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FUNCTION AND SURFACE APPROXIMATION BASED ON ENHANCED KERNEL REGRESSION FOR SMALL SAMPLE SETS

Mohd Ibrahim Shapiai[1], Zuwairie Ibrahim[1], Marzuki Khalid[1]
Lee Wen Jau[2], Vladimir Pavlovic[3] and Junzo Watada[4]

[1]Centre of Artificial Intelligent and Robotics (CAIRO)
Universiti Teknologi Malaysia, International Campus
54100 Kuala Lumpur, Malaysia
{ ibrahim; zuwairie }@fke.utm.my; marzuki@utm.my

[2]Department of ATTD Automation (APAC) Pathfinding
Intel Technology Sdn. Bhd.
Kulim, Malaysia
{ wen.jau.lee; soon.chuan.ong }@intel.com

[3]Department of Computer Science
Rutgers University
NJ 08854, United States
vladimir@cs.rutgers.edu

[4]Graduate School of Information and Systems
Waseda University
2-7 Hibikino, Wakamatsu, Kita-Kyushu 808-0135, Japan
junzow@osb.att.ne.jp

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Abstract. *The function approximation problem is to find the appropriate relationship between a dependent and independent variable(s). Function approximation algorithms generally require sufficient samples to approximate a function. Insufficient samples may cause any function approximation algorithm to result in unsatisfactory predictions. To solve this problem, a function approximation algorithm called Weighted Kernel Regression (WKR), which is based on Nadaraya-Watson kernel regression (NWKR), is proposed. In the proposed framework, the original NWKR algorithm is enhanced by expressing the observed samples in a square kernel matrix. The WKR is trained to estimate the weight for the testing phase. The weight is estimated iteratively and governed by the error function to find a good approximation model. Four experiments are conducted to show the capability of the WKR. The results show that the proposed WKR model is effective in cases where the target function is non-linear and the given training sample is small. The performance of the WKR is also compared with other existing function approximation algorithms, such as artificial neural networks (ANN).*
Keywords: Weighted kernel regression, Small samples, Non-linear function, Artificial neural network

1. **Introduction.** The need for function approximation arises in many fields of applied mathematics. There are numerous function-approximation techniques available in the machine learning community. The modelling of function approximations using ANN has received significant attention from a number of researchers [1-3]. For example, the hybrid model of ANN with PSO has been proposed by [4,5] for function approximation. Genetic programming [6,7], evolutionary algorithms [8] and fuzzy systems [9,10] are other well-known techniques that can be found in the literature. However, most existing function