In this paper a method for the accurate and fast determination of direction of arrival (DOA) of impinging electromagnetic signal radiated from stochastic sources in the far-field is proposed. The method is based on neural models using MLP (Multi-Layer Perceptron) artificial neural network. To illustrate the applicability of the proposed method, two MLP models for one-dimensional (1D) DOA estimation (in azimuth plane) are presented: MLP model for the estimation of angle position of one stochastic source and MLP model for the estimation of two stochastic sources position at fixed angle distance. Presented models perform very fast 1D DOA estimation and therefore they are very suitable for the real time applications. The architecture of developed models, their training results and simulation results are described in details.