Universidade do Minho
Escola de Engenharia
Departamento de Informática

Machine Learning: Support Vector Machines 2017/2018

Paulo Novais, Tiago Pinto

Support Vector Machines

- Considerations
  - Loss function
  - Kernel function
  - Dimensionality / non-linearity
  - Parametrization

Support Vector Machines

- Run SVM in R: e1071 package
  - RStudio (Editor de R):

    https://download1.rstudio.org/RStudio-1.0.136.exe
  - R Language:

    https://cran.r-project.org/bin/windows/base/
  - How to install :

    install.packages("e1071") & install.packages("xlsx")

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Support Vector Machines

- Run SVM in R: e1071 package
  - run :

    A = runSVM("C://HVAC24hS16-11-2016--0.xls")
  - See :

    Package‘e1071’ user guide (from page 49)

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Support Vector Machines

- Example
  - HVAC24hS16-11-2016—0
  - TRAIN INPUT

	A	B	C	D	E	F	G	H	I	J	K
1	Date	1	2	3	4	5	6	7	8	9	10
2	2016/11/9-0	19.58333	568.8871	21.06	511.13	21.84	523.7006	21.46364	514.225	18.28	527.358
3	2016/11/2-0	17.69091	525.1277	18.93636	500.1194	17.16923	496.625	15.8	497.608	14.45333	474.664
4	2016/10/26-0	15.96667	459.7505	15.07273	461.3964	13.54545	435.2581	14.63	525.4318	15.97273	464.662
5	2016/10/19-0	16.63636	540.2799	-0.5	521.4808	14.67273	526.9169	14.09091	438.3948	14.70909	538.457
6	2016/10/12-0	20.34545	538.0065	21.86364	597.259	18.63636	689.0468	15.33	501.2855	14.1	437.727
7	2016/10/5-0	15.42727	486.1036	15	470.1398	15.26	458.3866	15.91818	533.8451	16.01818	492.179
8	2016/9/28-0	15.73636	498.3149	15.1	498.3149	15.52222	498.3149	17.97273	498.3149	18.54	498.314
9	2016/9/21-0	18.77273	725.9484	18.4	513.5847	16.38182	479.0166	18.60909	498.3149	18.66364	498.314
10	2016/9/14-0	17.08182	500.4739	19.26364	592.3215	18.61818	591.6362	19.9	637.7537	18.74545	601.232
11	2016/9/7-0	18.96667	599.0534	18.14545	526.157	19.12727	529.3238	18.92	538.5888	16.67	520.707
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Train Input | Train Output | Test Input | Test Result

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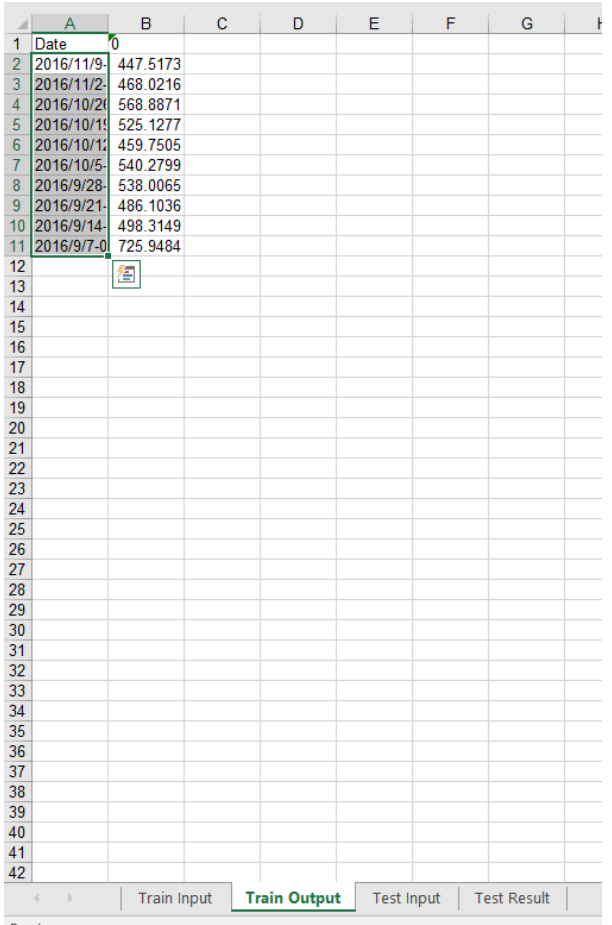
Support Vector Machines

- Example
  - HVAC24hS16-11-2016—0
  - TRAIN OUTPUT



	A	B
1	Date	0
2	2016/11/9-	447.5173
3	2016/11/2-	468.0216
4	2016/10/2(	568.8871
5	2016/10/1!	525.1277
6	2016/10/1:	459.7505
7	2016/10/5-	540.2799
8	2016/9/28-	538.0065
9	2016/9/21-	486.1036
10	2016/9/14-	498.3149
11	2016/9/7-0	725.9484

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- Example
  - HVAC24hS16-11-2016—0
  - TEST INPUT

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Support Vector Machines

- Example
  - HVAC24hS16-11-2016—0
  - TEST OUTPUT
    - Should be around 507,66

- Each train input MUST have a train output value
- Test input must have the same number of columns as train input
- Excel file cannot be open during execution
- Must delete Test Result sheet (or just remove / validate the excel writing in the code)

Support Vector Machines

- Exercises
  - Execute the SVM with standard parameterization with the other two excel files

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Support Vector Machines

- Exercises
  - Get back to HVAC24hS16-11-2016—0
  - Experiment with only 6 training inputs rather than 10
    - Delete the first three training inputs (and train outputs)
    - Use the fourth training input as test input
    - Compare the test result with the original train output of the same input

Support Vector Machines

- Exercises
  - Repeat this process for 6, 7 , 8 and 9 inputs
  - Calculate Mean Absolute Percentage Error (MAPE) to assess the error of the predictions
  - MAPE: AVERAGE ((real - forecasted) / real)
  - Experiment with different parameterizations and compare results (error)
    - Kernel function
    - Epsilon

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