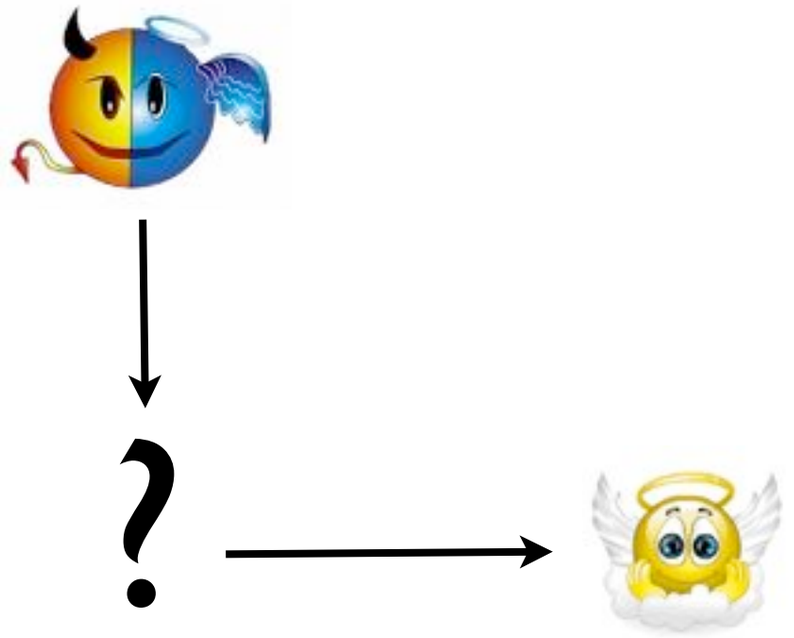
How Good are Humans at Solving CAPTCHAs? A Large Scale Evaluation

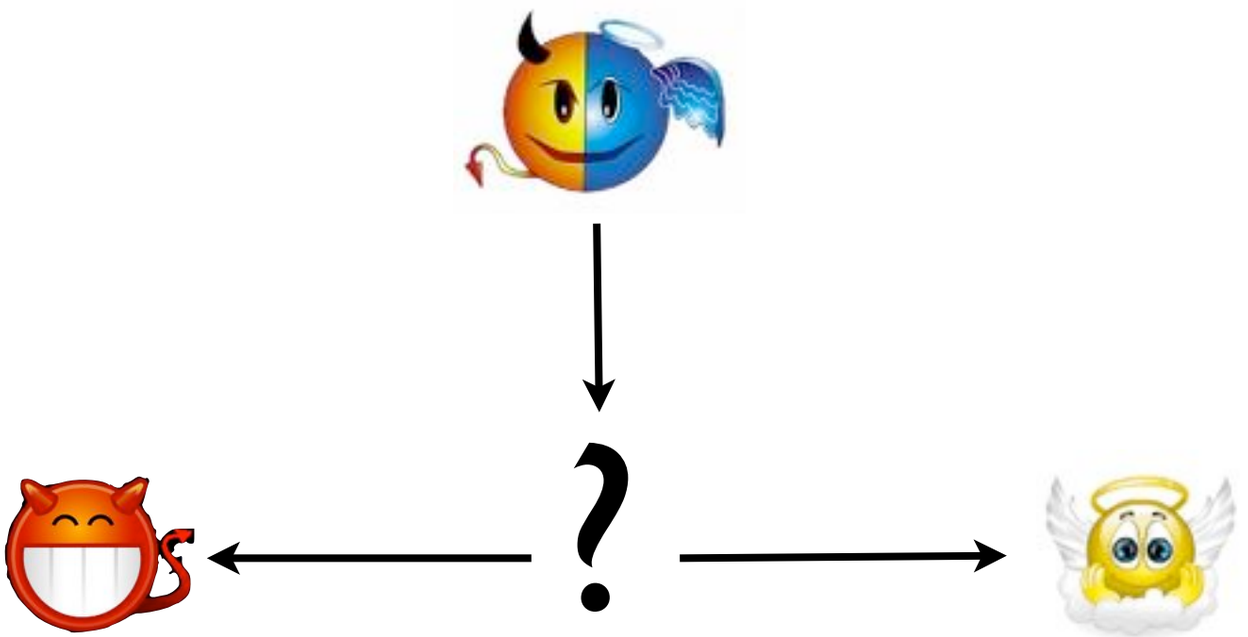
Elie Bursztein, Steven Bethard, Celine Fabry, John Mitchell, Dan Jurafsky,

Stanford Computer Security Lab

?

