Machine learning (ML) methods and data driven algorithm have been widely used in the Fault detection and isolation tasks in DC microgrids. However, the lack of labelled fault data is still one of the major obstacles for the development of supervised ML methods in power system, limiting the accuracy of prediction. In my thesis, I introduce a novel Machine learning model that uses the synthetic data as the alternative of fault data during the training time. The synthetic data is the high frequency component of the line current during the switch-on of no-load branches extracted by a discrete wavelet package transformation (DWPT) transformation on the original current signal. In this paper, the similarity of synthetic faults to the real short circuit faults in high frequency domain is verified through a circuit analysis and a DWPT case study. In addition, another contribution of this paper is introducing ensemble learning algorithm to FDI. A test will be taken to verify the effectiveness of ensemble learning in two aspects: 1) dealing with the distribution gap between synthetic data and the real fault data; 2) detecting the high impedance faults (HIFs), which have milder features than the common short circuit faults. The proposed ensemble model with synthetic data (EMSD) is implemented in Python and verified with the current data simulated with MATLAB/Simulink software.