# Classification of Normal and Stress between Female based on EEG Signals by using Artificial Neural Network

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UNIVERSITI TEKNOLOGI MARA

MALAYSIA

**NOR ATIQAH BINTI THAFA'I**

**FACULTY OF ELECTRICAL ENGINEERING**

**UNIVERSITI TEKNOLOGI MARA**

**40450 SHAH ALAM MALAYSIA**

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# ABSTRACT

Stress is an emotional state that is common to each and every one of us. Moderate level of stress can lead to positive effects such as motivation booster but too much of stress may lead to negative effect that may harm our body. One of the means to diagnose stress among individuals is to allow them to answer some types of questionnaires that could be used to measure the stress level being experienced. Such types of questionnaires are normally adopted by psychiatrists to initially screen for the signs of stress or depression among their patients. Many research works have been carried out in designing and constructing those questionnaires. However, such approach of diagnosis is prone to reliability problem, since it can only give subjective results. Due to this limitation, this study is to explore an alternative method to identify the sign of stress among female individuals by analyzing the EEG signals among normal subjects and subjects with stress. This EEG analysis is based on the classification of EEG signals to distinguish subjects with and without stress. Our research work includes performing classification of EEG signals by using two different types of Artificial Neural Network (ANN) classifier known as Scaled Conjugate Gradient and ANN with Resilient Back Propagation. The inputs fed to these classifiers are either in the form of Power Spectral Density (PSD) features or Energy Spectral Density (ESD) features extracted from the EEG signals. The aim of this study is to determine which one among of these two classifiers can perform better in distinguishing EEG signals of female with and without stress. In addition, the suitable type of EEG features as inputs to the classifier will also be studied. Based on the conducted analysis, it is shown that ANN with Resilient Back Propagation and Scaled Conjugate show high accuracy for PSD features, however only Scaled

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# CHAPTER 1

# INTRODUCTION

## 1.1 BACKGROUND OF STUDY

Stress or also known as tension is one of emotional states that frequently happen to everyone. Psychiatry researches [1-3] have shown that women are suffering more depression than men and they are more susceptible to the emotional states called stress. Stress is a kind of pressure that can give positive or negative effects. Stress is a part of natural methods on how our body react to a challenge. Looking from the positive side of stress, it will make the individuals to prepare themselves for incoming challenges and to avoid any danger. While looking at its negative side, if stress continues to be experienced without relief, it may lead to distress. Based on the information from The American Institute of Stress (AIS) [4], there are 50 common signs and symptoms of stress such as chest pain, excess anxiety and insomnia.

Questionnaires help to measure the level of stress and many research works have been carried out in creating such types of questionnaires. Nevertheless, it is only used as an initial diagnosis and only help in giving a subjective result and susceptible to reliability problems. An objective result is needed to give proper medical treatment.

Due to this limitation, in this study we explore an alternative method to identify the sign of stress among female individuals by analysing the EEG signals among normal subjects and subjects with stress by using two different types of Artificial Neural Network (ANN) classifier known as Scaled Conjugate Gradient and ANN with Resilient Back Propagation. By recording and analyzing the brain activity of subjects