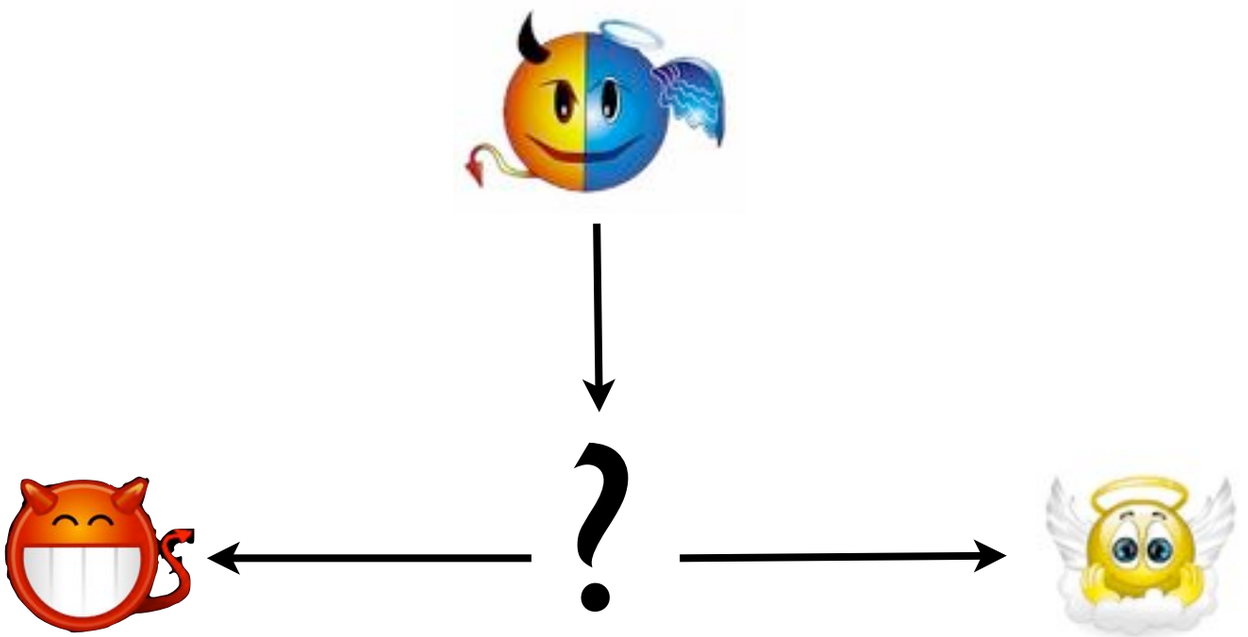


users



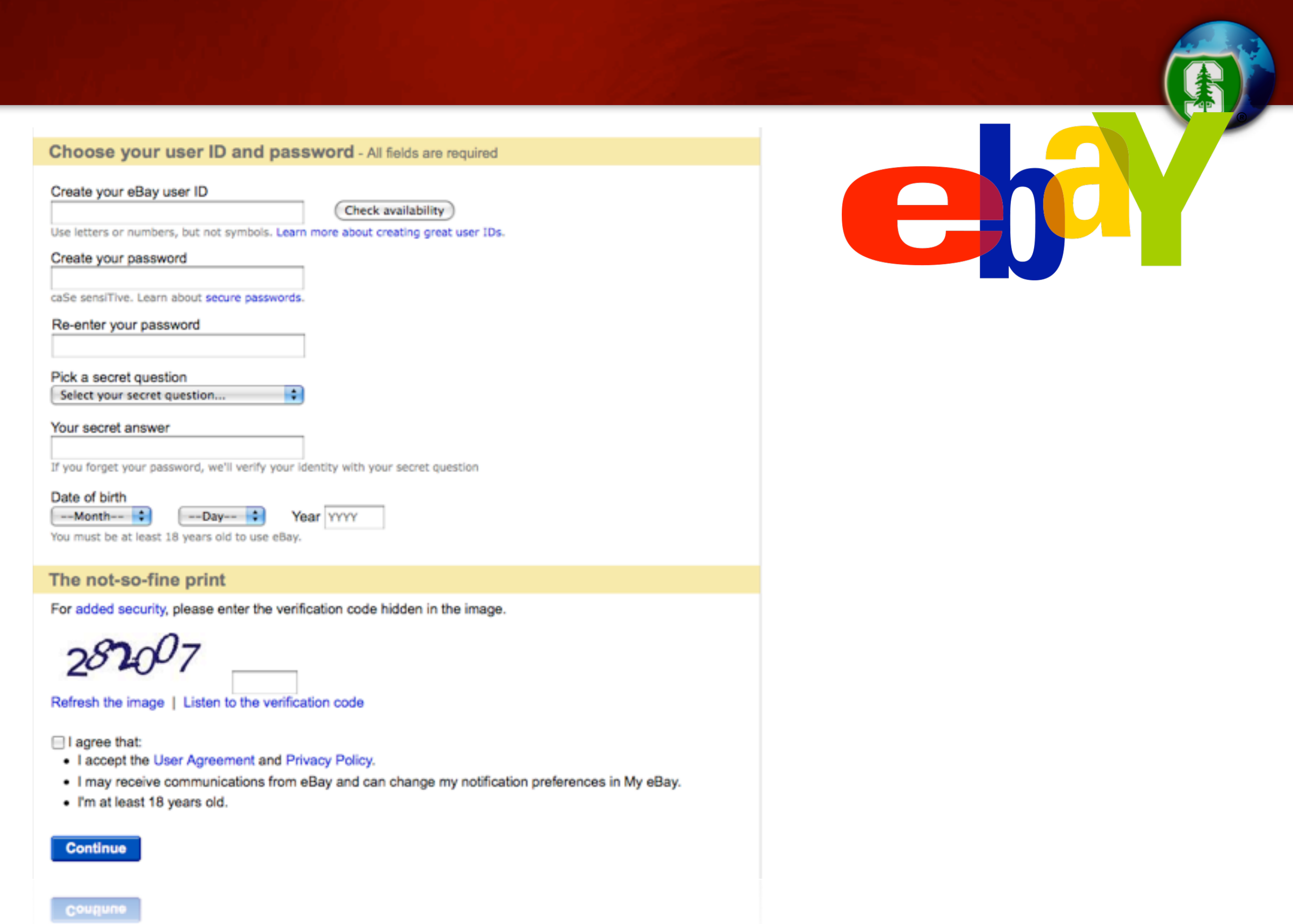
bots

users



CAPTCHA

Completely **A**utomated **P**ublic **T**uring test to tell **C**omputers and **H**umans **A**part


Choose your user ID and password - All fields are required
Create your eBay user ID
Check availability
Use letters or numbers, but not symbols. Learn more about creating great user IDs.
Create your password
caSe sensiTive. Learn about secure passwords.
Re-enter your password
Pick a secret question
Select your secret question...
Your secret answer
If you forget your password, we'll verify your identity with your secret question
Date of birth
--Month--
--Day--
Year
YYYY
You must be at least 18 years old to use eBay.
The not-so-fine print
For added security, please enter the verification code hidden in the image.
Refresh the image | Listen to the verification code
I agree that:
I accept the User Agreement and Privacy Policy.
I may receive communications from eBay and can change my notification preferences in My eBay.
I'm at least 18 years old.
Continue

Choose your user ID and password - All fields are required

Create your eBay user ID

Check availability

Use letters or numbers, but not symbols. Learn more about creating great user IDs.

