**Function** GeneticModel

Input = Model

**BEGIN**

ChromosomesArray = [] #Array of chromosomes

**IF** ChromosomesArray is empty **THEN**

Epoch[0], ChromosomesArray[0] = InitializeScale(Epoch[0])

**ENDIF**

**FOR** i = 0 **to** Earlystopping **DO**

Epoch[i], ChromosomesArray = GeneticAlgorithm(Epoch[i], ChromosomesArray)

**ENDFOR**

**EXIT**

**END**

**Function** GeneticAlgorithm

Input = 1 Epoch, #[Iteration\_1, Iteration\_2...Iteration\_n]

ChromosomesArray

Output = Genetic 1 epoch, ChildChromosomesArray

**BEGIN**

**IF** ChromosomesArray[1] is empty **THEN** #if the second chromosome is not defined

#1.초기 염색체 생성

**FOR** i = 0 **to** The number of iterations **DO**

ChromosomesArray[i] = Scale term of the Iteration

**ENDIF**

**FOR** i = 0 **to** The number of iterations **DO**

Iteration[i] = SetScale(Iteration[i], ChromosomesArray[i])

**ENDFOR**

#2.적합도 계산(loss이용)

FitnessArray = Array of fitnesses

**FOR** i = 1 **to** The number of iterations **DO**

FitnessArray[i-1] = Loss of Iteration[i] - Loss of Iteration[i-1]

**ENDFOR**

Index1, Index2 = Index of largest value in FitnessArray, Index of second largest value in FitnessArray

#3\_1.자손 염색체 생성

ChildChromosomesArray = crossover(ChromosomesArray[Index1+1], ChromosomesArray[Index2+1])

#3\_2.돌연변이 생성

ChildChromosomesArray = mutation(ChromosomesArray[Index1+1], ChromosomesArray[Index2+1])

**END**

**Function** InitializeScale

Input = 1 Iteration #[Layer\_1, Layer\_2...Layer\_n]

Output = 1 Iteration multipled by scale term and Chromosomes

**BEGIN**

Chromosomes = [] #2D Array [Layer\_1\_Chromosomes, Layer\_2\_Chromosomes...Layer\_n\_Chromosomes]

**FOR** i = 0 **to** The number of convolution layers **DO**

Featuremaps = Outputs of the layer

Shape = Shape of the Featuremaps #(The number of samples, featuremap\_W, featuremap\_H, The number of featuremaps)

Size = shape[3] #the number of featuremaps

ScaleArray = [Size] #an array that get scale values

**FOR** i = 0 **to** Size **DO**

ScaleArray[i] = 1 / Size

**ENDFOR**

Input.Convolution\_layer[i] = Input.Convolution\_layer[i] \* ScaleArray

Chromosomes[i] = ScaleArray

**ENDFOR**

**RETURN** Input, Chromosomes

**END**

**Function** SetScale

Input = 1 Iteration , Chromosomes

Output = 1 Iteration multipled by scale term

**BEGIN**

**FOR** i = 0 **to** The number of convolution layers **DO**

Input.Convolution\_layer[i] = Input.Convolution\_layer[i] + Chromosomes[i]

**ENDFOR**

**END**

