The present work aims at applying Machine Learning approaches to predict CO_2 viscosity at different thermodynamical conditions. Various data-driven techniques including multilayer perceptron (MLP), gene expression programming (GEP) and group method of data handling (GMDH) were implemented using 1124 experimental points covering temperature from 220 to 673 K and pressure from 0.1 to 7960 MPa. Viscosity was modelled as function of temperature and density measured at the stated conditions. Four backpropagation-based techniques were considered in the MLP training phase; Levenberg-Marquardt (LM), bayesian regularization (BR), scaled conjugate gradient (SCG) and resilient backpropagation (RB). MLP-LM was the most fit of the proposed models with an overall root mean square error (RMSE) of 0.0012 mPa s and coefficient of determination (R^2) of 0.9999. A comparison showed that our MLP-LM model outperformed the best preexisting Machine Learning CO_2 viscosity models, and that our GEP correlation was superior to preexisting explicit correlations.