

Machine Learning

Assignment #4

Predictive Maintenance by SVM

Paper Presentation

- 論文清單: [授課教材]-[Paper Presentation]-Paper.zip
- 報告時間: 6/7、6/14
- 報告方式
 - 每四人為一組 (此分組亦為Final Project分組)
 - 每組12分鐘報告、3分鐘問答
- 報告登記
 - E-Course討論區登記報告日期、順序、組別成員、論文名稱
 - 5/29(二)13:00開放E-Course討論區登記，First Come First Serve!
- 報告當天請印出一份論文紙本給老師

Predictive Maintenance

- Predictive maintenance techniques are designed to help **anticipate equipment failures** to allow for advance scheduling of corrective maintenance, thereby preventing unexpected equipment downtime, improving service quality for customers, and also reducing the additional cost caused by over-maintenance in preventative maintenance policies.
- Many types of equipment—e.g., automated teller machines (ATMs), information technology equipment, medical devices, etc.—track run-time status by generating system messages, error events, and log files, which can be used to predict impending failures.

Data Description

- Observation Window/ Prediction Window
 - Different data-sets with different Observation- and Prediction-Window sizes are provided:
 - OW: [1, 2, 4, 8, 16] days;
 - PW: [1, 2] days.
- Feature (27 types of errors in total)
 - 26 frequent errors have been selected to be relevant, these errors are represented by their Error ID;
 - All other (infrequent) relevant errors are grouped as rare errors. They are grouped under Error ID 1;
 - For each error, three different statistic has been provided:
 - The amount of errors;
 - The mean interval of the errors (vMean);
 - The standard deviation of the interval of the errors (vStd).
- Label
 - FALSE: the machine is OK in that day;
 - TRUE: machine break down for some reasons in that day.

Predictive Maintenance by SVM

Feature

1. Count: The amount of errors
2. vMean: The mean interval of the errors
3. vStd: The standard deviation of the interval of the errors

Label

True: the machine is OK in that day

False: machine break down for some reasons in that day

PP Day	Error 1			Error 2			...	"Bad" PW
	Count	vMean	vStd	Count	vMean	vStd		
5/11	~	~	~	~	~	~	...	FALSE
6/11	~	~	~	~	~	~	...	TRUE
7/11	~	~	~	~	~	~	...	FALSE
8/11	~	~	~	~	~	~	...	FALSE
9/11	~	~	~	~	~	~	...	TRUE
...

Features
Labels

	A	B	C	D	E	F	G	H	I	J	K	L	M
1			1	1	1	1.36E+08	1.36E+08	1.36E+08	1.36E+08	1.36E+08	1.36E+08	1.36E+08	1.36E+08
2			count	vMean	vStd	count	vMean	vStd	count	vMean	vStd	count	vMean
3	Machine	Date											
4	M040_A1	2015/5/30	11	7850.549	9407.844								
5	M040_A1	2015/5/31											
6	M040_A1	2015/6/1											
7	M040_A1	2015/6/2											
8	M040_A1	2015/6/3											
9	M040_A1	2015/6/4											
10	M040_A1	2015/6/5											
11	M040_A1	2015/6/6	6	8193.567	16356.36								
12	M040_A1	2015/6/7											
13	M040_A1	2015/6/8											
14	M040_A1	2015/6/9	1										
15	M040_A1	2015/6/10											

CC	CD	CE	CF
1.37E+08	1.37E+08	1.37E+08	Label
count	vMean	vStd	
			FALSE
			TRUE
			FALSE
			FALSE
			TRUE
			FALSE
			FALSE

Prediction Results

- submission_sample.csv
- Your submission is probability of failure from your model
- **submission format:**
 - 5 datasets have different label size.(due to different OW size)
 - 個別上傳OW=1、2、4、8、16, PW=1和OW=1、2、4、8、16, PW=2的預測結果

	A	B	C
1	id	Label	
2	M066_A1-4/6/2015	0.5	
3	M066_A1-5/6/2015	0.5	
4	M066_A1-6/6/2015	0.5	
5	M066_A1-7/6/2015	0.5	
6	M066_A1-8/6/2015	0.5	
7	M066_A1-9/6/2015	0.5	
8	M066_A1-10/6/2015	0.5	
9	M066_A1-11/6/2015	0.5	
10	M066_A1-12/6/2015	0.5	
11	M066_A1-13/6/2015	0.5	
12	M066_A1-14/6/2015	0.5	
13	M066_A1-15/6/2015	0.5	
14	M066_A1-16/6/2015	0.5	
15	M066_A1-17/6/2015	0.5	
16	M066_A1-18/6/2015	0.5	
17	M066_A1-19/6/2015	0.5	
18	M066_A1-20/6/2015	0.5	
19	M066_A1-21/6/2015	0.5	
20	M066_A1-22/6/2015	0.5	

The Dataset of Predictive Maintenance

- Dataset can be downloaded at:
 - Nexperia Predictive Maintenance Full 1
 - <https://www.kaggle.com/c/nexperia-predictive-maintenance-full-1/data>
 - Nexperia Predictive Maintenance Full 2
 - <https://www.kaggle.com/c/nexperia-predictive-maintenance-full-2>

Assignment #4

1. Download SVM Tools.
 - <https://www.csie.ntu.edu.tw/~cjlin/libsvm/>
2. Study functions and parameter settings of SVM
3. Train your model on **Predictive Maintenance Dataset**.
4. Upload your testing results (.csv) to E-Course:
5. Submit **two text files** and your **code** to E-Course
 - Readme – How to run your code
 - Report
 - Method description & parameter settings
 - Experimental results – accuracy for different ow & pw
 - Discussion of difficulty or problem encountered
6. **Deadline: 05/30(Wed) 11:59p.m**