Chip design is so complex and its productivity has long been restricted by the challenge of design prediction. That is, the impact of early designs steps on final products is huge yet immensely difficult to predict. Conventional approaches of design predictions are either impractically expensive to use or insufficiently accurate. Machine learning, by knowledge extraction from data and reuse, offers an opportunity to overcome this challenge. This presentation introduces machine-learning techniques for fast and credible predictions of rout ability, crosstalk, net-length and analog circuit performance. In general, machine-learning applications tend to be plug-in use with parameter tuning and therefore their advantages are not fully utilized for specific problems. To this end, we show how to customize machine learning architectures by leveraging domain knowledge so that inference accuracy is further improved.