Evaluating Boosting Algorithms to □lassi□ar□□lass□□ □om□arison an□ □m□ro□m□nts

Authors: □oshi□ □umar □ Agar□al

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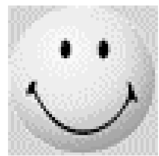

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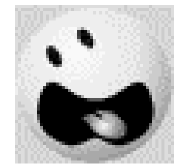

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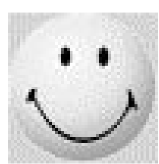

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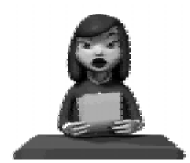

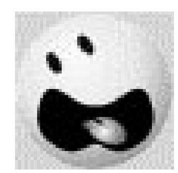

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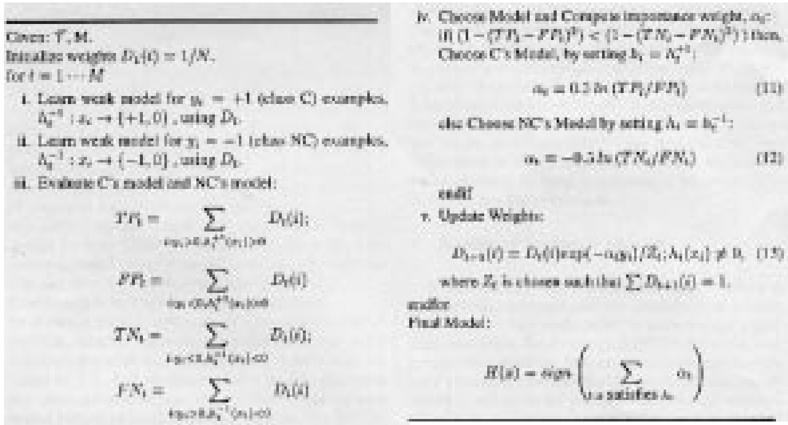

Given: $\mathcal{T}, M$.
Initialize weights $D_1(i) = 1/N$.
for $t = 1 \cdots M$

i. Learn weak model for $y_i = +1$ (class C) examples. $h_t^{+1} : x_i \to \{+1, 0\}$, using D_t.
ii. Learn weak model for $y_i = -1$ (class NC) examples. $h_t^{-1} : x_i \to \{-1, 0\}$, using D_t.
iii. Evaluate C's model and NC's model:

$$TP_t = \sum_{i:y_i \geq 0, h_t^{+1}(x_i) \neq 0} D_t(i);$$

$$FP_t = \sum_{i:y_i < 0, h_t^{+1}(x_i) \neq 0} D_t(i)$$

$$TN_t = \sum_{i:y_i < 0, h_t^{-1}(x_i) \neq 0} D_t(i);$$

$$FN_t = \sum_{i:y_i > 0, h_t^{-1}(x_i) \neq 0} D_t(i)$$

iv. Choose Model and Compute importance weight, α_t:
if $(1-(TP_t - FP_t)^2) < (1-(TN_t - FN_t)^2)$ then,
Choose C's Model, by setting $h_t = h_t^{+1}$:

$$\alpha_t = 0.5 \ln (TP_t / FP_t) \quad (11)$$

else Choose NC's Model by setting $h_t = h_t^{-1}$:

$$\alpha_t = -0.5 \ln (TN_t / FN_t) \quad (12)$$

endif
v. Update Weights:

$$D_{t+1}(i) = D_t(i)\exp(-\alpha_t y_i)/Z_t; h_t(x_i) \neq 0, \quad (13)$$

where Z_t is chosen such that $\sum D_{t+1}(i) = 1$.
endfor
Final Model:

$$H(x) = sign\left(\sum_{t:x \text{ satisfies } h_t} \alpha_t\right)$$

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snc1	R	77.04	77.04	81.13	74.93	77.04	77.04	77.04
	P	94.19	94.19	95.94	98.61	94.19	94.19	94.19
	F	84.76	84.76	87.92	85.16	84.76	84.76	84.76
snc2	R	76.78	76.78	69.39	76.78	76.78	76.78	77.31
	P	95.41	95.41	85.53	95.41	95.41	95.41	95.75
	F	85.09	85.09	76.62	85.09	85.09	85.09	85.55
snc3	R	41.03	41.16	35.09	49.21	43.14	43.14	79.02
	P	59.58	65.00	59.11	62.37	67.84	67.84	51.73
	F	48.59	51.10	44.04	55.01	52.74	52.74	62.53
snc4	R	54.75	58.71	47.63	56.99	52.64	38.13	69.53
	P	79.35	90.45	94.75	82.60	55.65	51.89	76.38
	F	64.79	71.20	63.39	67.45	54.10	43.95	72.79
snc5	R	47.23	51.58	43.14	53.96	56.46	55.67	63.19
	P	76.50	87.87	98.14	89.50	50.53	77.86	92.47
	F	58.40	65.00	57.93	67.33	53.33	64.92	75.08

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Cfrc		ABst	RB-1	SLIP	RB-2	CSB1	CSB2	ACst
2.9%	R	50.93	57.20	64.80	56.27	57.07	84.00	67.20
	P	71.27	81.25	57.51	82.10	60.03	44.74	68.39
	F	59.41	67.14	60.94	66.77	58.51	58.39	67.79
5.7%	R	63.20	68.67	63.60	73.20	67.07	84.13	76.00
	P	80.61	83.74	71.19	81.70	72.90	46.43	72.15
	F	70.85	75.46	67.18	77.22	69.86	59.84	74.03
13.1%	R	76.53	77.47	70.00	79.73	77.07	88.67	74.80
	P	80.62	83.36	78.59	86.04	72.70	58.18	85.65
	F	78.52	80.30	74.05	82.77	74.82	70.26	79.86
23.1%	R	78.27	84.40	80.80	80.80	86.13	96.13	85.07
	P	83.74	85.43	82.56	86.45	76.81	68.60	84.39
	F	80.91	84.91	81.67	83.53	81.21	80.07	84.73

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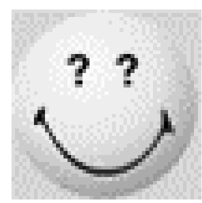

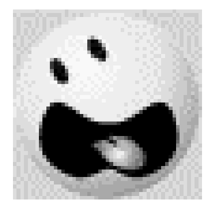

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