Create your password

caSe sensiTive. Learn about secure passwords.

Re-enter your password

Pick a secret question

Select your secret question...

Your secret answer

If you forget your password, we'll verify your identity with your secret question

Date of birth

--Month-- --Day-- Year YYYY

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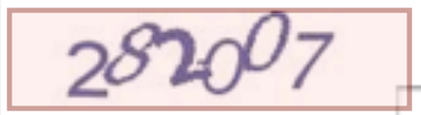

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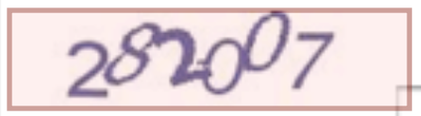

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Continue

Audio Security Measure

Click the "Play audio" link and listen to the verification code. Type the code you hear into the box below, then click the **Submit** button.

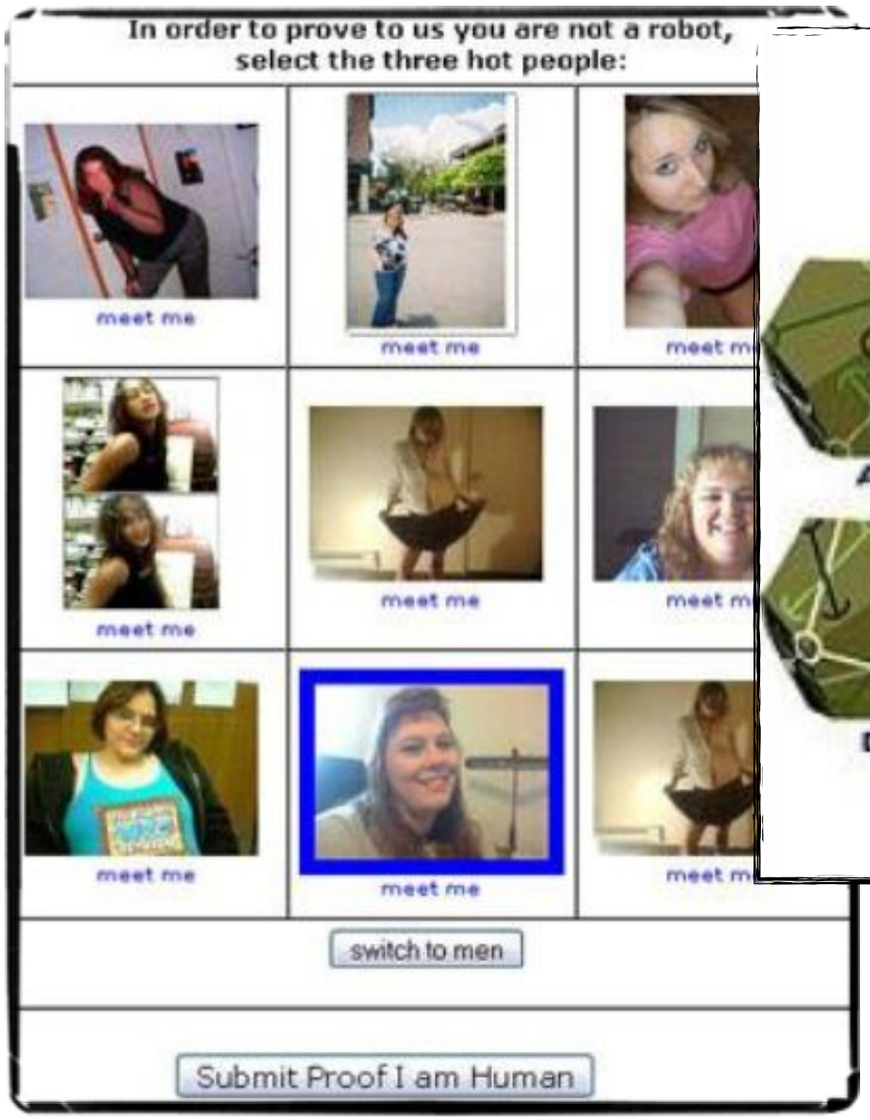
If you have trouble hearing the verification code, press the "Play audio" link again.

