



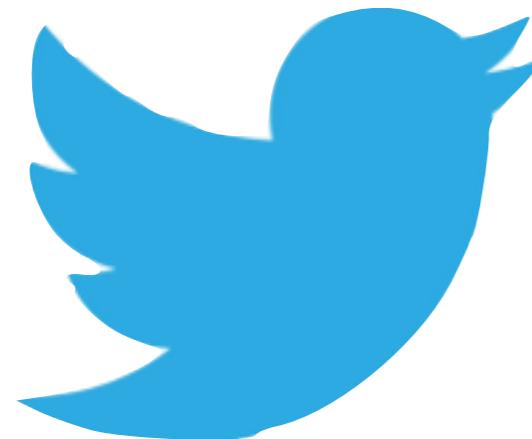
Crowdsourcing Translation

Chris Callison-Burch

April 22, 2014

with Rui Yan, Mingkun Gao, Ellie Pavlick, Matt Post, Dmitry Kachaev,
Ann Irvine, Omar Zaidan, Scott Novotney, and 10clouds

facebook®



TED
IDEAS WORTH SPREADING

coursera

IBM

gengo



duolingo

The Duolingo logo features a green cartoon owl with large white eyes and a small orange beak, positioned above the brand name.

Can Turkers Translate?

Urdu

میں اس خطے میں ابتدائی 1994 انسانوں کی باقیات جو تقریباً 8 لاکھ سال پرانی مانی جاتی ہے، دریافت کی گئیں جنہیں ہومو اینٹی سیسٹر یعنی 'بانی انسان' کا نام دیا گیا۔

اس سے قبل 6 لاکھ پرانے انسان جنہیں سائنسی اصطلاح میں ہومو ہیڈلبرجنیس کہا جاتا ہے، اس خطے کے قدیم ترین رہائشی مانے جاتے تھے۔

آثارِ قدیمه کے ماہرین کا کہنا ہے کہ انہیں ایسے شواہد ملے ہیں جن سے پتہ چلتا ہے کہ اس خطے کے لوگ ڈھلانی کیسے ہوئے اور اس بھی

LDC Translation

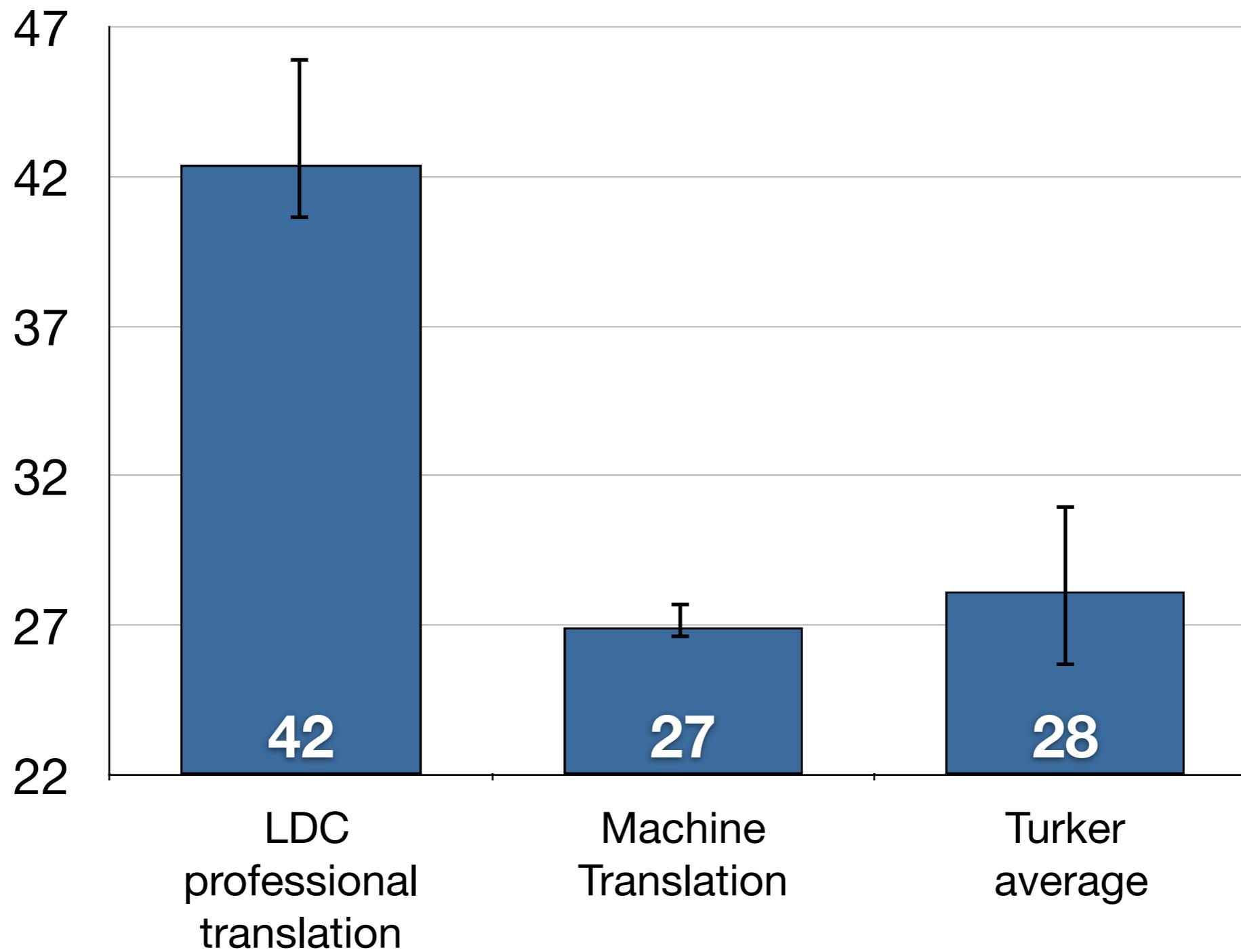
In 1994, the remains of early human beings who were believed to be eight hundred thousand years old were discovered who were given the name homo antecessor meaning the 'founder man'. Prior to this, the six hundred thousand years old man, called homo heidelbergensis in scientific terms, was believed to be the earliest resident of this area.

Turk Translation

In 1994, the remains of pre-historic man, which are believed to be 800,000 years old were discovered and they were named 'Home Antecessor' meaning 'The Founding Man'. Prior to that 6 lac years old humans, named as Homogenisens in scientific terms, were believed to be the oldest dwellers of this area.

Professionals versus Turkers*

*Without Quality Control



Avoiding dieting to prevent from flu	abstention from dieting in order to avoid Flu	Abstain from decrease eating in order to escape from flue	In order to be safer from flu quit dieting
This research of American scientists came in front after experimenting on mice.	This research from the American Scientists have come up after the experiments on rats.	This research of American scientists was shown after many experiments on mouses.	According to the American Scientist this research has come out after much experimentations on rats.
Experiments proved that mice on a lower calorie diet had comparatively less ability to fight the flu virus.	It has been proven from experiments that rats put on diet with less calories had less ability to resist the Flu virus.	It was proved by experiments the low calories eaters mouses had low defending power for flue in ratio.	Experimentaions have proved that those rats on less calories diet have developed a tendency of not overcoming the flu virus.
research has proven this old myth wrong that its better to fast during fever.	Research disproved the old axiom that " It is better to fast during fever"	The research proved this old talk that decrease eating is useful in fever.	This Research has proved the very old saying wrong that it is good to starve while in fever.

