

# Lesson Plan

- Lesson 1.1: Neural Networks
- Lesson 1.2: Image Recognition Training
- Lesson 2.1: Programming Fundamentals
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- Lesson 2.4: Functional Programming**
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## Lesson 2.4 Functional Programming

Warm-up	(10 mins)
Functions	(20 mins)
Wrap up	(05 mins)
Extras	(10 mins)

### Prerequisites:

In our previous chapter we discussed some important concepts of programming languages like conditions and loops . If you haven't already, please refer to pages 10 & 13

### Lesson Overview:

In this chapter, we will introduce a programming concept called functions.

### Lesson objective:

To make students understand and use programming concept of functions..

### Getting started:

1. We'll be playing Bot Movements => Advanced Code Cards => Functions from our rule book which covers functions programming. The goal is to teach students about functions in programming.

2. Instructors will explain the rule book and students will do the exercise.
3. After the rule book is explained, arrange the cards and the board. After the initial setup, explain cards, movements of the bot, choose starting position and get ready to start the game.

### **Activity:**

1. Students should understand how computers execute functions.
2. Each player reviews their code cards and the sequence of their programming code.
3. Ask the students to write the algorithm of the game played on a sheet.

### **Functions:**

Functions are a programming structure that takes in parameters and performs the computations as defined inside it. Functions are easy and

Consider we pass two parameters as num1 and num2 to a function as shown below, and the function takes the sum of two numbers, we'll get the sum of any two numbers we pass to this function as parameters.

```
def function Add(num1 , num2):  
    Num = num1 + num2  
    Return Num
```

Driver code:

```
Add(5 , 8) // returns 13
```

```
Add(2 , 4) // returns 6
```

Add(1 , 7) // returns 8

### **Explanation:**

Here Num = num1 + num2 is a mathematical expression written inside a function which is defined as Add(num1, num2). Here num1 and num2 are called parameters of the function, which simply means it can take any values and pass it onto the code defined inside the function.

Once the instructions inside the function are executed, it needs to be returned to the main code. In the example above we return the 'Num' variable.

### **Board Activity:**

Explain the functions and their role in our advanced cards deck.

1. Tell the students to pick three basic cards from the deck.
2. These three cards together will form a function inside the game and whenever a function card is drawn.
3. Ask the students to apply these functions on the board game and see where they reach.

### **Extended Learning:**

Let's say we want to calculate Body Mass Index(BMI) of one of a student. The formula for BMI is,

$$\text{BMI} = \text{Weight (in Kgs)} / \text{Height(in meters)} ^ 2$$
 Here '^ 2' means exponent of 2

We ask for height and weight of one of the kids in the audience. Once we get the inputs, we write our computer program to calculate BMI as follows:

$$\text{BMI} = \text{weight} / (\text{height}) * (\text{height})$$

This was easy, right?

But, what if we asked you to find BMI for every child in the class?

Instead of writing the code for BMI as defined above for each student, we can define a function called 'BMIcalculator' which takes height and weight as parameters and returns the BMI after computation.

```
def BMIcalculator(weight, height):  
    BMI = weight / (height) * (height)  
    return BMI
```

Driver code:

```
John's BMI = BMIcalculator(29, 0.8);  
John's BMI = BMIcalculator(36, 0.76);  
Steve's BMI = BMIcalculator(32, 0.68);
```

The output for the code will be their respective BMIs.

So, as you can see above, defining a function above saved us a lot of time and space to create a program for calculating BMIs for any number of students. This is the advantage of using functions in programming.