Play audio

Enter verification code:

Submit | Cancel

In order to prove to us you are not a robot,
select the three hot people:
meet me
meet me
meet me
meet me
meet me
meet me
meet me
meet me
meet me
switch to men
Submit Proof I am Human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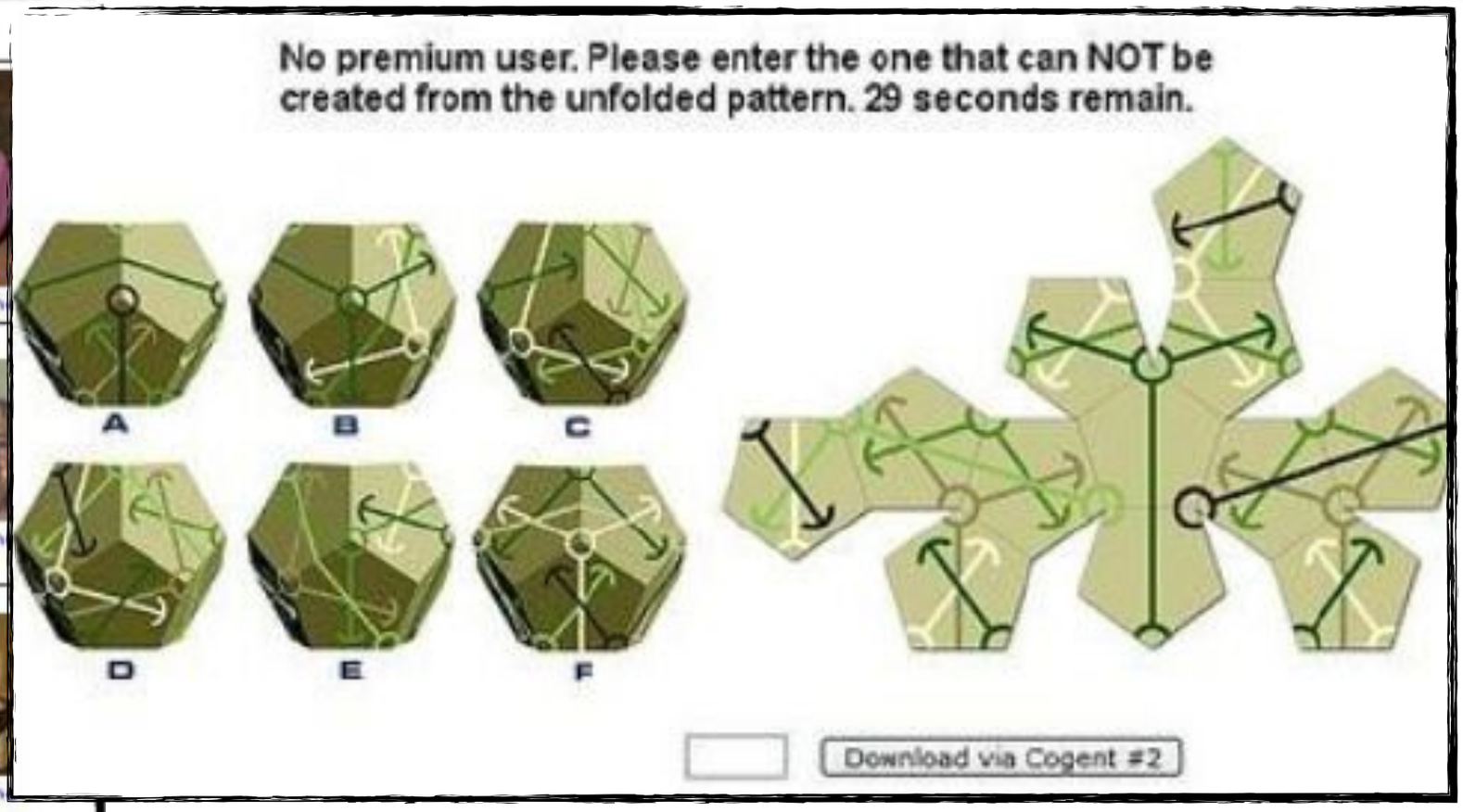
No premium user. Please enter the one that can NOT be created from the unfolded pattern. 29 seconds remain.
A
B
C
D
E
F
Download via Cogent #2