Avoiding dieting to prevent from flu	abstention from dieting in order to avoid Flu	Abstain from decrease eating in order to escape from flue	In order to be safer from flu quit dieting
This research of American scientists came in front after experimenting on mice.	This research from the American Scientists have come up after the experiments on rats.	This research of American scientists was shown after many experiments on mouses.	According to the American Scientist this research has come out after much experimentations on rats.
Experiments proved that mice on a lower calorie diet had comparatively less ability to fight the flu virus.	It has been proven from experiments that rats put on diet with less calories had less ability to resist the Flu virus.	It was proved by experiments the low calories eaters mouses had low defending power for flue in ratio.	Experimentaions have proved that those rats on less calories diet have developed a tendency of not overcoming the flu virus.
research has proven this old myth wrong that its better to fast during fever.	Research disproved the old axiom that " It is better to fast during fever"	The research proved this old talk that decrease eating is useful in fever.	This Research has proved the very old saying wrong that it is good to starve while in fever.

Avoiding dieting to prevent from flu	abstention from dieting in order to avoid Flu	Abstain from decrease eating in order to escape from flue	In order to be safer from flu quit dieting
This research of American scientists came in front after experimenting on mice.	This research from the American Scientists have come up after the experiments on rats.	This research of American scientists was shown after many experiments on mouses.	According to the American Scientist this research has come out after much experimentations on rats.
Experiments proved that mice on a lower calorie diet had comparatively less ability to fight the flu virus.	It has been proven from experiments that rats put on diet with less calories had less ability to resist the Flu virus.	It was proved by experiments the low calories eaters mouses had low defending power for flue in ratio.	Experimentaions have proved that those rats on less calories diet have developed a tendency of not overcoming the flu virus.
research has proven this old myth wrong that its better to fast during fever.	Research disproved the old axiom that " It is better to fast during fever"	The research proved this old talk that decrease eating is useful in fever.	This Research has proved the very old saying wrong that it is good to starve while in, fever.

Avoiding dieting to prevent from flu	abstention from dieting in order to avoid Flu	Abstain from decrease eating in order to escape from flue	In order to be safer from flu quit dieting
--------------------------------------	---	---	--

Avoid		dieting		to		prevent	from	flu
Abstention	from	dieting	in order	to		avoid		Flu
Abstain		decrease eating	in order	to		escape		flue
quit		dieting		to	be	safer	from	flu

Avoiding dieting to prevent from flu	abstention from dieting in order to avoid Flu	Abstain from decrease eating in order to escape from flue	In order to be safer from flu quit dieting
--------------------------------------	---	---	--

Avoid		dieting		to		prevent	from	flu
Abstention	from	dieting	in order	to		avoid		Flu
Abstain		decrease eating	in order	to		escape	from	flue
quit		dieting		to	be	safer	from	flu

Translate Urdu into English

Help us translate Urdu articles into English. Your translations will be distributed with a [Creative Commons license](#), so that other people can re-use it. This HIT is for people who speak both Urdu and English. Please **do not use** translation software or online machine translation systems like Google translate. Please make sure that your English translation.

- Does not add or delete any information from the original text
- Has the same meaning and style as the original
- Does not contain any spelling errors
- Is grammatical, natural-sounding English

First, please answer these questions about your language abilities:

Is Urdu your native language?

Yes No

How many years have you spoken Urdu?

years

Is English your native language?

Yes No

How many years have you spoken English?

years

افغانستان ایشیاء کا ایک ملک ہے جس کا سرکاری نام اسلامی
جموری افغانستان ہے۔

اس کے جنوب اور مشرق میں پاکستان، مغرب میں ایران، شمال
مشرق میں چین، شمال میں ترکمانستان، ازبکستان اور تاجکستان ہیں۔

اردگرد کے تمام ممالک سے افغانستان کے تاریخی، مذہبی اور
ثقافتی تعلق بہت گہرا ہے۔

اس کے بیشتر لوگ مسلمان ہیں۔

۔۔۔ ملک بالتسباب اب ائمہ، سُنّانیمہ، عَدِیمہ، تَکَوْمَ، منگولہ،

Informed Consent Form

Purpose of research study: We are collecting translations to improve translation software and to make Wikipedia content accessible in all languages.

Benefits: Although it will not directly benefit you, this study may benefit society by improving how computers process human languages. This could lead to better translation software, improved web searching, or new user interfaces for computers and mobile devices.

Risks: There are no risks for participating in this study.

Voluntary participation: You may stop participating at any time without penalty by clicking on the "Return HIT" button, or closing your browser window.

We may end your participation if you do not have adequate knowledge of the language, or you are not following the instructions, or your answer significantly deviate from known translations.

Confidentiality: The only identifying information kept about you will be a WorkerID serial number and your IP address. This information may be disclosed to other researchers.

Questions/concerns: You may e-mail questions to the principle investigator, [Chris Callison-Burch](#). If you feel you have been treated unfairly you may contact the Johns Hopkins University [Institutional Review Board](#).

Clicking on the "Accept HIT" button indicates that you understand the information in this consent form. You have not waived any legal rights you otherwise would have as a participant in a research study.

Translation of the first sentence goes here.

Translation of the second sentence goes here.

Translate Urdu into English

Informed Consent Form

Purpose of research study: We are collecting translations to improve translation software and to make Wikipedia content accessible in all

```
<script language="Javascript">
<!--
function getUserInfo() {
    var userDisplayLanguage = navigator.language ? navigator.language : navigator.userDisplayLanguage;
    var country = sGeobitesCountry;
    var city = sGeobitesCity;
    var region = sGeobitesRegion;

    document.mturk_form.userDisplayLanguage.value = userDisplayLanguage;
    document.mturk_form.country.value = country;
    document.mturk_form.city.value = city;
    document.mturk_form.region.value = region;
}

getUserInfo();
// -->
```

Help us
Common
and Eng
Google t

- D
- H
- D
- Is

First, ple

Is Urdu
How ma
Is Engl
How ma

getUserInfo();
// -->

اس کے جنوب اور مشرق میں پاکستان، مغرب میں ایران، شمال
مشرق میں چین، شمال میں ترکمانستان، ازبکستان اور تاجکستان میں۔

اردگرد کے تمام ممالک سے افغانستان کے تاریخی، مذہبی اور
ثقافتی تعلق بہت گہرا ہے۔

اس کے بیشتر لوگ مسلمان ہیں۔

۹۰٪ ملک بالتساب اب اپنے، بُنانيه، عرب، تکہ، منگولہ،

Translation of the second sentence goes here.

Machine Translate

Quality Control Model

- **Sentence features**
 - Language model probability
 - Ratio of source / target sentence lengths
 - Web n-gram match percentage
 - Translation edit rate to other translators
- **Turker features**
 - Aggregate of sentence feature scores
 - Self-reported language abilities
 - (Is native speaker? How long speaking?)
 - Worker location (Pakistan? India?)
- **Ranking features** (based on second pass vote)
- **Calibration feature** (Bleu against professionals)

Vote for the best translation

Please read the sentences and vote on the one that you think is the best in each group. The sentences are translations that were produced by people who are not native English speakers. Their translations are often ungrammatical, misspelled, disfluent, or bad in other ways. Your goal is to try to pick the best translation among the set. The one that you choose as the best will be forwarded on for editing, and it will undergo a variety of other quality control mechanisms before it is published.

