

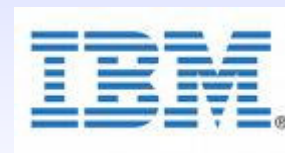
# CEAS 2008 Spam Filter Challenge

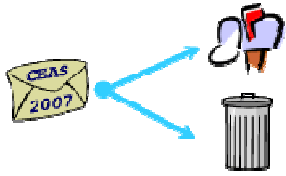
Richard Segal  
IBM Research

Andrej Bratko  
Jozef Stefan Institute

Gordon Cormack  
University of Waterloo

Sponsors





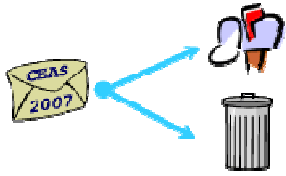
# CEAS 2008 Spam Filter Challenge

Aug 5-9, 2008

<http://www.ceas.cc/challenge>

## Overview

- Live Spam Competition
  - 72 hour live e-mail feed.
  - Full network access.
  - SMTP-based feed to remote filters.
  
- Lab Evaluation
  - Continuation of TREC Spam Track.
  - Filters submitted to be run in a controlled environment.
  - No network access.
  - Active Learning option.
  - Data: Reprise of live stream, Private e-mail collection.
  
- Performance Criteria
  - Smoothed Logistic Average Mean (Smoothed LAM).
  - 1 - Area under ROC curve (1 - AUC)



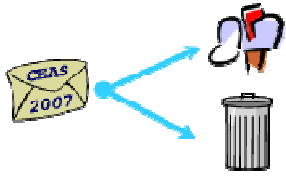
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# Live Competition Data

- 143K messages, 115K spam, 28K ham
  
- E-mail Sources
  - Spam traps provided by Project Honeypot.
  - Spam and ham traps provided by Gordon Cormack.
  - Donated ham with headers rewritten to look live
  
- Header Rewriting
  - Simulate a single domain with a fixed user base.
  - Each recipient mapped to a fake user.
  - Dates rewritten relative to original sending time.
  - Filter headers added at destination.



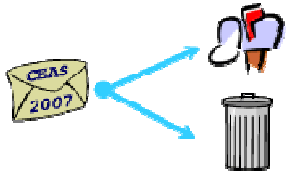
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# Live Spam Summary

- It worked!
- Error-based feedback problems
  - No error-based feedback at start.
  - **First 3 hours not scored.**
- Connection failures
  - Intermittent server overload.
  - Filters with good retry policies not affected.
  - Many responses after 10 min timeout interval.
  - **Late responses scored as if on time.**
  - **Discarded messages that timed out for 2 or more users.**
- CNN Virus
  - 500 CNN virus messages incorrectly judged ham on last day.
  - Caused incorrect feedback during competition.
  - **Judgments corrected in final scoring.**



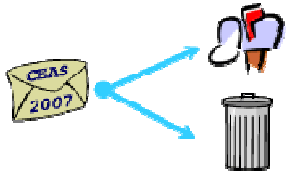
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## Lab Evaluation

- Reprise of Live Stream
  - Original message ordering.
  - Same relative timing of feedback.
  - Reproduced errors in feedback.
  
- Private E-mail Stream
  - 198K messages, 109K spam, 90K
  - Random sample of emails from a real domain.
  - Reproduced actual user-feedback.
  - Delayed, partial feedback, with original users errors.
  - Results vastly different than live stream.
  
- Active Learning
  - Request labels for up to 1K messages.
  - No other feedback.



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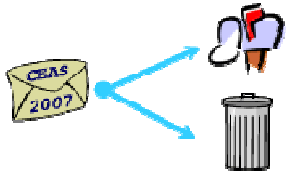
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# Winner Live Competition

*Solido Systems*

**Honorable Mention**

*IBM Kassel Lab*



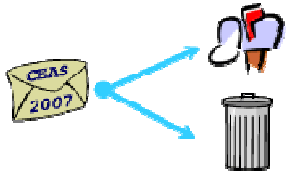
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# Winner Lab Competition Live Stream

*IGF - Ígor Assis Braga*



CEAS 2008 Spam Filter Challenge

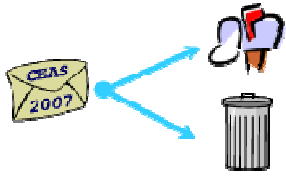
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# Winner Active Learning Live Stream