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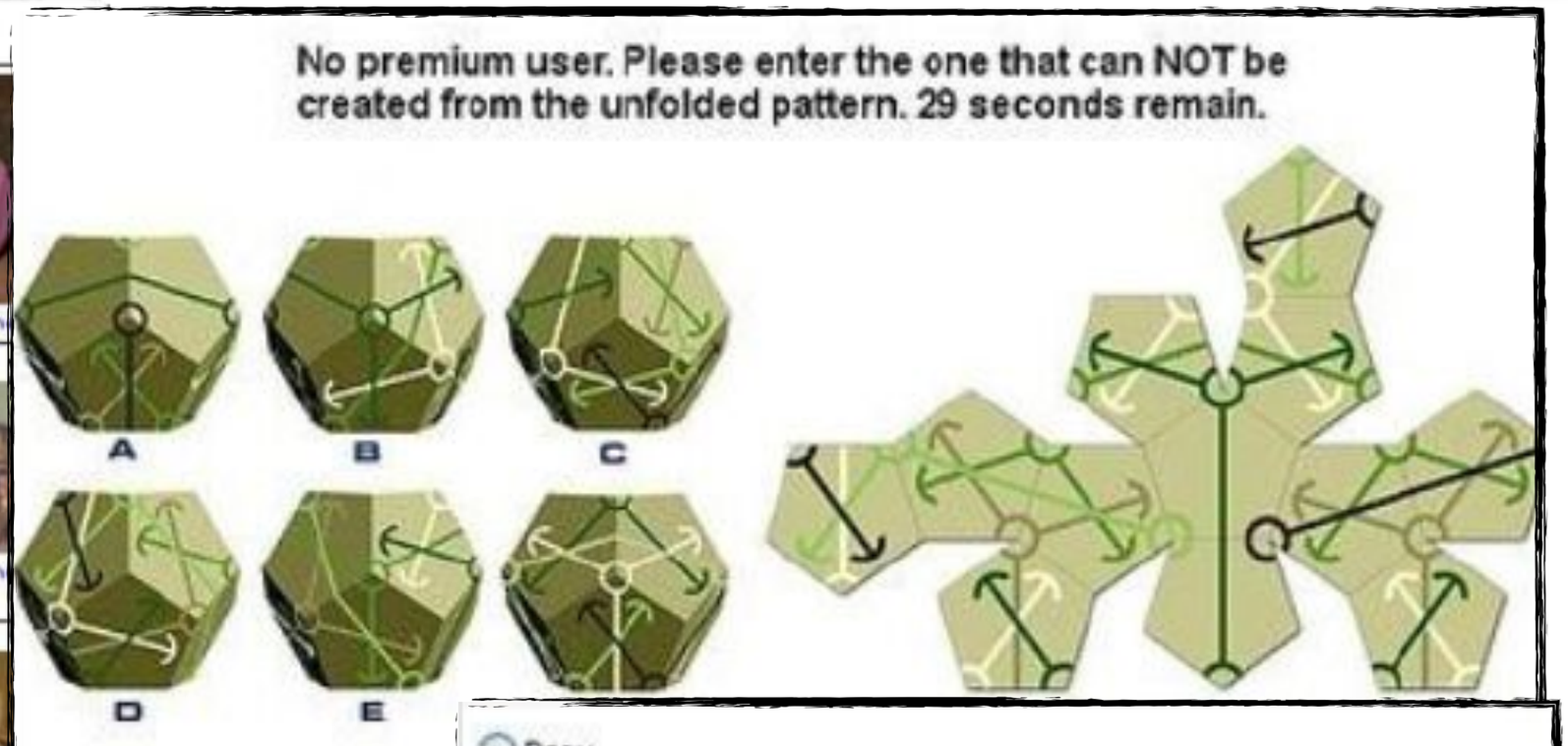
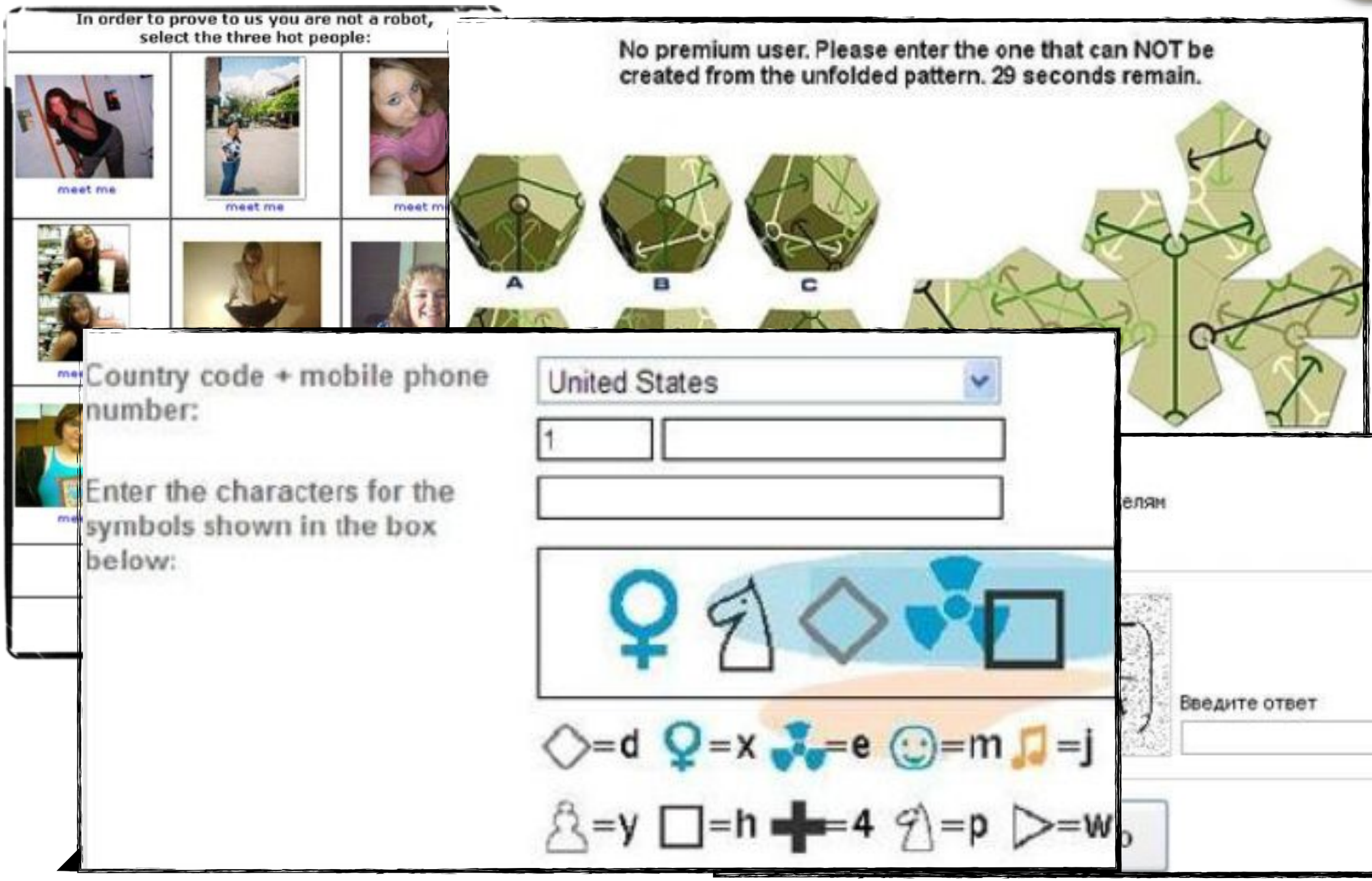