You should consider the following factors when selecting one translation as the best:

- Does it make more sense than the others?
- Is the English reasonably good?
- Do the grammar and spelling require only minimal correction?

<input type="radio"/>	Experimentaions have proved that those rats on less calories diet have developed a tendency of not overcoming the flu virus .
<input type="radio"/>	in has been proven from experiments that rats put on diet with less calories had less ability to resist the Flu virus.
<input type="radio"/>	Experiments proved that mice on a lower calorie diet had comparatively less ability to fight the flu virus.
<input type="radio"/>	It was proved by experiments the low calories eaters mouses had low defending power for flue in ratio.

<input type="radio"/>	The research proved this old talk that decrease eating is useful in fever.
<input type="radio"/>	Research disproved the old axiom that " It is better to fast during fever"
<input type="radio"/>	research has proven this old myth wrong that its better to fast during fever.
<input type="radio"/>	This Research has proved the very old saying wrong that it is good to starve while in fever.

<input type="radio"/>	According to the scientist a patient should eat more while in fever.
<input type="radio"/>	According to scientists, eat a lot during fever.
<input type="radio"/>	Eat and drink more in fever according to scientists.
<input type="radio"/>	according to the scientists one should eat a lot during fever.

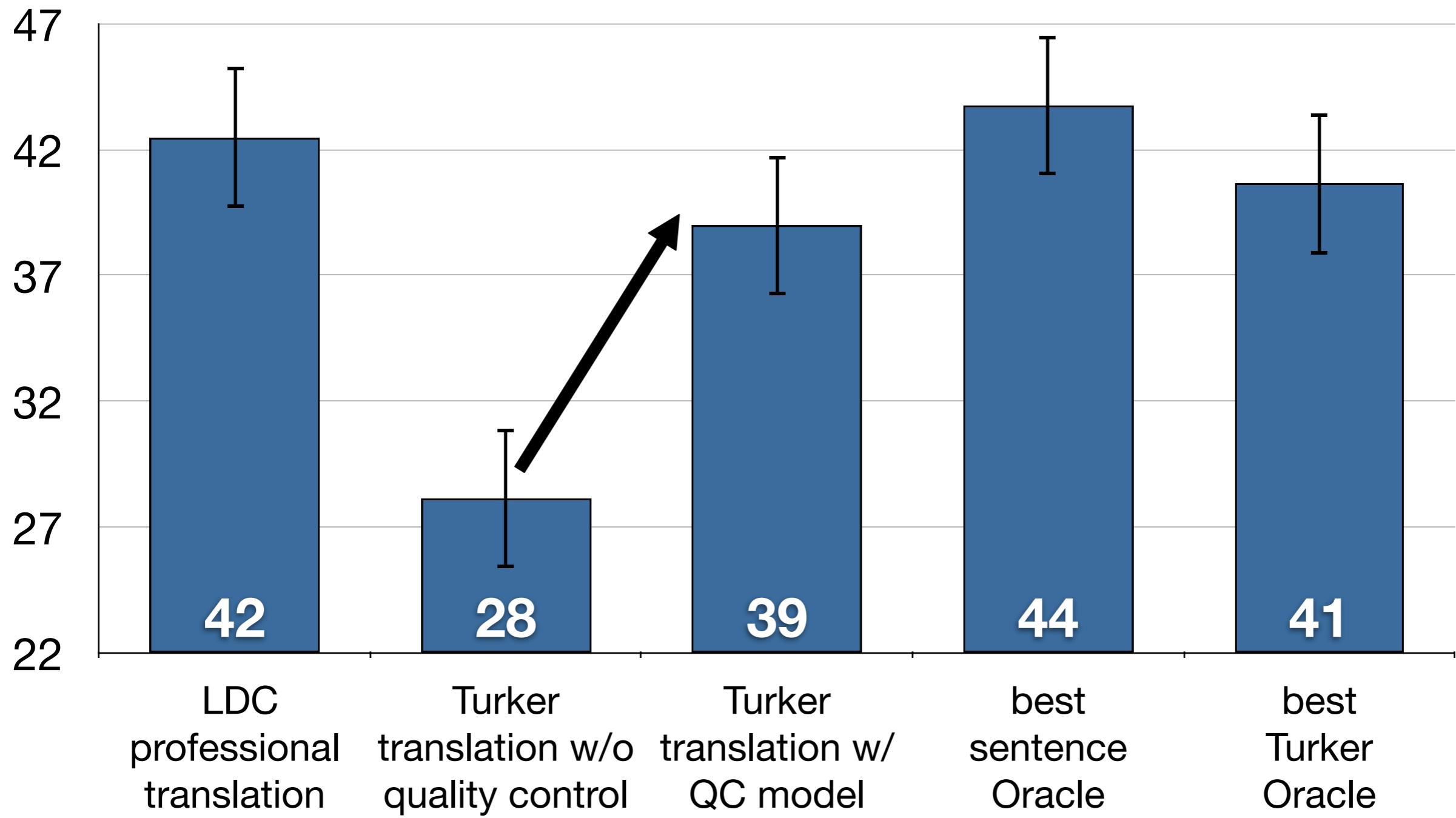
<input type="radio"/>	According to the Researchers of the State of Michigan University diet taking rats have less strength to fight with the infection and also the chances of death increased whereas earlier those rats on common diet had more strength to fight with the flu virus.
-----------------------	---

Calibration data

Turker	Reference
Avoiding dieting to prevent from flu	Avoid Dieting to Avoid Flu
This research of American scientists came in front after experimenting on mice.	This research of American scientists has come to light after experiments done on mice.
Experiments proved that mice on a lower calorie diet had comparatively less ability to fight the flu virus.	The experiments have proved that the capability of fighting Flu virus became less in mice placed on food containing fewer calories.
research has proven this old myth wrong that its better to fast during fever.	The old saying that,'It's better to starve during fever,'has been proven wrong by the research.

