



## Use of nonlinear prediction tool to estimate uniaxial compressive strength and modulus of elasticity of some granitic rocks

Nurgul Gultekin (1), Ebru Sezer (2), and Candan Gokceoglu (1)

(1) Hacettepe University, Department of Geological Engineering, 06800, Beytepe, Ankara, Turkey , (2) Hacettepe University, Department of Computer Engineering, 06800, Beytepe, Ankara, Turkey

In several rock engineering applications, various prediction tools have been used to estimate strength and deformation parameters of intact rock. Commonly, simple and linear multivariable regression methods have been employed. However, recently, some soft computing methods such as fuzzy inference systems, artificial neural Networks and neuro-fuzzy models have been used and they have yielded successful results, because the problems at hand have generally nonlinear nature. The purpose of the present study is to apply neuro-fuzzy modeling to estimate uniaxial compressive strength and modulus of elasticity of some granitic rocks from their physical and index properties. For the purpose of the study, sampling works on seven different granitic rocks from different locations in Turkey were performed. On these samples, unit weight, porosity, void ratio, water absorption by weight, P-wave velocity, point load index, block punch index, tensile strength, uniaxial compressive strength and modulus of elasticity were determined in laboratory. A total of 88 specimens were used during the laboratory tests. In the first stage of the analyses, stepwise multiple regression analyses were performed. By using the input parameters of the most successful regression models, some models based on adaptive neuro-fuzzy inference system (ANFIS) were developed to predict uniaxial compressive strength and modulus of elasticity. The general performances of the ANFIS models are considerably high. This results show that prediction of some intact rock properties is a nonlinear problem. For this reason, when predicting the intact rock properties, the nonlinear methods such as fuzzy inference system, artificial neural networks, adaptive neuro-fuzzy inference system or nonlinear multiple regression methods should be considered.