

# Classification of high performance archers by means of bio-physiological performance variables via $k$ -Nearest Neighbour classification model

Zahari Taha<sup>1</sup>, Rabiū Muazu Musa<sup>1,2</sup>, Anwar P P Abdul Majeed<sup>1</sup>, Mohamad Razali Abdullah<sup>2</sup>, Ahmad Fakhri Ab Nasir<sup>1</sup> and Mohd Hasnun Arif Hassan<sup>1</sup>

<sup>1</sup> Innovative Manufacturing, Mechatronics and Sports Laboratory, Faculty of Manufacturing Engineering, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia

<sup>2</sup> Faculty of Applied Social Sciences, Universiti Sultan Zainal Abidin, 21300 Kuala Terengganu, Terengganu, Malaysia  
rabiumuazu86@gmail.com

**Abstract.** The present study classified and predicted high and low potential archers from a set of bio-physiological variables trained via a machine learning technique namely  $k$ -Nearest Neighbour ( $k$ -NN). 50 youth archers drawn from various archery programmes completed a one end archery shooting score test. Bio-physiological measurements of systolic blood pressure, diastolic blood pressure, resting respiratory rate, resting heart rate and dietary intake were taken. Multihierarchical agglomerative cluster analysis was used to cluster the archers based on the variables tested into low, medium and high potential archers. Three different  $k$ -NN models namely fine, medium and coarse were trained based on the measured variables. The five-fold cross-validation technique was utilised in the present investigation. It was shown from the present study, that the utilisation of  $k$ -NN is non-trivial in the classification of the performance of the archers.

**Keywords:** Bio-physiological Variables, Artificial Intelligence, Classification,  $k$ -Nearest Neighbour.

## 1 Introduction

It has been reported that archery sport involves conscious breathing control and its synchronization limb movements [1]. Shooting in archery is the concurrent matching between breathing; gross motor control of body positioning; fine-motor control of the archer's fingers, hands, elbows, legs, feet, and cheek; and the handling of perceptual cues associated with the target, the sights and the peep or string [2].

Moreover, though archery is not considered as physically exhaustive sport compared to other games, such as basketball, rugby, cycling or soccer, nevertheless, there is still a need for the archers to consider their nutritional status. For example, it has been proven a number of times that breakfast is the most essential meal of the day. When an archer is preparing to devote the entire day shooting or during a competition that could take the whole day, he/she will perform well with a healthy breakfast [3]. Evidence has