

Paperwork on Degree Project: Machine Learning Based Fault Prediction for Real-time Scheduling on Shop-floor

First Name 1 Last Name 1

Personal Number 1

E-mail 1

First Name 2 Last Name 2

Personal Number 2

E-mail 2

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Support Vector Machine

Overview

Support vector machines(SVM), introduced by Vapnik and coworkers in the 1990s, are a family of supervised learning models widely used in classification and regression analysis. Mapping the training data into two separate categories by constructing a hyperplane in a high- or infinite-dimensional space, SVM algorithm creates a non-probabilistic binary classification model. To solve the problem of non-linear separable data, SVM introduced kernel function for reducing dimensions and increasing computational efficiency.

SVM has been widely used in research in recent years, like other machine learning algorithms. Pao-Shan Yu et al. compared SVM and random forest based on real-time radar-derived rainfall forecasting and concluded that SVM outperforms random forest(Journal of Hydrology)[1]. Verena Klass et al. used a SVM model to capture lithium-ion battery dynamics(Journal of Power Sources)[2]. Ni Dong et al. conducted crash prediction at the level of traffic analysis zones with SVM model(Accident Analysis and Prevention)[3].

Algorithm Details

Overall, medium computation time, small amount of training data works. (Not)capable of learning complex patterns. Tricky in choosing kernel function. Outperforms random forest. Step 1:

...

Step n: equations

References

- [1] Hassan K Khalil. *Nonlinear systems*. Prentice Hall, Upper Saddle river, 3. edition, 2002. ISBN 0-13-067389-7.

- [2] Tobias Oetiker, Hubert Partl, Irene Hyna, and Elisabeth Schlegl. *The Not So Short Introduction to \LaTeX 2 ϵ* . Oetiker, OETIKER+PARTNER AG, Aarweg 15, 4600 Olten, Switzerland, 2008. <http://www.ctan.org/info/lshort/>.
- [3] Shankar Sastry. *Nonlinear systems: analysis, stability, and control*, volume 10. Springer, New York, N.Y., 1999. ISBN 0-387-98513-1.