Carnegie Mellon University

Tweet Location Prediction with Convolution Neural Networks

---A Case Study on Twitter Keyword Search Stream

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In many Twitter studies, it is important to know where a tweet came from in order to use the tweet content to study regional user behavior. However, researchers using Twitter to understand user behavior often lack sufficient geo-tagged data. Herein, we present a new method to predict a Twitter user's location based on the information in a single tweet. We integrate text and user profile meta-data into a single model using a convolutional neural network.

Dataset description

# of tweets	# of users	# of timezones	# of lang.	# of countries (or regions)	Tweets per country	# of cities	Tweets per city
4645692	3321194	417	103	243	19118.0 (99697.1)	3709	1252.5(4184.5)

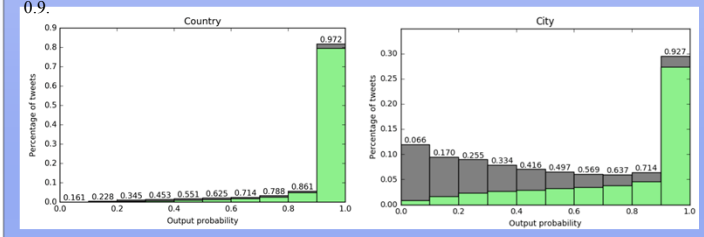
Table 3. Country prediction results.

	Acc	Acc@Top5
STACKING	0.868	0.947
STACKING+	0.871	0.950
Our approach	**0.921**	**0.972**

Table 4. City prediction results.

	Acc	Acc@161	Acc@Top5	Median
STACKING	0.389	0.573	0.595	77.5 km
STACKING+	0.439	0.616	0.629	47.2 km
Our approach	**0.528**	**0.692**	**0.711**	**28.0** km

Two bar charts that show the distribution of tweets in terms of the output probability. We get 97.2% accuracy for country-level prediction with output probability larger than 0.9. Surprisingly, the accuracy of city-level is as high as 92.7% for the 29.6% of the tweets with output probability greater than 0.9.



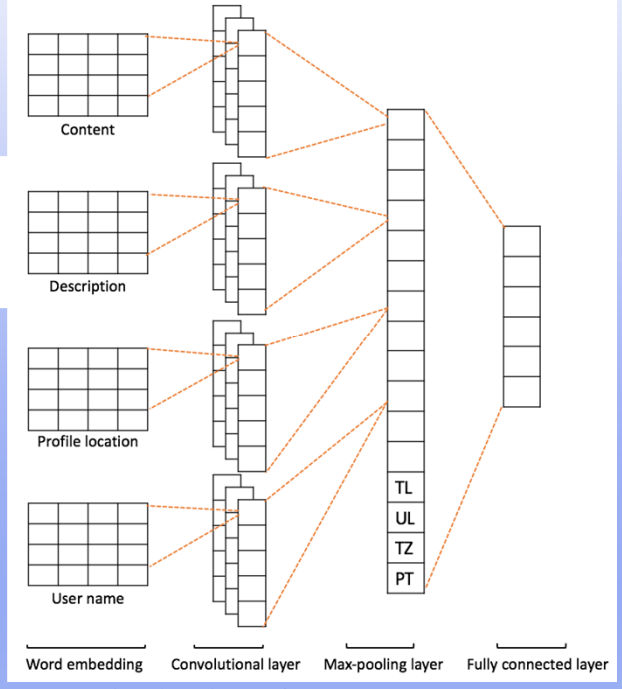
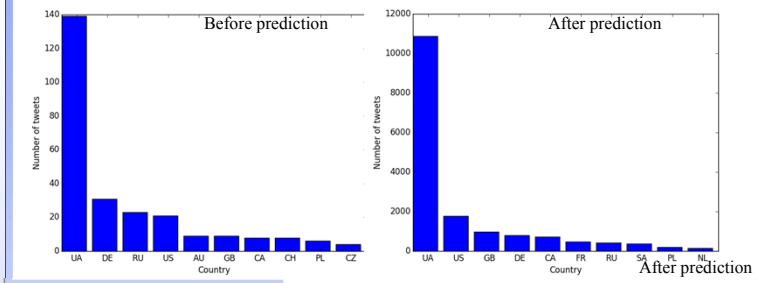


Figure 1: architecture of the neural network.

A case study on an Ukraine data

of tweets: 18297 # of geo-tagged tweets: 292



Top users in the mention-by network: Only 86 users posted geotagged tweets in the data while the total number is 7551.

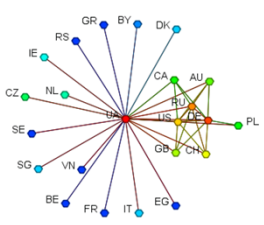
UA	US	RU
liveuamap	Ginandpop2	AinurArenova
rbc_ukraine	ZANVDEM	njkz57
MaxRTucker	BigMouthJoe	
wo1demar	EnergyVoter	
crozzle	StoutHammer	
MFA_Ukraine		
domouprav_ua		
TetySt		
ollejos		
reva_dima		

UA	US	RU
Monalove55*	RT_com	ASLuhn
OlehKuts	Ayesha_Gohar38	AinurArenova
interfaxua	JuliaDavisNews	NinaByzantina
uatodaytv	SputnikInt	MarkSleboda1
Dbnmjj*	SimonOstrovsky	GraceCuddihy
SpecGhost	nolanwpeterson	NormanShenley*
Steiner1776	Newsweek	sputnik_fr
Korrespondent	LManwaring	GazetaRu_Biz
russian_market	WAJournal	PKKANEWS
ukraina_ru	rougek68	JaredE23*

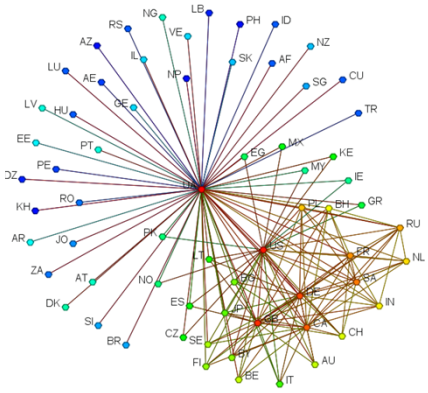
* denotes suspended users.

Country co-hashtag network

Before prediction



After prediction



Top hashtag in countries

UA	US	RU	UA	US	RU
Ukraine	Ukraine	Ukraine	Ukraine	Ukraine	Ukraine
Kiev	God	painting	Україна	Russia	Russia
Україна	Amen	contemporary	ATO	Syria	Moscow
time_ua	Kiev	art	StopRussianAggression	Iraq	Putin
news	iraq	Украину	PutinKiller	Israel	Путин
Запоріжжя	Moscow	украина	BanRussiaFromSwift	USA	MH17
Lviv	russia	одесса	Russia	Iran	NATO
kiev	RichMansWar	новини	Kiev	SaudiArabia	BUK
Zaporozhye	libya	українськийтвіттер	War	Yeman	DNR
Politics	iran	николаев	Putin	NorthKorea	War

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