The main objective of this thesis is to use the data measured by the MAVEN spacecraft and machine learning methods to develop models of the locations of bow shock and magnetic pileup boundary. Characteristic values of density, flow speed, and magnetic field magnitude in solar wind, magnetosheath, and magnetosphere allows an automatic classification of measured data into respective regions using the SVM method, as well as the identification of the boundary crossings. Models of the two boundaries based on multilayer neural networks are then developed. Two different approaches are used: i) model based directly on the classification of individual regions, and ii) model using only the identified boundary crossings. The accuracy of the developed models is validated both by using individual boundary crossings and by a comparison with former empirical models.