Professional Quality from Non-Professionals

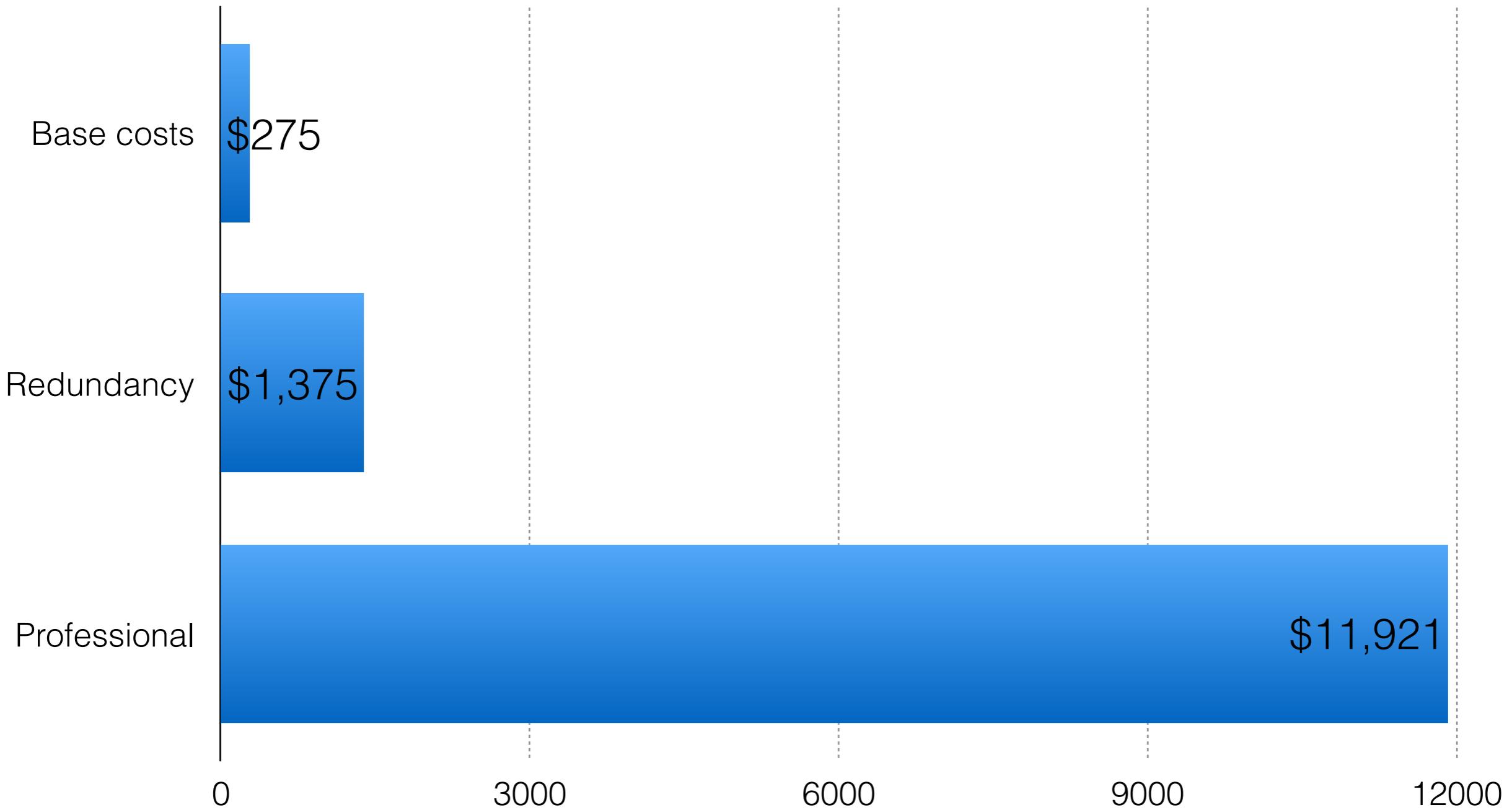
Full details in Zaidan and
Callison-Burch (ACL 2011a)
& Zaidan (PhD Thesis 2012)



