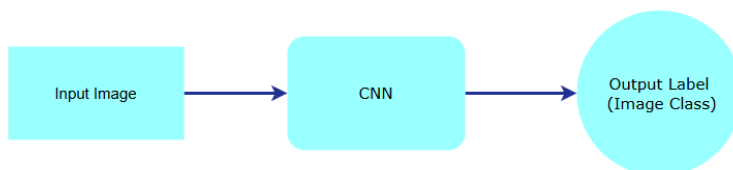
The point that we want to make here is that our brain classifies any image it sees based on the features it detects first. Convolutional Neural Networks work in a similar manner. CNNs try to find the features that are important for the classification of the images.

**Note:** CNNs are mainly used for image-based tasks, but recent studies have proven that they can also be used for NLP tasks. However, the application can be limited for NLP.

## How does a CNN work?

There are three elements involved when we work with CNNs:

- Input image
- Convolutional Neural Network
- Output (classified image class)



### Elements involved while working with CNNs

Here, the CNN works in four steps, which are discussed further in the latter part of the chapter.

- **Convolution** - the first building block is the convolution operation. In this step, we will discuss the feature detectors, which basically serve as the neural network's filters. We will also discuss how these filters are learned by the network.

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- **Pooling** - in this lesson, we'll cover pooling, and you will learn exactly how it works. Our focus, however, will be on a specific type of pooling i.e. max pooling. However, there are some different poolings available and we will be discussing them in the next chapter.
- **Flattening** - in this lesson, we will discuss how flattening works and creates an output that converts your input to a vector.
- **Full Connection** - in this lesson, we will see how all of these steps are merged together and how the final predictions are done.

These are the building blocks of a Convolutional Neural Network.

## How does a CNN work with images?

A Convolutional Neural Network not only works with black and white images, but it can work with colored images. Although there will be some differences, the overall structure of a CNN remains the same.

It will become clearer once we move ahead in the chapter but please keep these points in mind:

- Images are represented as matrices. A black and white image is simply a single matrix, whereas a colored image is represented by a combination of three matrices (one for each color channel, i.e., RGB).
- The values in the matrix are the pixel values at the point in the image. Look at the image below to better understand this.

B/W Image 2x2 px

Pixel 1	Pixel 2
Pixel 3	Pixel 4

2-D Array

Pixel 1	Pixel 2
Pixel 3	Pixel 4

Colored Image 2x2 px

Pixel 1	Pixel 2
Pixel 3	Pixel 4

3-D Array

Pixel 1	Pixel 2
Pixel 3	Pixel 4

- Each pixel contains eight bits (one byte) of information.
- Colors are represented on a scale from 0 to 255.
- Generally, 0 is pitch black and 255 is pure white, and in between 0 and 255 are the various shades of gray.
- Each pixel value for a colored image is represented on three levels (RGB). Since any color is a combination of red, green, and blue at different levels of concentration, a single pixel in a colored image is assigned a separate value for each of these layers.
- The network does not actually learn colors. Since computers understand nothing but 1's and 0's, the colors' numerical values are represented to the network in binary terms.

Now let's look at the application of CNNs.

## Applications of CNN

- Self-driving cars
- Image classification
- Facial expression detection
- Medical diagnosis using X-Rays, CT Scans, etc.

CNNs are very useful in almost all sectors.

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