**LAM:** *IGF - Ígor Assis Braga*

**1-AUC:** *Heilongjiang Institute of Technology*



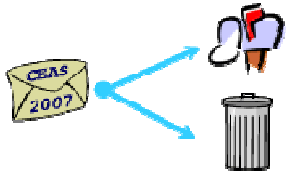
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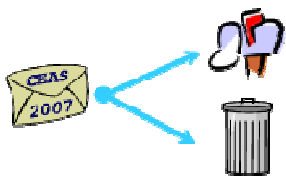
# Winner Lab Competition Private Stream

*IGF - Ígor Assis Braga*



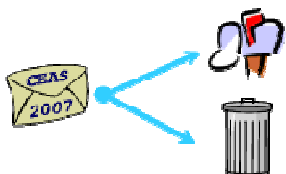
# Live Competition by LAM

	Name	Data %	Spam Caught %	Blocked Ham %	LAM %
	OSBF-Lua (TREC06-ofl)	100	98.97	0.03	0.19
1	Solido Systems	100	99.88	0.68	0.28
2	IBM Kassel Lab - Entry 1	100	94.35	0.02	0.31
3	Heilongjiang Institute of Technology - Entry 1	100	99.25	0.20	0.39
	Logistic Regression + DMC (TREC07-wat3)	100	99.29	0.25	0.42
4	IBM Kassel Lab - Entry 2	100	97.75	0.09	0.45
	CRM114 (TREC07-crm1)	100	99.68	0.75	0.49
	Logistic Regression (TREC07-wat1)	100	99.30	0.38	0.51
	IGF (Ígor Assis Braga) - Entry 1	88	98.53	0.27	0.64
5	Anonymous02	100	98.92	0.40	0.66
	George Hendrickson	55	97.68	0.21	0.71
6	Anonymous01 - Entry 1	100	99.21	0.68	0.73
	AntiSpam.sh	85	98.88	0.52	0.76
7	Communication and Computer Network Lab (South China Univ. of Technology) - Entry 1	100	99.71	3.56	1.03
8	Anonymous01 - Entry 2	100	96.83	0.48	1.24
9	Anonymous03 - Entry 2	100	99.40	4.21	1.60
	Commercial desktop plugin (Cormack)	89	93.67	0.63	2.03
	Anonymous04	94	94.32	1.31	2.75
10	Anonymous03 - Entry 1	100	96.93	2.58	2.82
	Anonymous05	93	94.24	4.31	4.99
11	Anonymous06	100	82.41	8.52	12.36



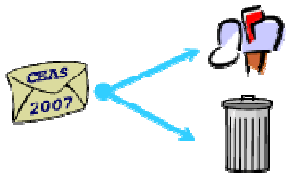
# Live Competition by 1-AUC

	Name	Data %	Spam Caught %	Blocked Ham %	1-AUC %
	OSBF-Lua (TREC06-ofl)	100	98.97	0.03	0.0127
1	Solido Systems	100	99.88	0.68	0.0131
	CRM114 (TREC07-crm1)	100	99.68	0.75	0.0359
	Logistic Regression + DMC (TREC07-wat3)	100	99.29	0.25	0.0384
2	Heilongjiang Institute of Technology-Entry 1	100	99.25	0.20	0.0398
3	Communication and Computer Network Lab (South China Univ. of Technology) - Entry 1	100	99.71	3.56	0.0439
	Logistic Regression (TREC07-wat1)	100	99.30	0.38	0.0447
	IGF (Ígor Assis Braga) - Entry 1	88	98.53	0.27	0.0871
4	IBM Kassel Lab - Entry 2	100	97.75	0.09	0.1589
	AntiSpam.sh	85	98.88	0.52	0.7568
5	Anonymous02	100	98.92	0.40	0.7767
	Anonymous04	94	94.32	1.31	0.8721
6	Anonymous01 - Entry 2	100	96.83	0.48	1.7570



