Immune Particle Swarm Optimization for Support Vector Regression on Forest Fire Prediction

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Abstract. An Immune Particle Swarm Optimization (IPSO) for parameters optimization of Support Vector Regression (SVR) is proposed in this article. After introduced clonal copy and mutation process of Immune Algorithm (IA), the particle of PSO is considered as antibodies. Therefore, evaluated the fitness of particles by the Cross Validation standard, the best individual mutated particle for each cloned group will be selected to compose the next generation to get better parameters ε, C, δ of SVR. It can construct high accuracy and generalization performance regression model rapidly by optimizing the combination of three SVR parameters at the same time. Under the datasets generated from $\sin cx$ function with additive noise and forest fires dataset, experimental results show that the new method can determine the parameters of SVR quickly and the gotten models have superior learning accuracy and generalization performance.

Keywords: Immune algorithm, Particle swarm optimization, Support vector regression.

1 Introduction

Support Vector Regression (SVR) is a regression method which is based on Support Vector Machine (SVM), with solid theoretical foundation. Different from SVM, SVR is trying to find a hyperplane which can accurately predict the distribution of information, but not the plane on how to classify the data [1][2][3]. However, the prerequisite for SVR to achieve better results is to find appropriate three parameters, which play key roles in constructing high accuracy and generalization performance regression model. Many scholars have recognized this point and launched an in-depth study, but still have not form an effective general theory of the guiding principles and methods yet [4][5].

Particle Swarm Optimization (PSO) was proposed by J. Kennedy and R.C.Eberhart in 1995, which idea is deriving from the simple social system simulation [6]. Particles are able to use the information of the local optimal solutions and the global optimal solutions. And it shows very good performance in many optimization problems [7].

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