Cost of Translation on MTurk



Cost of Translation versus Professionals

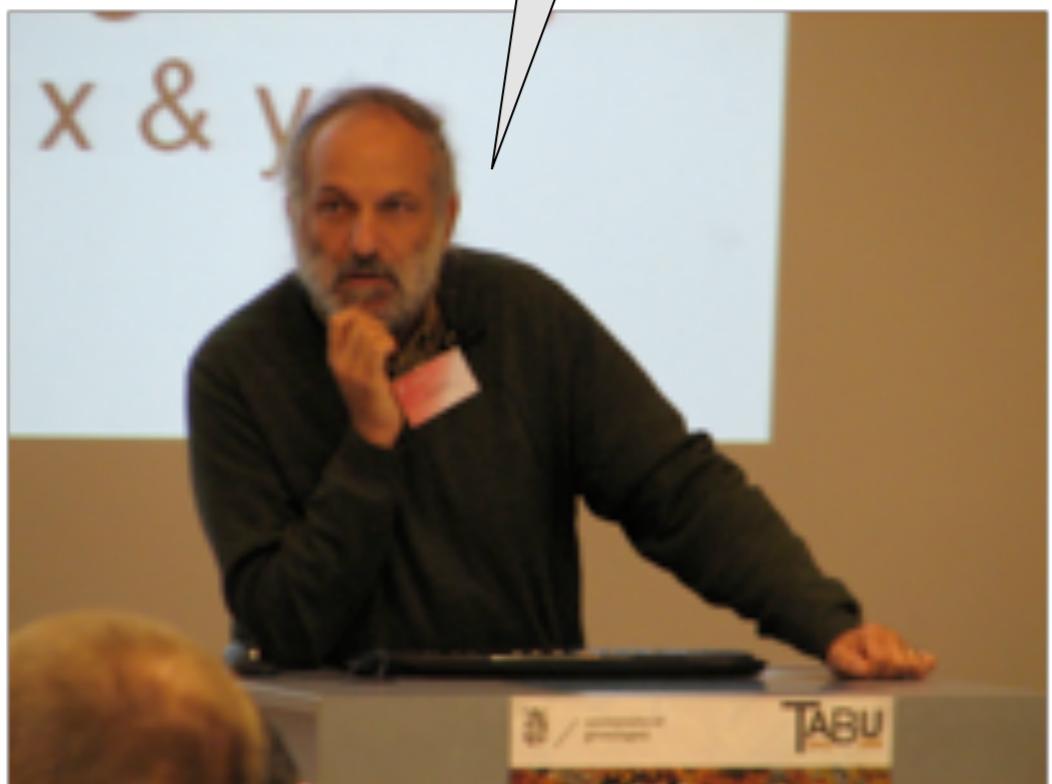


Cost of Translation on MTurk

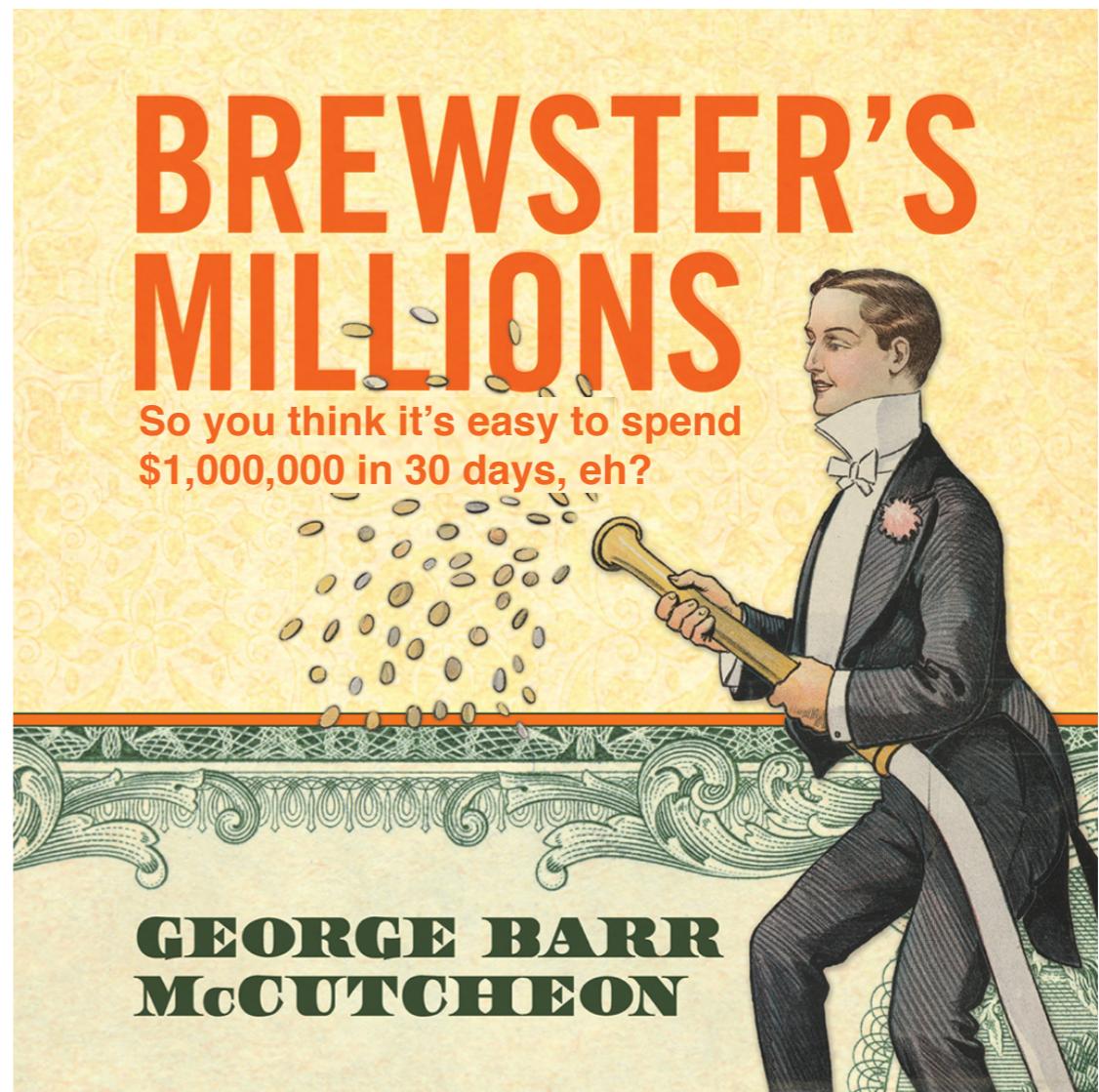
- Approximately an order of magnitude cheaper than the cost of professional translation
- Further reductions possible
 - reduce dependency on gold standard data
 - reduce amount of redundant translations collected
 - predict whether we need to get another translation
- It now seems feasible to collect enough data to train a statistical machine translation system

\$100,000 challenge

Surely it can't scale. I bet you can't spend my money fast enough.



- Ken Church bet me \$50k that I couldn't spend \$50k on MTurk in two months



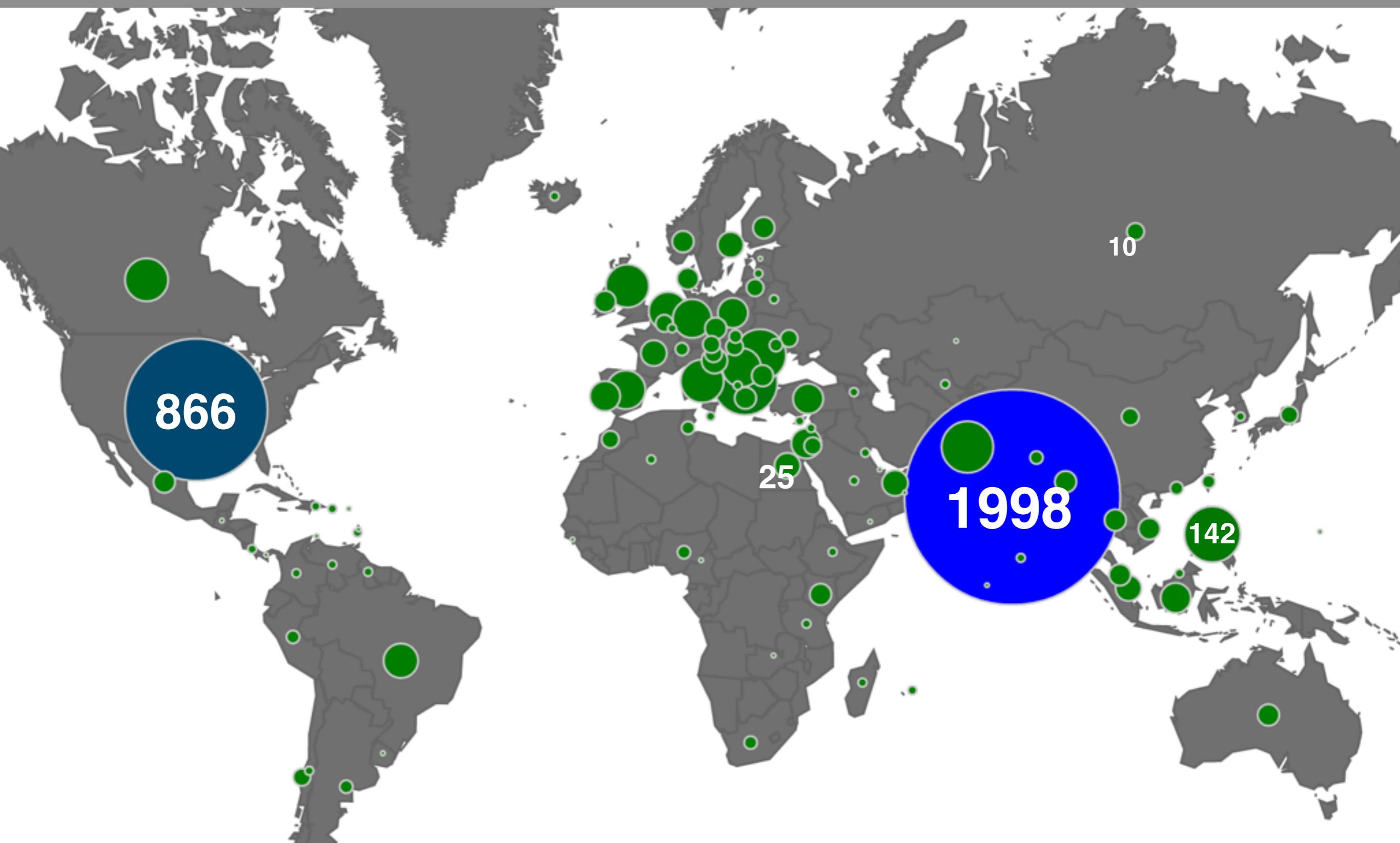
Leaderboard

Mechanical Turk Monitor: Top-1000 Recent Requesters

[General](#)[Top requesters](#)[Arrivals](#)[Completed](#)[Search](#)[About](#)

