Utilization of SVM, LSSVM and GP for Predicting the Medical Waste Generation

J. Jagan
VIT University, India

Yıldırım Dalkılıç
Erzincan University, Turkey

Pijush Samui
National Institute of Technology Patna, India

ABSTRACT

The prediction of wastes generated in the hospital will help their management for several activities like storage, transport and disposing. This chapter adopts Support Vector Machine (SVM), Least Square Support Vector Machine (LSSVM) and Genetic Programming (GP) in order to estimate the rate of medical waste generation. In the event of predicting the rate, type of hospital, capacity and bed occupancy has been used as inputs of SVM, LSSVM and GP. SVM is based on statistical learning theory, which provides an elegant tool for nonlinear system modeling. LSSVM is the re-formulation to the general SVM. GP, a best part of evolutionary algorithm and also the specification of Genetic Algorithm (GA). These SVM, LSSVM and GP have been used as the regression techniques. The results show the performance of the developed SVM, LSSVM and GP models were elegant and outstanding.

INTRODUCTION

The development of industries, urban growth together with population and population densities will automatically increase the production of wastes. World Health Organization (WHO) has advocated that the hospital wastes should be treated as the particular wastes (Rushbrook et al., 2000). These hospital wastes are more hazardous and are rapidly increasing in the society. Inadequate hospital waste manage-
Utilization of SVM, LSSVM and GP for Predicting the Medical Waste Generation

ment will cause environmental pollution, generation of germs and insects, foul smell, etc., will lead to the contagious diseases like typhoid, cholera and AIDS through the wound from syringes and needles contaminated with the human blood (Henry & Heinke, 1996). This research has the better scope in the smart cities with more industries and population. Potentially dangerous hospital wastes can be predicted for the prevention of some hazardous diseases.

Through inventory, questionnaire survey and formal and informal interviews, data has been collected for empirical field observation in Dhaka city, Bangladesh (Hassan et al., 2008). Very deep interviews were carried out to obtain the knowledge of earlier and current management of medical wastes. Their examination provides the outcome of average waste generation 1.9 kg/bed/day. Hassan et al., (2008) delivers the reasons for improper management of medical wastes like, lack of awareness, appropriate policy and laws, and willingness. Omar et al., (2012) has considered the medical waste generation in Malaysia and determined the factors affecting management of medical wastes. They detected and detailed specifically flaw in segregation process of medical waste. Omar et al., (2012) has adopted Microsoft Excel and its pertinent statistical gadget like ANOVA for evaluating the management of medical waste. Maha et al., (2015) had thrown their limelight work distinctly on dental clinics at Lebanon. They considered 242 dental clinics arbitrarily and made survey with 32 framed questions. According to their scrutiny, the process of isolating the waste was vanished and it is mingled with the municipality wastes. Their audit provides the necessity of adopting efficient and responsible medical waste management, in order to prevent disaster in public health and pollution at Lebanon. Hence the adequate management of hospital waste is required to reduce the health and environmental risks. Unfortunately, collection, transport and disposal of waste have no proper strategy or planning behind its implementation. It urgently needs to that needs to be regulated by definitive rules (Askariana et al., 2004).

In order to determine the rate of waste generation, the data like (i) number of bed/patient available at the hospital; (ii) type of specialization (type and range of care); and (iii) number, kind, and size of departments have been utilized (Award et al., 2004). The goal of this chapter is to predict the rate of waste generation based on the mentioned criteria’s. Artificial Neural Network (ANN) and Multiple Linear Regression (MLR) have been adopted for this determination (Jahandideh et al., 2009). Since ANN & MLR have some disadvantages such as the low accuracy of MLR and the black box approach, over fitting issues, lack of generalization capability and slow convergence rate of ANN (Park & Rilett, 1999; Kecman, 2001), various effective methods have been utilized.

The methodology of pursuing the medical waste generation includes the upcoming procedures. A total of 50 hospitals private, governmental, educational and non-educational, but university-related hospitals in Fars province, Sharz city, Iran have been considered for the collection of dataset (Jahandideh et al., 2009). The dataset contains information about type of hospital, Capacity(C), Bed Occupancy (B0) and Waste generation rates (kg/day) (wt). This chapter accommodates the machine learning techniques like Support Vector Machine (SVM), Least Square Support Vector Machine (LSSVM) and Genetic Programming (GP) for determination of rate of medical waste generation.

**SUPPORT VECTOR MACHINE (SVM)**

The SVM have been formulated by Vapnik (1998, 1999) based on statistical learning theory. Initially, SVM was utilized for two class classifications, later it was developed to multi-classification, regression, estimation and other similar works. Support Vector machines can be defined as systems which use hy-