No premium user. Please enter the one that can NOT be created from the unfolded pattern. 29 seconds remain.
A
B
C
D
E

Всем
Только зарегистрированным пользователям
Никому
$\lim_{x \to 0} \ln\left(2 + \sqrt{\operatorname{arctg} x \cdot \sin\frac{1}{x}}\right)$
Введите ответ
Всё верно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meet me
meet me
No premium user. Please enter the one that can NOT be created from the unfolded pattern. 29 seconds remain.
A
B
C
Country code + mobile phone number:
United States
1
Enter the characters for the symbols shown in the box below:
=d
=x
=e
=m
=j
=y
=h
=4
=p
=w
елян
Введите ответ

twitter
Home Profile Find People Settings Help Sign out
elie
That's you!
Lists
http://www.youtube.com /watch?v=xIxDJof7xxQ video that demonstrate HTML5 upcoming features
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Retweeted by you and 16 others
Name Elie Bursztein
Location Palo Alto
Web http://elie.im
21 following
30 followers
0 listed
Tweets 80
Favorites
Lists
security
View all
Following
RSS feed of elie's tweets

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Home Profile Find People Settings Help Sign out
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security
View all
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RSS feed of elie's tweets

twitter

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elie

That's you! Lists

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Retweeted by you and 16 others

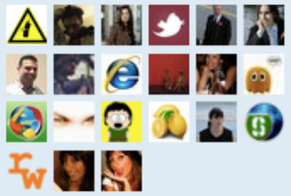
Name Elie Bursztein
Location Palo Alto
Web http://elie.im

21 following | 30 followers | 0 listed

Tweets 80
Favorites

Lists
security
View all

Following



RSS feed of elie's tweets

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home • login

Welcome to Twitter Follower

Register Now

Name

Email

Register

Twitter Follower - One of the best methods to get more followers, make money online

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Home Profile Find People Settings Help Sign out
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Welcome to Twitter Follower
100 Free Trial . com
Get 100 Twitter Followers Free!
We find high quality, real people, active followers for you, they all willing to follow you, and listen to you
We can target keywords, find people talking about your keywords on twitter and turn them into your followers
We can target people, e.g. famous people, guru, expert or your competitor, and turn their followers into yours
We can also target geo-location, find people live in your targeted city/country, and turn them into your followers
Free Signup
Send only 1 tweet to your account, you will recieve 100 followers from us, Free!
Twitter Username:
Twitter Password:
RT I use http://g22.ca/8J8aDs to Get 100's of Twitter Followers, Free!
Signup

twitter

Home Profile Find People Settings Help Sign out

elie

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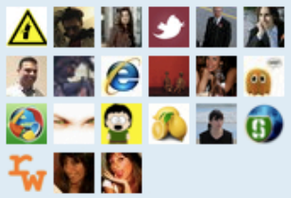

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Welcome to Twitter Follower

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Get short, timely messages from Kalam Uddin.

Twitter is a rich source of instantly updated information. It's easy to stay updated on an incredibly wide variety of topics. Join today and follow @kalamuddin1.

Give it a try ›

Get updates via SMS by texting **follow kalamuddin1** to your local code.
Codes for other countries

@kalamuddin1/free-follower
World is beautiful

This list was created by kalamuddin1

FreeFollowers RT @teenalign: @NASA is there any hd video of the spacewalk
12:24 PM May 18th, 2009 via web

FreeFollowers RT @teenalign: Forget about all the reasons why something may not work. You only need to find one good reason why it will.
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FreeFollowers RT @teenalign: A man can fail many times, but he isnt a failure until he begins to blame somebody else. –John Burroughs
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FreeFollowers Check Our Profile On ReTwtr! www.ReTwtr.com/FreeFollowers
7:33 PM May 17th, 2009 via web

Tweets
Following 1
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Following

twitter follower

get followed.

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Retweeted by you and 16 others

twitter

Join the Conversation

Already on Twitter? Sign in.

Already use Twitter on your phone? Finish signup now.

Full name bli ok

Username blibli32 ok

Are you human?

Before we create your account, we need to make sure you're not a computer.

Mauriac not

Can't read this?
Get two new words
Hear a set of words
Powered by reCAPTCHA.
Help

Type the words above

Finish

By clicking on "Create my account" below, you are agreeing to the Terms of Service above and the Privacy Policy.

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es from Kalam Uddin.

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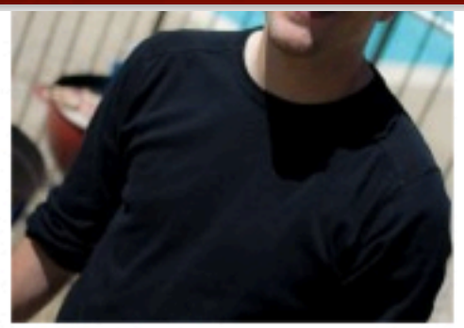


View Photos of Me (1)
View Videos of Me (1)
Edit My Profile

No, I don't wear a blackhat !

It is not my fault is everything I touch breaks

Information

Networks:
EPITA Alum
Stanford Alum

Birthday:
June 1

Current City:
Palo Alto, CA

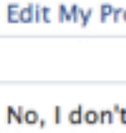
Friends

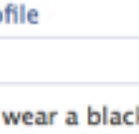
183 friends See All

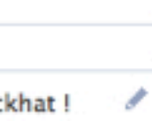
Vincent Vergonjeanne

Arturo Bejar

Gregory Charbonneau


Mathieu Arnold


Ariane Laffon


Etienne Gérain

Attach:

Elie Bursztein Totally awesome skydiving prank :)

Prank War 8: The Skydiving Prank – CollegeHumor video
Amir launches the first aerial attack in the war's four-year history.
Source: www.collegehumor.com

April 25 at 9:43pm via yoono · Comment · Like · Get Yoono

Alexander A. Veith likes this.

