DUT DURBAN UNIVERSITY OF TECHNOLOGY

ELECTRICAL POWER ENGINEERING

Department of Electrical Power Engineering

Postgraduate Research Template

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	Student Name / Surname	Adeniyi Kehinde Onaolapo	**Start Date:**	**01/03/2016**	**Supervisor**	**Mr. K T Akindeji**
	Title of Project	Modeling and Recognition of Faults in Smart Distribution Grid Using Machine Intelligence Technique	**Completion**	**01/12/2018**	**Co-Supervisor(s)**	**Prof E Adetiba**
	Program of Study (M Eng. / D Eng.):		**MEng**			
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Synopsis of Research Project: (< 300 words)

Electrical power systems experience unforeseen faults attributable to diverse arbitrary reasons. Unanticipated failures occurring in power systems are to be prevented from propagating to other parts of the protective system to enhance economic efficacy of electric utilities and provide better service to energy consumers. Since most consumers are directly connected to power distribution networks, there is increasing research effort in distribution network fault recognition and fault-types identifications to solve the problem of outages due to faults. This study focuses on fault recognition and fault-types identification in electrical power distribution system based on the Design Science Research (DSR) approach. Diverse simulations of fault types at different locations were applied to the IEEE 13 Node Test Feeder to produce three phase currents and voltages as data set for this study. This was realized by modelling the IEEE 13-node benchmark test feeder in MATLAB-Simulink R2017a. In order to achieve intelligent fault recognition and fault-type identification, different Multi-layer Perceptron Artificial Neural Networks (MLP-ANN) models were designed and subsequently trained using the generated dataset with the Neural Network toolbox in MATLAB R2017a. The fault recognition task verifies if a fault occurs or not while the fault-types identification task determines the fault class as well as the faulty phase(s). Results obtained from the various MLP-ANN models were recorded and statistically analyzed. Acceptable performances were obtained for fault recognition with the 6-25-20-15-1 MLP-ANN architecture, for fault-types identification with the 6-40-4 MLP-ANN architecture and for fault location with the 6-30-15-5-4 MLP-ANN architecture. Given the result obtained in this study, MLP-ANN is adjudged suitable for intelligent fault recognition and fault-types identification in power distribution systems. The trained MLP-ANNs in this study could ultimately be incorporated in power distribution networks within South Africa and beyond in order to enhance energy consumers' satisfaction.