

A Prediction Market Approach to Learning with Sequential Advice



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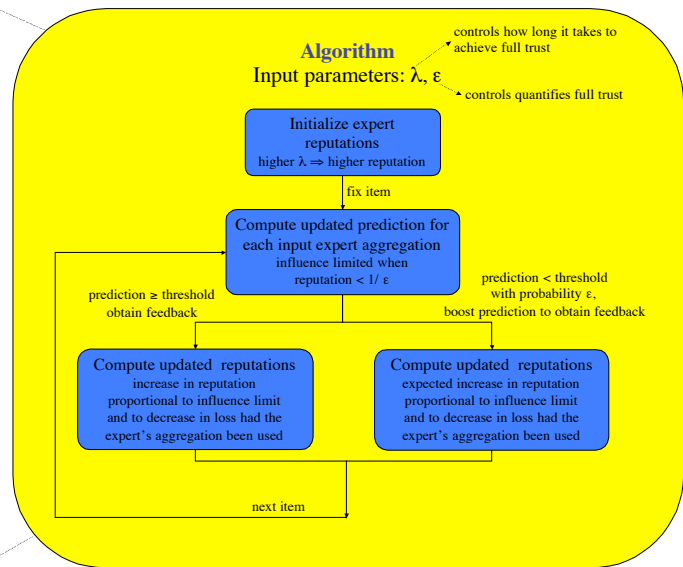
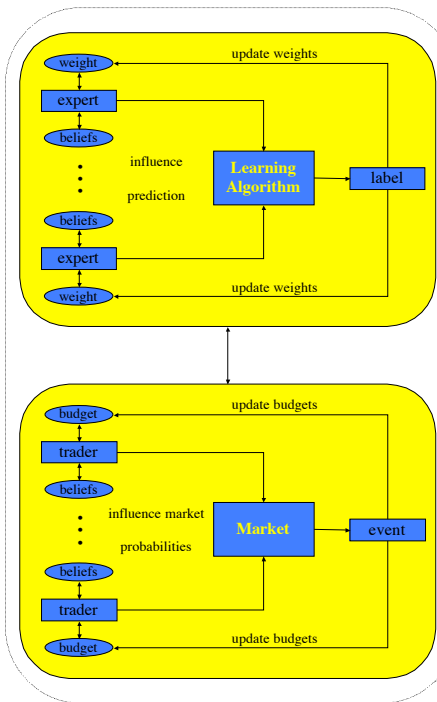
Computational Social Science
 and the Wisdom of Crowds (NIPS 2010)

Distinguishing Features of this Domain

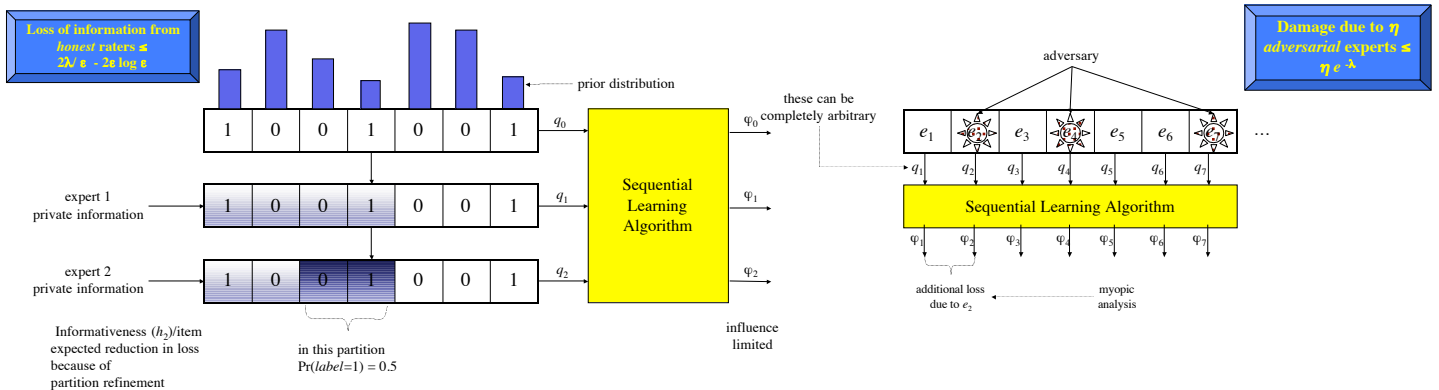
- Expert advice**
 Sequentially arriving
 Partial availability
- Some experts are *honest***
 accurate estimate based on private information
 private information need not be complete
- Some experts are *adversarial***
 unreliable advice
- True label/feedback not always available**

	t=1	t=2	t=3	...
e_1	0.5	0.1	0.5	
e_2	0.1	0.1	0.5	
e_3	0.1	0.2	0.1	
e_4	0.4		0.2	
e_5	0.9	e_5	e_1	
prediction	$\Pr(\text{label} = 1) = 0.8$	$\Pr(\text{label} = 1) = 0.1$	$\Pr(\text{label} = 1) = 0.4$	
actual label (partial feedback)	1	0 (unobserved)	0	
quadratic loss	$(1-0.8)^2$	$(0-0.1)^2$ (unobserved)	$(0-0.4)^2$	

Motivation



Hybrid Analysis



Conclusions and Future Work

- Market Trading Metaphor for Scoring Experts**
 sequentially arriving experts simulate market
 budgets = weights/reputation
- Hybrid Analysis**
 Stochastic assumption on honest experts
 Worst case analysis for adversarial experts
- Next steps: MLE in the hybrid model**

Related Work

- Prediction Markets and Learning**
 Chen and Vaughan, EC 2010
- Learning with Sleeping Experts**
 Kleinberg, Natchusen Miral and Sharma, COLT 2008
- Learning with Incomplete Feedback**
 Cesa-Bianchi and Lugosi (book), 2006
- Market Scoring Rules**
 Hanson, Information System Frontiers, 2003
- Influence Limits with Complete Feedback**
 Resnick and Sami, RecSys 2007