Write a comment...

Elie Bursztein is looking for a way to store and share pdf/doc across multiples computers and the iphone ipad. So far I found three ways : Google Doc, Evernote and DropBox. Any suggestion ?

April 24 at 6:59pm via yoono · Comment · Like

Vincent Hanquez get rid of the ipad, use a free solution instead :)
April 25 at 2:30am · Delete

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4 minutes ago · Delete

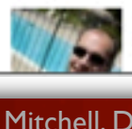
Write a comment...

RECENT ACTIVITY

Elie commented on Nicolas Noble's status.

Elie commented on Arturo Bejar's link.

2 more similar stories



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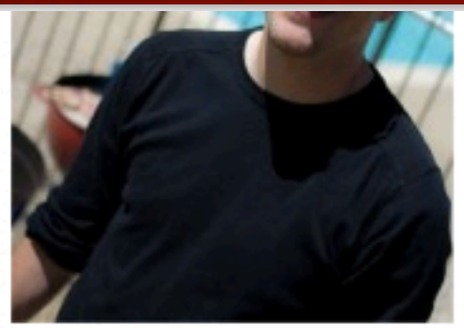

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BUT ONLY UNTIL THE END OF APRIL!
PLACE YOUR ORDER BELOW NOW BEFORE YOU MISS OUT!
facebook marketing services...
Want to know how to get more Facebook fans? Simple -- buy targeted fans from us in packages starting at 1,000 for a small investment. You know you can't pass this up.
Did you know that Facebook has recently been valued at $16 billion? Do you have any idea why a community site like this could be worth so much? It's simple -- because it's a massive advertising platform.
You can take advantage of this by connecting with thousands of potential fans of your product, service or cause by investing in packages of targeted, real Facebook fans delivered to your fan page on Facebook. Only uSocial.net can offer you all of this:
Why Should You Invest in Facebook Fans from uSocial.net?
* 100% real, targeted fans.
* Delivered to your Facebook fan page.
* Targeting based on industry, interest groups and/or geo-location.
* Fans we deliver are yours, forever.
* Guaranteed delivery. We don't deliver, you get a refund.
* Secure: We won't ask you for your account password.
* Over-delivery: We usually deliver more than you pay for
* Most powerful form of social marketing available!
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BLOG
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CONTACT
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Front Page Servi
Press Release D
Facebook Marke
Twitter Marketing
YouTube Marketi
res
About Us
Media
Charity Fund
AQ
Now!
10% SAVE ON FACEBOOK FAN PACKAGES
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Keep me logged in
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Email
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Facebook helps you connect and share with the people in your life.
Sign Up
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* Over-delivery: We usually deliver more than you pay for
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Arnold
Laffon
Gerain
Elie Bursztein I think I found the ideal USB backup drive :) The new version (64GB) seems exactly what I was looking for. Any one

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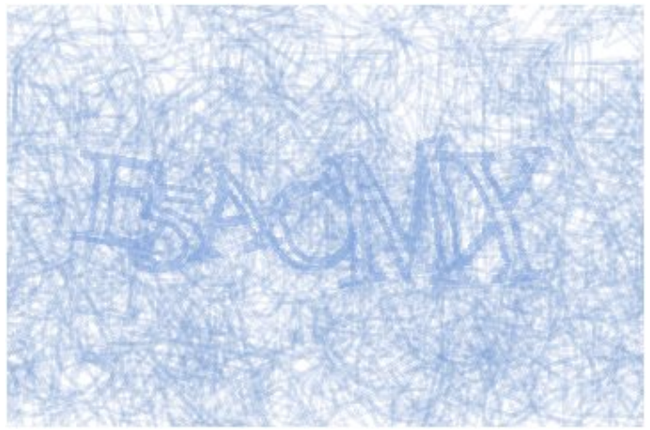

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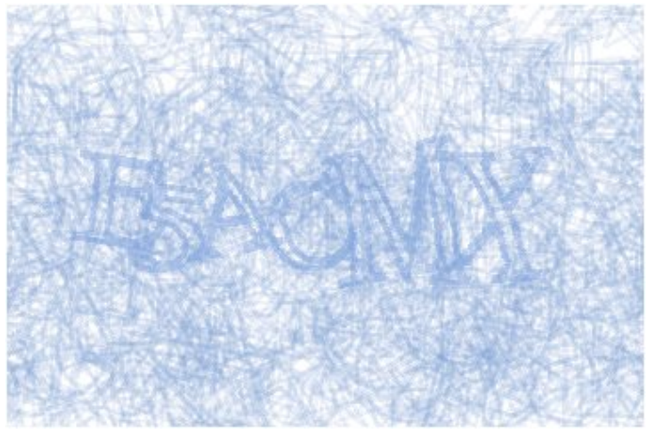