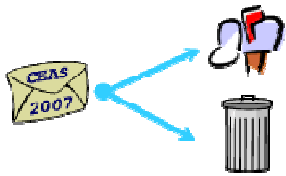
# Lab Live Stream by LAM

	Name	Spam Caught %	Blocked Ham %	LAM %
	PPM Compression (TREC07-ijspmm)	98.82	0.00	0.047
	Dynamic Markov Compression(TREC07-wat2)	99.57	0.01	0.049
1	IGF (Ígor Assis Braga) - Entry 3	97.40	0.00	0.070
	OSBF-Lua (TREC06-ofl)	99.28	0.06	0.210
2	Heilongjiang Institute of Technology - Entry 3	99.37	0.11	0.259
3	Heilongjiang Institute of Technology - Entry 2	99.34	0.15	0.310
	Online SVM (TREC07-tftS) - Entry 1	99.27	0.17	0.354
	Online SVM (TREC07-tftS) - Entry 2	99.25	0.18	0.362
	Online SVM (TREC07-tftS) - Entry 3	99.26	0.19	0.379
	Logistic Regression + DMC (TREC07-wat3)	99.39	0.26	0.401
	Logistic Regression (TREC07-wat1)	99.38	0.40	0.497
	CRM114 (TREC07-crm1)	99.23	0.36	0.528
4	Communication and Computer Network Lab (South China Univ. of Technology) - Entry 3	99.88	3.39	0.654
5	IGF (Ígor Assis Braga) - Entry 2	83.12	0.03	0.744
6	Communication and Computer Network Lab (South China Univ. of Technology) - Entry 2	99.88	5.50	0.841
7	Kosmopoulos Aris - Entry 2	98.06	57.76	14.128
8	Kosmopoulos Aris - Entry 1	97.62	57.61	15.404



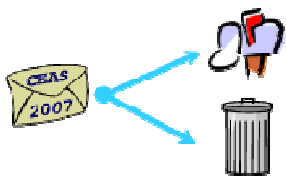
# Lab Live Stream by 1-AUC

	Name	Spam Caught %	Blocked Ham %	1-AUC %
	PPM Compression (TREC07-ijspmm)	98.82	0.00	0.0233
	Dynamic Markov Compression(TREC07-wat2)	99.57	0.01	0.0235
1	IGF (Ígor Assis Braga) - Entry 3	97.40	0.00	0.0540
	OSBF-Lua (TREC06-ofl)	99.28	0.06	0.0293
2	Heilongjiang Institute of Technology - Entry 3	99.37	0.11	0.0277
3	Heilongjiang Institute of Technology - Entry 2	99.34	0.15	0.0197
	Online SVM (TREC07-tftS) - Entry 1	99.27	0.17	0.0367
	Online SVM (TREC07-tftS) - Entry 2	99.25	0.18	0.0297
	Online SVM (TREC07-tftS) - Entry 3	99.26	0.19	0.0440
	Logistic Regression + DMC (TREC07-wat3)	99.39	0.26	0.0359
	Logistic Regression (TREC07-wat1)	99.38	0.40	0.0666
	CRM114 (TREC07-crm1)	99.23	0.36	0.0372
4	Communication and Computer Network Lab (South China Univ. of Technology) - Entry 3	99.88	3.39	0.0178
5	IGF (Ígor Assis Braga) - Entry 2	83.12	0.03	2.9029
6	Communication and Computer Network Lab (South China Univ. of Technology) - Entry 2	99.88	5.50	0.0747
7	Kosmopoulos Aris - Entry 2	98.06	57.76	20.4114
8	Kosmopoulos Aris - Entry 1	97.62	57.61	20.2338



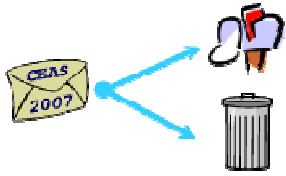
# Active Learning by 1-AUC

	Name	Spam Caught %	Blocked Ham %	1-AUC %
	Logistic Regression + Active Learning	99.92	0.12	0.0033
	Online SVM (TREC07-tftS) - Entry 1	98.65	0.08	0.0250
	Online SVM (TREC07-tftS) - Entry 3	98.65	0.07	0.0257
1	Heilongjiang Institute of Technology - Entry 3	98.66	0.14	0.0303
	Online SVM (TREC07-tftS) - Entry 2	98.61	0.07	0.0331
2	Heilongjiang Institute of Technology - Entry 2	98.64	0.19	0.0557
	PPM Compression (TREC07-ijspmm)	94.28	0.01	0.1031
3	Communication and Computer Network Lab (South China Univ. of Technology) - Entry 3	99.98	27.55	0.1500
	Dynamic Markov Compression(TREC07-wat2)	98.11	0.34	0.2988
4	Communication and Computer Network Lab (South China Univ. of Technology) - Entry 2	99.88	25.53	0.5234
5	IGF (Ígor Assis Braga) - Entry 3	72.57	0.01	1.4495
6	IGF (Ígor Assis Braga) - Entry 2	80.59	0.01	8.9047
7	Kosmopoulos Aris - Entry 2	81.84	51.14	27.1210
8	Kosmopoulos Aris - Entry 1	86.20	57.20	28.7998



