









































































4	A Contro	lled Crow	/d-sensing	Ŋ
	E	Experime	nt	
Ex	ample: Find	Free Parking	Lots on UIUC	Campus
1	Table I. Accuracy	of Finding Free Par	king Lots on Campu	S
-	Schemes	False Positives	False Negatives	Ĺ
	EM-Conflict	6.67%	10.87%	
	EM-Regular	11.67%	17.39%	₽
	Average-Log	16.67%	19.57%	1
	Truth-Finder	18.33%	15.22%	
	Voting	21.67%	23.91%	]
	Results of I	Extended EM	vs Baselines	-
Experim 106 park 30 partic	ent setup: king lots of inte cipants, 901 ma	erests, 46 indee arks collected	d free	38









































Exar	nple Da	ta Traces	
Trace	Hurricane Sandy	Hurricane Irene	Egypt Unrest
Time duration	14 days	8 days	18 days
Locations	16 cities in East Coasts	New York	Cairo, Egypt
# of users tweeted	7,583	207,562	13,836
# of tweets	12,931	387,827	93,208
# of users crawled in social network	704,941	2,510,316	5,285,160
# of follower- followee links	37,597	3,902,713	10,490,098



























































	Tr	acking Nepal Earthquake
Date	New Detected Keywords	xample Sample Tweets
04/25/2015	nepal, earthquake, death	Powerful magnitude-7.8 earthquake that rocked Nepal triggered an avalanche on Mount Everest http://t.co/MULEuWhx3Q http://t.co/QeRKg8QgYp RT@BBCBreaking. At least 876 killed in Nepal #earthquake; deaths also reported in India, Tibet & amp; Bangladesh http://t.co/3BTo9I1QZ4 http://202
04/26/2015	help, nepalearthquake	RT @cnnbrk: At least 2,263 people have died in Nepal from massive #NepalEarthquake and aftershocks, official says. http://t.co/ftCyjO7YyS7 Anvone with information about my son Joseph Patrick please help #NepalEarthquake #Prav4Joe http://t.co/ZKn7mOtRO http://t.co/ZC
04/27/2015	surges, devastation, drone, thankyoupm, donations	Nepal #earthquake: Death toll surges to 3,218; four aftershocks felt in last 12 hours http://t.cor/Njvru9k2kQ @cmin: New drone footage shows the extent of devastation from the #NepalEarthquake: http://t.cor/PiPipayQZ1bttps://t.cor/PhIGRkYoZQ #ThankYouPM for massive rescue and relief operation by India in Nepal after #earthquake Nepal Earthquake: Facebook to Match Donations Made for Victims http://t.co/al.ooad/YKg/Fee_Submission http://t.co/J90df2qnXb
04/28/2015	salute2indianforce: koirala, sanjay, humanitarian	Thank you very much Indin Forces for being with us.lt means alot #Salute2IndianForces Thank you very much Indin Forces for being with us.lt means alot #Salute2IndianForces TON's Dr. Sanjay Gupta performs surgery on girl in Nepal: CNN's Dr. Sanjay Gupta performed a life-saving http://t.co/4EtmH28EwC #toot Live: Nenal earthauake kills 4.352, PM Sushil Koirala savs death toll could reach 10,000: A high-intensity ear http://t.co/A68VtR6hWK
04/29/2015	survivor,hours, hospital, field, miracle	Nepal earthquake survivor drank urine while trapped for 82 hours http://t.co/v9DHM5Jhnf #worldnews That is amazing, Nepal Army rescued a 4-month kid alive after 22 hours! :http://t.co/KzJPJeZDCx https://t.co/HvTkvS0Ba0 via @sharethis RT @haaretzcom: Nepal earthquake updates / Israeli field hospital opens, to treat 200 people per day http://t.co/PMwRIRT6YO http://t.co/s9J
04/30/2015	pakistan, serves, masala, teenage, lydia	Pakistan serves 'beef masala' to earthquake-hit Nepal via /r/worldnews http://t.co/GoFJO09mJP Teenage boy pulled out of rubble alive five days after Nepal earthquake http://t.co/kiAjgYE7M #telegraph #news Lydia Ko donating earnings to Nepal relief effort: The 18-year-old Ko, ranked No. 1 in the world, successfully http://t.co/2nquClTqJa













Unucu	al Event Detection
Uliusu	al Eveni Delection
mnle <sup>.</sup> Detect	ing Traffic Events
mpie. Deteet	
	5
Keyword Pair	Event Cluster
(Crash, Rancho)	#BREAKING: Massive crash has traffic down to a trickle on SB15 at Via Rancho Parkway in Escondido.
	#BreakingNews #SigAlert Major traffic crash on the 15-southbound at Via Rancho Parkway. traffic backed up for miles. some lanes open now.
	Traffic colligion on CD   E just parth of Enginitae Divid Vahiela hit contar madian
(Collision, North)	I ITATIC CONSION ON SET-5 JUST NORTH OF ENCINITIAS BIVU. VEHICLE HIL CENTER I MEDIAN
(Collision, North)	One lane blocked on SB I-5 just north of the San Diego-Coronado Bridge due t traffic collision.
(Collision, North) (Lanes, Pasadena)	One lane blocked on SB I-5 just north of the San Diego-Coronado Bridge due t traffic collision. All lanes were closed on the westbound 210 Freeway in Pasadena because of the crash and rush hour traffic
(Collision, North) (Lanes, Pasadena)	One lane blocked on SB I-5 just north of Enclinitas Bivd. Vehicle in center media One lane blocked on SB I-5 just north of the San Diego-Coronado Bridge due t traffic collision. All lanes were closed on the westbound 210 Freeway in Pasadena because of the crash and rush hour traffic NBCLA: TRAFFIC ALERT: Big rig crash shuts down lanes of WB 210 Fwy in Pasadena.































































How Ma	any are Spe	eeding?
<ul> <li>Real versus est vehicles on diff who "lie" abou</li> </ul>	timated percenta ferent streets (fro t both speed and	ge of speeding om data of users l location)
Sheel	Redi 70	EStimateu 70
	Speeding	Speeding
University Ave	Speeding 15.6%	Speeding 17.8%
University Ave Neil Street	Speeding           15.6%           21.4%	Speeding           17.8%           23.7%
University Ave Neil Street Washington Street	Speeding           15.6%           21.4%           0.5%	Speeding           17.8%           23.7%           0.15%



- Is there an optimal perturbation scheme?
- What is the measure the privacy?
- How can we generate the optimal perturbation?

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## Conclusions

- Consumer Devices, Connected "Things" and Social networks as CPS components
- New research on data reliability, privacy, association and aggregation
- A new modality for sensing (acoustic, magnetic, optical, and now social)
  - Physical events impact a medium which responds with a signature
  - Analyze signature to measure the event
- Results
  - Accurately assess veracity without semantic inspection of text
  - Accurately detect and track physical events (matching a user's interest) without semantic inspection of text
  - Optimally perturb data while enabling reconstruction of community statistics
  - Enable generalizations from sparse data
- Book on "Social Sensing".