	Requester ID	Requester	#Task	#HITs	Rewards
1	Dolores Labs	A2IR7ETVOIULZU (RSS)	470	317857	33084.24
2	ContentGalore	A2XL3J4NH6JI12 (RSS)	674	10622	17554.6
3	SpeechInk	A1AQ7EJ5P7ME65 (RSS)	9019	13613	12876.67
4	CastingWords	A3MI6MIUNWCR7F (RSS)	9454	14036	8947.02
5	QuestionSwami	AD7C0BZNKYGYV (RSS)	629	4116	4750.37
6	Chris Callison-Burch	A32TTE4XXN6MQZ (RSS)	11	9961	4458.02
7	Smartsheet.com Clients	A1197OGL0WOQ3G (RSS)	434	38212	3118.28
8	retaildata	AD14NALRDOSEN9 (RSS)	8	50288	3110.85
9	Classify This	A1CTI3ZAWTR5AZ (RSS)	25	94590	1891.8
10	Andrew Stephen	A1Y25F6MZCMQGY (RSS)	3	22705	1131.25
11	Dolores Labs 2	A3JX8WONBL5N9X (RSS)	34	8976	1043.27
12	RelevanceQuest	A8RMEN71ICE57 (RSS)	15	47881	1029.92
13	Crowd Task	AFAOUHS65HNDS (RSS)	4	2388	955.6
14	nlds.soe.ucsc.edu	A1HI9DWCF794RE (RSS)	4	4702	933.9

Language Demographic Study



Language Feasibility

workers	quality	speed	
many	high	fast	Dutch, French, German, Gujarati, Italian, Portuguese, Romanian, Serbian, Spanish, Tagalog, Telugu
		slow	Arabic, Hebrew, Irish, Punjabi, Swedish, Turkish
	medium or low	fast	Hindi, Marathi, Tamil, Urdu
		slow	Bengali, Bishnupriya Manipuri, Cebuano, Chinese, Nepali, Newar, Polish, Russian, Sindhi, Tibetan
few	high	fast	Bosnia, Croatian, Macedonian, Malay, Serbo-Croatian
		slow	Afrikaans, Albanian, Aragonese, Asturian, Basque, Belarusian, Bulgarian, Central Bicolano, Czech, Danish, Finnish, Galician, Greek, Haitian, Hungarian, Icelandic, Ilokano, Indonesian, Japanese, Javanese, Kapampangan, Kazakh, Korean, Lithuanian, Low Saxon, Malagasy, Norwegian (Bokmal), Sicilian, Slovak, Slovenian, Thai, Ukrainian, Uzbek, Waray-Waray, West Frisian, Yoruba
	medium or low	slow	Amharic, Armenian, Azerbaijani, Breton, Catalan, Georgian, Latvian, Luxembourgish, Neapolitan, Norwegian (Nynorsk), Pashto, Piedmontese, Somali, Sudanese, Swahili, Tatar, Vietnamese, Walloon, Welsh
none			Esperanto, Ido, Kurdish, Persian, Quechua, Wolof, Zazaki

Parallel Corpora for 6 Indian Languages

پاکستان نے بھی پ्रتیکار س्वरूप ۲۸ مई ۱۹۹۸ مें چھ परमाणु پरीक्षण कर डाले।

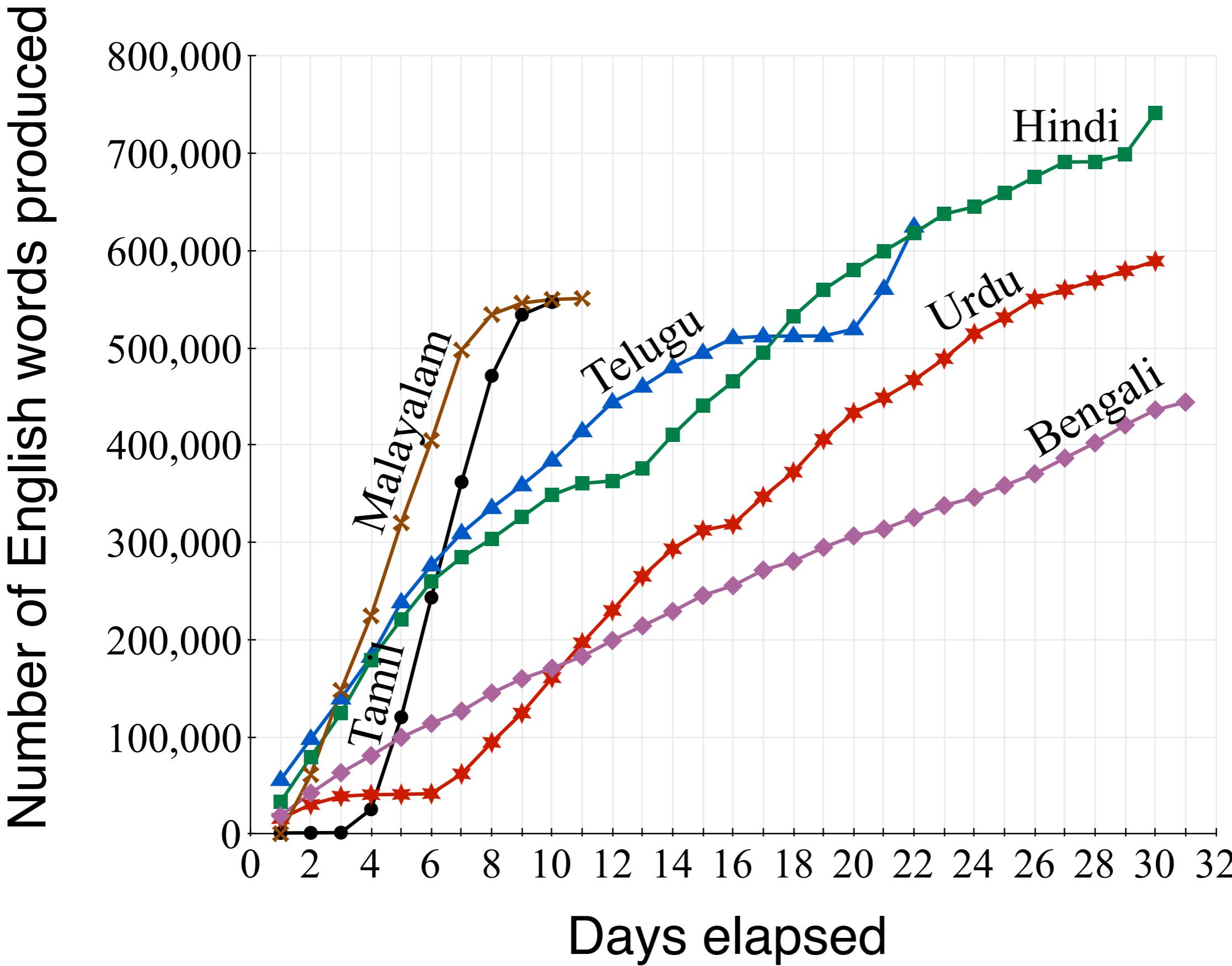
In retribution pakistan also did six nuclear tests on 28 may 1998.

On 28 May Pakistan also conducted six nuclear tests as an act of redressal.

Retaliating on this 'Pakistan' conducted Six(6) Nuclear Tests on 28 May, 1998.