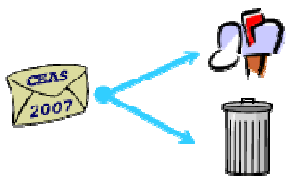
# Active Learning by LAM

	Name	Spam Caught %	Blocked Ham %	LAM %
	Logistic Regression + Active Learning	99.92	0.12	0.098
	PPM Compression (TREC07-ijspmm)	94.28	0.01	0.183
	Online SVM (TREC07-tftS) - Entry 3	98.65	0.07	0.313
	Online SVM (TREC07-tftS) - Entry 2	98.61	0.07	0.317
	Online SVM (TREC07-tftS) - Entry 1	98.65	0.08	0.321
1	IGF (Ígor Assis Braga) - Entry 2	80.59	0.01	0.364
2	Heilongjiang Institute of Technology - Entry 3	98.66	0.14	0.432
3	IGF (Ígor Assis Braga) - Entry 3	72.57	0.01	0.455
4	Heilongjiang Institute of Technology - Entry 2	98.64	0.19	0.509
	Dynamic Markov Compression(TREC07-wat2)	98.11	0.34	0.801
5	Communication and Computer Network Lab (South China Univ. of Technology) - Entry 3	99.98	27.55	0.946
6	Communication and Computer Network Lab (South China Univ. of Technology) - Entry 2	99.88	25.53	1.988
7	Kosmopoulos Aris - Entry 1	86.20	57.20	31.622
8	Kosmopoulos Aris - Entry 2	81.84	51.14	32.521



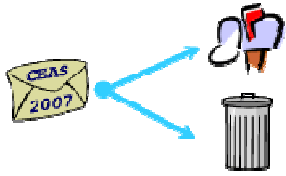
# Lab Private Stream by LAM

	Name	Spam Caught %	Blocked Ham %	LAM %
	Dynamic Markov Compression (TREC07-wat2)	84.61	2.80	6.75
	Logistic Regression + DMC (TREC07-wat3)	87.56	5.72	8.49
	Logistic Regression (TREC07-wat1)	88.18	9.25	10.47
	OSBF-Lua (TREC06-ofl)	29.99	1.03	13.49
1	IGF (Ígor Assis Braga) - Entry 2	72.94	7.02	14.33
2	Communication and Computer Network Lab (South China Univ. of Technology) - Entry 3	32.17	8.10	30.12
3	Communication and Computer Network Lab (South China Univ. of Technology) - Entry 2	53.18	24.78	35.00
4	Kosmopoulos Aris - Entry 2	80.89	57.90	36.31
5	Kosmopoulos Aris - Entry 1	80.53	57.64	36.45
6	IGF (Ígor Assis Braga) - Entry 3	12.13	11.22	48.90



# Lab Private Stream by 1-AUC

	Name	Spam Caught %	Blocked Ham %	1-AUC %
	Logistic Regression + DMC (TREC07-wat3)	87.56	5.72	5.671
	Logistic Regression (TREC07-wat1)	88.18	9.25	5.752
	Dynamic Markov Compression (TREC07-wat2)	84.61	2.80	6.766
1	IGF (Ígor Assis Braga) - Entry 2	72.94	7.02	12.629
2	Kosmopoulos Aris - Entry 1	80.53	57.64	28.745
3	Kosmopoulos Aris - Entry 2	80.89	57.90	28.749
4	Communication and Computer Network Lab (South China Univ. of Technology) - Entry 2	53.18	24.78	29.071
5	Communication and Computer Network Lab South China Univ. of Technology) - Entry 3	32.17	8.10	34.017
	OSBF-Lua (TREC06-off)	29.99	1.03	48.358
6	IGF (Ígor Assis Braga) - Entry 3	12.13	11.22	50.104



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Slides and Results Available Online

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