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## **GRNN and MFFNN models for energy equivalent speed prediction and fault rate determination of involvements in traffic accidents: Case study in Turkey**

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There are some deficiencies in defining fault rates in “No.2918 Turkish Highway Traffic Act” in Turkey. Fault rates are determined according to initiative of accident experts (sometimes no speed analyses of vehicles, just procession of accident) and there are no specific quantitative instructions on fault rates related to procession of accident in act. Mostly, only consistence situation of accident does not yield adequate data in determining fault rate. The most important parameters for determination of fault rates are the speeds of vehicles which correspond to more comprehensive parameter, Energy Equivalent Speed (EES). In this study, data collected from accident scene (police reports, skid marks, deformation situation of involvements, crush depth etc.) were inserted properly into the software called “vCrash” which is able to simulate the accident scene in 2D and 3D. Then, 784 parameters, related to calculating EES with a prediction error were prepared according to several accidents. These parameters were also used as teaching data for the Multi-layer Feed Forward Neural Network (MFFNN) and Generalized Regression Neural Network (GRNN) models in order to predict EES values of involvements which give idea about severity and dissipation of deformation energy corresponding to the observed vehicle residual crush and finally fault rates without requirement of performing simulation for probable accidents in future. Using 10-fold cross validation on the dataset, standard error of estimates (SEE) and multiple correlation coefficients (R) of both models are calculated. The GRNN-based model yields lower SEE whereas the MFFNN-based model yields higher R. Assuming a fault rate scale, fault rates of involvements were determined based on predicted EES values of involvements. Every predetermined increment in EES of specific involvement was deemed as a specific increment in fault rate of the same involvement to carry out a systematic and scientific approach.

### **Biography**

Ali Can Yilmaz has graduated from Istanbul University Department of Mechanical Engineering in 2007. He has completed his MSc degree in Cukurova University, Department of Automotive Engineering and is currently a PhD student in the same university and department. His field of interest includes combustion in engines, alternative fuels, renewable energy systems and traffic accident reconstruction.

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