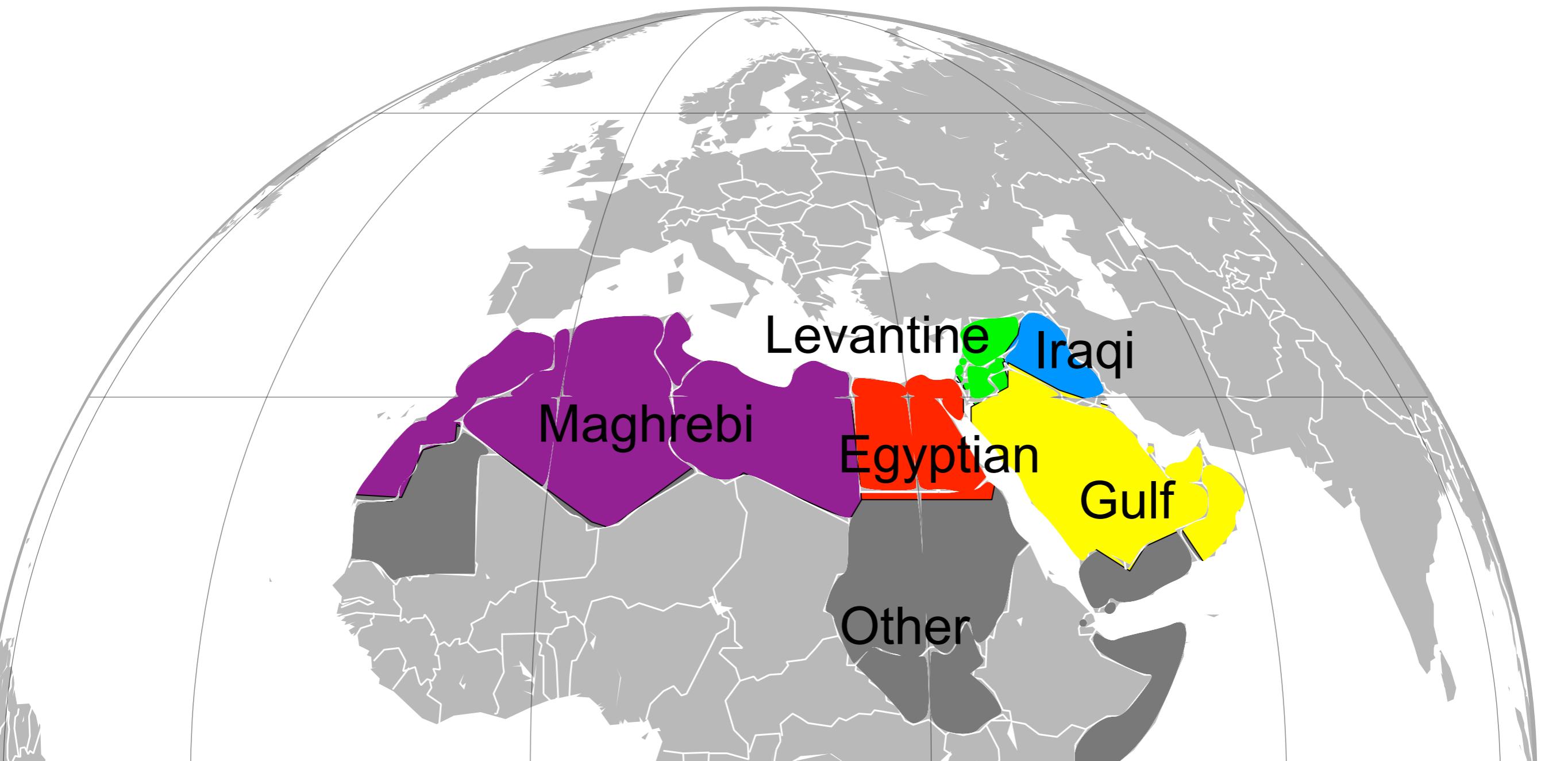
pakistan also did 6 nuclear test in retribution on 28 may, 1998

Rate of Translation



Gathering Data about Arabic Dialects

Arabic has **different varieties**. MSA is the standardized form but there are many **distinct regional dialects**.



Translating Dialects with MSA MT

MSA:

متى سنرى هذه الثلة من المجرمين تخضع للمحاكمة ؟

*mtY snrY h*h Alvp mn Almjrmyn txDE llmHAkmp ?*

Levantine:

ايمتى رح نشوف هالشلة من المجرمين بتتحاكم ؟

AvmtY rH n\$wf hAl\$lp mn Almirmvn btthAkkm ?

PT: Quando veremos esse grupo de criminosos serem julgados?

ES-EN: **Quando esse** group of criminals see **Serem julgados**?

Written Arabic Dialect

بلخادم: ما يجمع مصر والجزائر يجعل التقارب أكثر من ضروري

الخميس، 16 يونيو 2011 - 09:27



عبد العزيز بلخادم الممثل الشخصي للرئيس الجزائري

الجزائر (أ.ش.)



أكد عبد العزيز بلخادم الممثل الشخصي للرئيس الجزائري والأمين العام لحزب جبهة التحرير الوطني ذات الأغلبية في البرلمان والحكومة، أن العلاقات بين مصر والجزائر قديمة ومتعددة علاوة على مصالح مشتركة قوية تربط بين البلدين.

وقال بلخادم إنه وبالتالي فإن ما حدث من "سحابات الصيف" "عقب مباراة كرة القدم بين فريقي البلدين في تصفيات كأس العالم عام 2009 لا يؤثر على طبيعة العلاقة والأخوة والروابط بين الشقيقين، مشدداً على ضرورة العمل على رفع سقف التعاون بين البلدين على المستوى الحكومي والجماهيري والمؤسساتي

خليل في حالك وابعد عننا 1
بواسطة: bebooo بتاريخ: الخميس، 16 يونيو 2011 - 09:39

EGY

خليل في حالك انت وابعدوا عننا وانت اخر ناس تكلم عن التقارب والعروبة

الجزائر إخوه أعزاء لنا وأهلاً ومرحباً بتقوية العلاقات معهم 2

بواسطة: سامي شاهين بتاريخ: الخميس، 16 يونيو 2011 - 09:55

MSA

التقارب بين مصر والجزائر يعتبر حاجة ملحة تستدعيه الظروف الراهنة التي يمر بها الوطن العربي ، أهلاً ومرحباً يأي تقارب عربي بين الأشقاء في الوطن والمصير ، يسقط الاستعمار الجديد المتمثل في أمريكا والناتو ومن ورائه آل مهيوبون

هزلت 3

بواسطة: مواطن مصرى بسيط بتاريخ: الخميس، 16 يونيو 2011 - 09:55

EGY

هزلت وعيلت ومشت سفينة نوح على اليابس - الدنيا جري فيها ايه علشان نسمع دروس من امثالكم

تبنيه 4

بواسطة: علي بتاريخ: الخميس، 16 يونيو 2011 - 09:57

MSA

انا الشعب الجزائري يعمل جاهدا من اجل السعي لتجديد العالم العربي وكذاك السعي ورا طموحات اكبر وهي ، ان تكون كلمت العرب كلما واحدة امام الغرب

انت 5

بواسطة: الفيلسوف بتاريخ: الخميس، 16 يونيو 2011 - 10:14

EGY

أنت بتكلم مين يا بلخادم كل الأنظمة فاسدة وتابعة لأمريكا وإسرائيل، إن أردتم فعلا حل مشاكل العرب في البيت العربي فيما على الحكام إلا تكوين جمعية وذهب لمتحج الحكام المخلوعين بالمملكة السعودية وسيروا الشعوب تبحث في قيام الولايات العربية المتحدة وعاصمتها القدس إنشاء الله (معلش حبيبي هو حلم يقطن يمكن يتحقق في يوم من الأيام من مـن يعلم الغيب؟)

