

Ensemble Learning Attempt

Summary of Ensemble Method

- RF and SVM model are used
 - Both models are trained on 80% of 90 instances of each distribution (i.e $0.80 \times 90 \times 6 = 432$ training instances for all distribution)
 - Both models are to predict distribution on the same set of test data 20% of 90 instances of each distribution (i.e $0.20 \times 90 \times 6 = 108$ training instances for all distribution)
 - The ensemble method is such that RF and SVM predict the distribution of the test data independently, and only when both models reach the same conclusion that converged prediction is accepted.

Results of Ensemble Method

- Out of 108 instances, ensemble method 'discards' 28 of them due to them not being agreed upon by both RF and SVM
- Out of the 80 converged predictions, 76 of them are correctly predicted.
- This gives an accuracy of 95%

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[80 rows x 2 columns]
      Converge prediction      Actual
0      functional      functional
2      outlier      outlier
3      bimodal      bimodal
4      outlier      outlier
6      longtail      longtail
..      ...      ...
101     longtail     longtail
103     outlier     outlier
104     discrete     discrete
105     bimodal     bimodal
107     normal      normal

[76 rows x 2 columns]
Accuracy is: 95.0

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Analysing what happened to the discarded pile

- Where did SVM and RF not agree on?

	Test Random Forest	Support Vector
5	a_clcXrftrim_BBA.GainOffset.0_x_x_x_	bimodal
9	p_open_PADS.DIG.EOF.V_x_1mA_x__SE_ISO_RST	normal
10	p_dcspec_PADS.VOL_x_1V8_x__NFC_GPIO3_AO	longtail
11	a_vihXatt_CLIF.LPDET.DIFF.SEL8_x_x_x_	normal
17	a_iccXinlXtrim.zone_PMUGPADC_x_0.127_x_	discrete
23	a_vihXvtx_CLIF.LPDET.SE.SEL15_x_x_x_	normal
34	p_clc_PADS.IILDELTA_x_1V8_x__NFC_GPIO2_AO	bimodal
37	ip_trim_TOP--DLOG-TRIMVALUE-VREF.HQ-WR.PFN2	longtail
42	a_clcXrftrim_AGCPHASE.Crx.39_x_x_x_	discrete
45	p_clc_PADS.SIG.DELTA.EOF.V_x_1mA_x__TX2	longtail
55	p_short_PADS.DIG.V_x_1mA_x__VDDA	longtail
56	ip_nvMxutil_TOP--DLOG-W1-TESTED-HOUR	normal
59	a_trimXiccal_CLIF.RSSI.OFFSET_x_x_x_	normal
61	p_short_PADS.DIG.V_x_1mA_x__RSTN	bimodal
62	p_lkg_PADS.IIL_x_1V8_x__NFC_CLK_REQ	longtail
64	p_lkg_PADS.IIL_x_1V8_x__NFC_GPIO1	bimodal
65	p_short_PADS.DIG.EOF.V_x_1mA_x__SE_SPI_MISO	normal
67	a_anlXlslb_CLIF.VTUNE_x_x_x_	longtail
70	p_lkg_PADS.IILEND_x_1V8_x__NFC_GPIO2_AO	normal
72	p_open_PADS.DIG.V_x_1mA_x__VDDA	bimodal
83	a_clcXrftrim_AGCPHASE.Crx.6_x_x_x_	normal
89	a_clcXline.reg_VDDPA_x_3V65-load.530mA_x_	longtail
90	a_anlXinl.avg.zone_PMUGPADC_x_129.255_x__RMS	normal
94	a_anlXinl.avg.zone_PMUGPADC_x_257.383_x__RMS	bimodal
95	a_clcXrftrim_AGCPHASE.Crx.12_x_x_x_	longtail
96	a_vrf_SIM.CLASSB_x_40mA_x__SIMVCC	longtail
102	ip_trim_TOP--DLOG-TRIMVALUE-VREF.VDDC-WR.PFN2	normal
106	a_iccXinlXtrim.zone_PMUGPADC_x_512.639_x_	discrete
		normal

Further analysis required in Exensio

Analysing what happened to the 4 wrong converged prediction

- Could it be that this was influenced by my own unstandardised labelling?

		Test Models Prediction		Actual Prediction
1	a_icc_CLIF.CLKBUF.HP.VBAT_x_VBAT.VNOM_x__post	normal	1	bimodal
63	a_clcXrftrim_AGCGain.Crx.61_x_x_x__	longtail	63	outlier
87	p_lkg_PADS.IIHEND_x_1V8_x__NFC_IRQ	normal	87	bimodal
88	p_clc_PADS.DIG.DELTA.EOF.V_x_1mA_x__RSTN	outlier	88	longtail

Further analysis required in Exensio

Steps Ahead

- Instead of going to a fully automated labelling process → we shld work towards minimising human intervention while not completely letting go
- For those 'discarded' pile due to the ensemble learning method
 1. Have an option for manual labelling instead. Even with manual labelling, the prediction provided by SVM and RF could narrow down the options for the labeller
 2. [Food for thought] Maybe we could analyse which of Random Forest or Support Vector Machine is better for predicting which distribution - then for mismatched predictions, choose either RF or SVM depending on the distribution of the prediction
 - a. Eg, for one particular test instance RF predicts normal, SVM predicts bimodal. If RF is known to predict normal more accurately as compared to SVM, choose RF's prediction.
 - More importantly, these rows which both models could not agree upon could act as a warning or pre-empt to the labeller that 'hey, as a model i'm confused too. What do you think?'

- These discarded instances can allow labellers to zoom into and study it without compromising the accuracy of its prediction