

IEEE CEC'2023 Competition on Multiobjective Neural Architecture Search

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1 Algorithm Description

1.1 Algorithm Overview

The algorithm I used is based modifications on NSGA-2.

The algorithm contains three sequential stages of NSGA-2, and a final subset selection.

Modified objective functions are used in the algorithm to encourage convergence.

No problem specific optimisation method is used.

1.2 Details

1.2.1 Initialization

A population with a size of 8 times of final population size is randomly sampled from search space.

The same amount of fitness evaluations are used.

1.2.2 Stage1

The first stage of evolution ceased when 4500 evaluation.

The initial population is selected on the initial population with a size of 0.8 times of final population size. Each offspring is tested using two independent fitness evaluations.

Differed from original NSGA-2 algorithm, the objective function is changed.

$$u_i(x) = (1 - \alpha)f_i(x) + \alpha \frac{1}{m} \sum_{j=1}^m f_j(x), i = 1, 2, \dots, m$$

The value of α is chosen as 0.3 for number of objectives $j= 3$ and 0.4 otherwise.

1.2.3 Population division

All the previous population is stored in an archive. The population of the last stage is sorted base only on predicted accuracy. After calculating mean and

variance of the accuracy of the population, the archive is divided into three part, whose accuracy is less than mean - 0.6 times std, or larger than mean + 0.6 times std, or otherwise. They are denoted as p1, p3, respectively. p2 is the population from the last stage. Two separated NSGA-2 selection are used at p1 and p3.

1.2.4 Stage2

p1 and p2 is used to initialize the population. $u(x) = (1 - \alpha) * f(x) + \alpha * f_1(x)$ where f_1 is the objective on number of parameters. The NSGA-2 algorithm is operated on these biased objectives.

1.2.5 Stage3

p2 and p3 is used to initialize the population. $u(x) = (1 - \alpha) * f(x) + \alpha * f_0(x)$ where f_0 is the objective on the accuracy. The NSGA-2 algorithm is operated on these biased objectives.

1.2.6 Final subset selection

The final subset selection is performed on the population gotten from three stages.

Final population included: 0.3 final population size from stage 1 0.45 final population size from stage 2 0.25 final population size from stage 3

2 Result

Problem	HV	IGD
c10mop1	0.9377 (0.0037)	0.0263 (0.0040)
c10mop2	0.9112 (0.0023)	0.0253 (0.0068)
c10mop3	0.807 (0.0018)	0.0378 (0.0017)
c10mop4	0.7891 (0.0247)	0.0527 0.0171
c10mop5	0.7107 (0.0004)	0.0529 0.0119
c10mop6	0.7245(0.0136)	0.0295 0.0196
c10mop7	0.7107(0.0699)	0.0529 0.0304
c10mop8	0.9513(0.0037)	
c10mop9	0.9387(0.01)	
l1kmop1	0.9117(0.0042)	
l1kmop2	0.863(0.0092)	
l1kmop3	0.8298(0.034)	
l1kmop4	0.9548(0.008)	
l1kmop5	0.9516 (0.0092)	
l1kmop6	0.9251(0.0148)	
l1kmop7	0.8576 (0.0142)	
l1kmop8	0.7539 (0.0931)	
l1kmop9	0.6761(0.12)	

3 Contact

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