In the article, a new hybrid model, ARIMA + LSTM, is proposed to predict CO2 emissions for total China and for the three regions We selected 14 factors that influence CO2 emissions and used random forest method to calculate and rank their contributions. These factors are then fed into the ARIMA + LSTM hybrid model, which better than the LR, BPNN, ARIMA and LSTM. As a result, the new model can predict CO2 emission trends more accurately. Our results show that this new model can be effectively applied in the field of CO2 prediction. After analyzing the influences of demographic, economy, transportation, and technological advances on CO2 emissions in China as a whole and in the three regions, To summarize the following conclusions. Firstly, the production activities of the primary and sec ondary industries in different regions cause the largest amount of CO2 emissions. Therefore, reducing their shares can effectively