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These are 3 generations which vectors, vectors error and fitness percent.

MDL-PROJECT

REPORT

Genetic Algorithm

Introduction

Our Genetic Algorithm consists of a fitness function, cross-over function , mutation function and also a storage function which will retain the vectors and errors of current generation to save the number of requests called. The loop will be starting with either a loaded vector or a randomly generated vector with its errors ,then the loop will run by creating new generation vectors and calling fitness functions for them.

Fitness Function

Our fitness function will start by getting errors for the newly created generation(children) . Then it will normalise the training error and validation error as normal error in form x*(training_error)+y*(vaildation_error) where |x,y|<1. We changed x and y as per priority to reduce either error(mostly used x=⅔ and y=⅓). After finding the normalised error we are finding the fitness percent of each vector by using 1/(normal_error+1). Then we are calling a storage function which will sort the combined vector population including previous generation and their children with respective percentage given by fitness function. Also it stores the next generation in Generations variable to save requests and also stores the best 10 vectors upto this generation in B_vectors. After this it will return a new_population which is agained returned by fitness function.

Cross-over Function

The parents selection for the cross-over function is by random choice function in numpy with probability as vectors_percent provided by the fitness function. Then we called the cross-over function with the two parents passed as arguments. In this cross-over function we randomly selected n(minimum 4) positions to swap between two parents and the swapped parents are the children for future. Then they are passed to mutation function.

Mutation Function

In the mutation function we assigned a random probability of 35 percent to each place in the vector. If the position is satisfied with the probability condition then we are multiplying the value with a random number in between -2 to 2. If the value exceeds -10 to 10 then we reassign the place with a random value between -10 to 10.

Hyper Parameters

We took pool size as 16 to make sure that it was not too large for calcutional(actually took small to generate more generations due limited requests). For creating new genes instead of splitting we preferred to make it as random and equally probable for each gene place to go to either child. So we selected n-places to swap the genes.

We started observing convergence at nearly 300 generations where the best fitting vectors are very close , but due to mutations very frequently we use to get little variations for fitting vectors in every 300 generations.

Other changes Or Methods followed

We use to change the normal error equation which is mentioned above in the fitness function. Since it is a major factor for reducing the training and validation error. At starting we use ⅔ weight for training and ⅓ for validation error which lead us to downfall by considering more overfitting models which may have variations when exposed to unknown dataset. Later we tried (⅓,⅔) and (¼,¾) to make it less of an overfitting model but it is too late to reduce the overfitting nature of the model.

Performance of Our models

Since models are first trained to be overfitting and then being down to underfitting models ,So our model will give good performance when the dataset is near to the training set data. But we can expect a very less performance when shown to an unknown dataset.