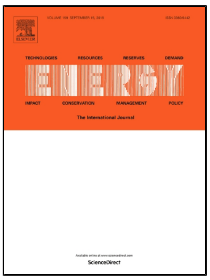
Accepted Manuscript



Energy modeling using an effective latent variable based functional link learning machine

Xiao-Han Zhang, Qun-Xiong Zhu, Yan-Lin He, Yuan Xu

PII:	S0360-5442(18)31641-4
DOI:	10.1016/j.energy.2018.08.105
Reference:	EGY 13581
To appear in:	*Energy*
Received Date:	03 January 2018
Accepted Date:	13 August 2018

Please cite this article as: Xiao-Han Zhang, Qun-Xiong Zhu, Yan-Lin He, Yuan Xu, Energy modeling using an effective latent variable based functional link learning machine, *Energy* (2018), doi: 10.1016/j.energy.2018.08.105

Energy modeling using an effective latent variable based functional link learning machine

Xiao-Han Zhang†; Qun-Xiong Zhu†; Yan-Lin He; Yuan Xu**

College of Information Science & Technology, Beijing University of Chemical Technology, Beijing, 100029, China;

Engineering Research Center of Intelligent PSE, Ministry of Education of China, Beijing 100029, China;

†These authors contributed to the work equally and should be regarded as co-first authors.

**Corresponding author: Tel.: +86-10-64426960; Fax: +86-10-64437805;*

Emails: heyl@mail.buct.edu.cn (Y.L. He); xuyuan@mail.buct.edu.cn (Y. Xu*)*

***ABSTRAT*:** With the increasing scale of modern petrochemical industries, energy modeling plays a more and more important role in energy-saving. However, it becomes more and more difficult to build accurate energy models due to the complicated characteristics of high nonlinearity, high dimension and strong coupling of modeling data. In order to tackle this problem, a novel latent variable based efficient functional link learning machine is proposed in this paper. In the proposed method, there are three salient features: first, a nonlinear function expansion block is used to extend the space of energy modeling data to highly nonlinear space for effectively solving the high nonlinear problem of energy modeling data; second, principal components based latent variables are extracted from the expanded space for removing redundant information; finally, an extreme learning algorithm based on generalized inverse is utilized to train the proposed model for achieving fast learning speed. To validate the performance of the proposed model, a case study of developing an energy model for a Purified Terephthalic Acid production process is carried out. Simulation results show that the proposed model can achieve not only extreme learning speed, but also acceptable accuracy.