MSA

EGY

Article body (MSA)

Crowdsourcing Dialect ID

Full details in Zaidan and Callison-Burch (ACL 2011b)

- Labeled 142k comments gathered from three online newspapers:
 - Al-Ghad (الغد), a Jordanian newspaper LEV MSA
 - Al-Riyadh (الرياض), a Saudi newspaper GLF MSA
 - Al-Youm Al-Sabe' (اليوم السابع), an Egyptian newspaper EGY MSA
- 59% MSA, 41% dialect
- Trained classifiers with 80-90% accuracy

Crowdsourcing Arabic Dialects

- Translated dialect-labeled segments  

Dialect Classification HIT	\$10,064
Sentence Segmentation HIT	\$1,940
Translation HIT	\$32,061
Total Cost	\$44,065
Num words translated	1,516,856
Cost per word	2.9 cents/word

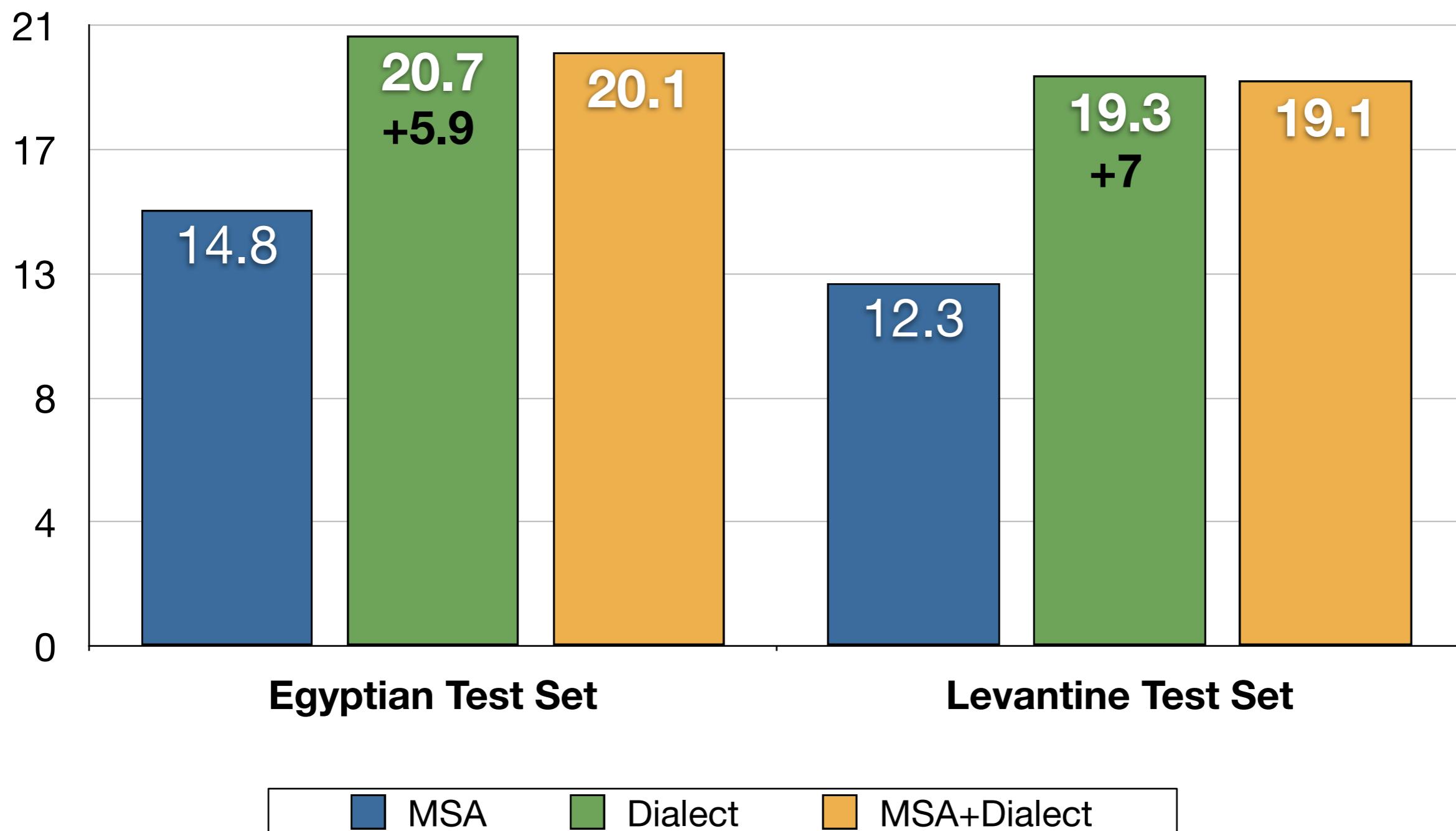
- 121 workers completed 20+ assignments
- 200,000 words translated per week
- Trained BBN's machine translation system ²⁹

Examples of Dialect Translation

Dialect Input	MSA system	Dialect system	Reference
EGY انت بتعمل له اعلان ولا ايه ؟ !!	You are working for a declaration and not?	You are making the advertisement for him or what?	Are you promoting it or what?!!
EGY نفسي اطمئن عليه بعد ما شاف الصوره دي	Myself feel to see this image.	I wish to check on him after he saw this picture.	I want to be sure that he is fine after he saw the images.
LEV لهيك الجو كتير كوروول	God you the atmosphere.	This is why the weather is so cool	This is why the weather is so cool
LEV طول بالك عم نمزح	Do you think about a joke long.	Calm down we are kidding	Calm down, we are only kidding

Dialect versus MSA

Full details in Zbib, Malchiodi, Devlin, Stallard, Matsoukas, Schwartz, Makhoul, Zaidan, & Callison-Burch (NAACL 2012)



Crowdsourcing for the win

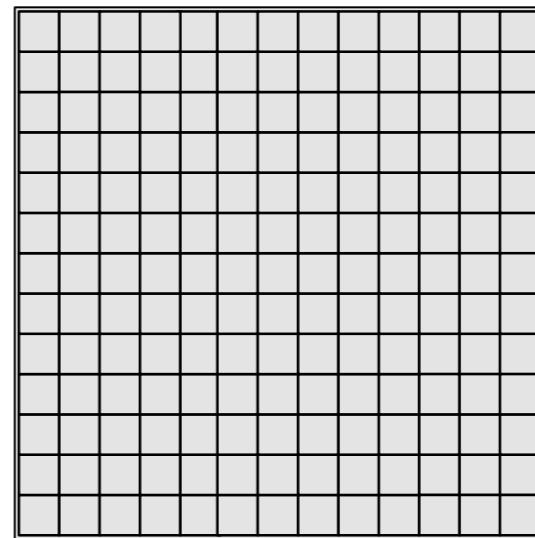
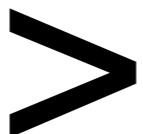
Crowdsourcing dramatically improved MT
for Arabic dialects

200M+

1.5M



Arabic
Dialect-English



MSA-English

2 months

\$44k

+6 Bleu

5 years

\$10s of millions

no added Bleu