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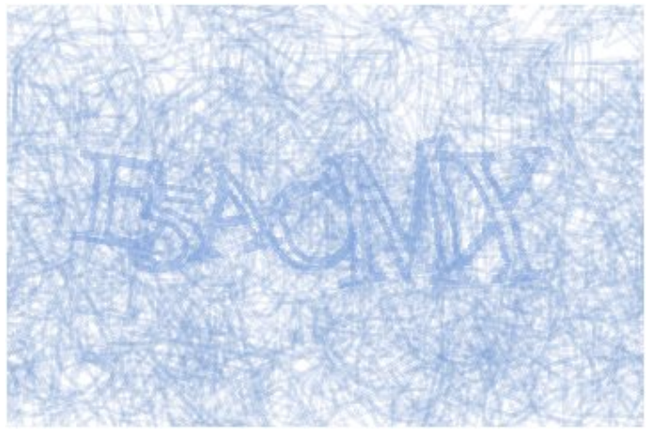

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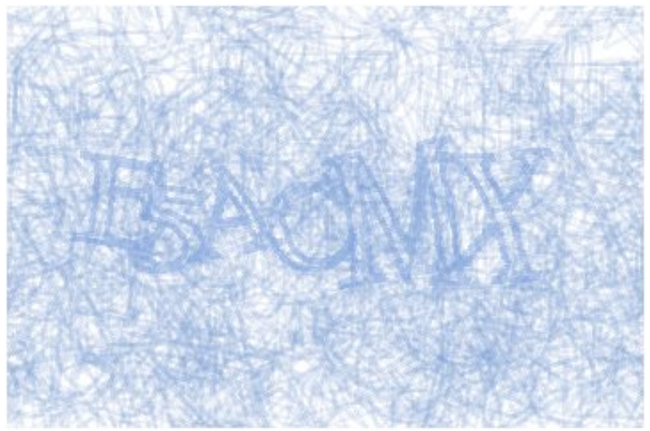

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7.3 sec

8.2 sec

7.3 sec

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7.3 sec

9.3 sec

10.6 sec

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7.3 sec

9.3 sec

Outline

- Study methodology
- Population demography
- Captcha measures

Accuracy

Accuracy

Solving time

The supply chain

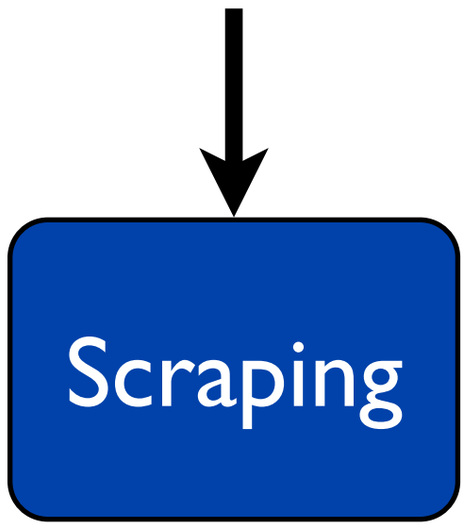
Websites

Paper

The supply chain

Websites

Paper



The supply chain

Websites

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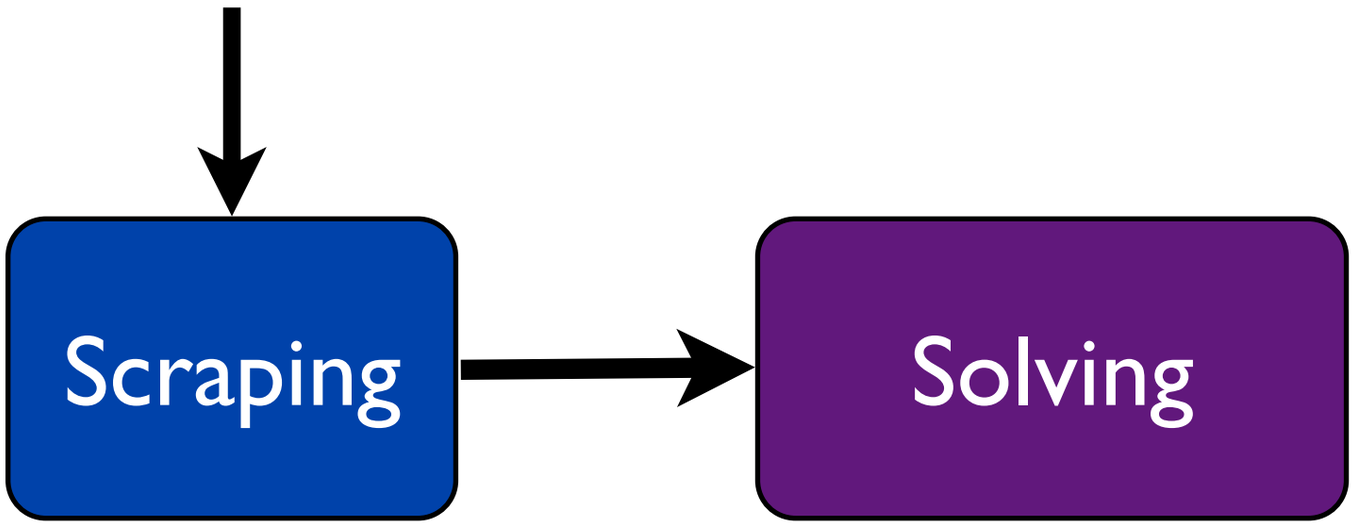

The supply chain

Websites

Paper

Scraping

Solving

Data Mining

Scraping

- Alexa top 50
- 23 scheme
- 10 000 captcha samples
- Custom scraper
- Cookies
- Javascript events
- Ip rate limiting
- User agent

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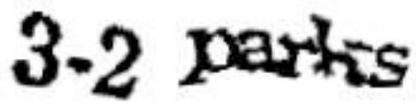

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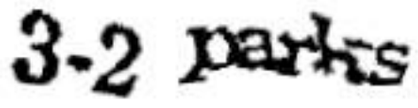

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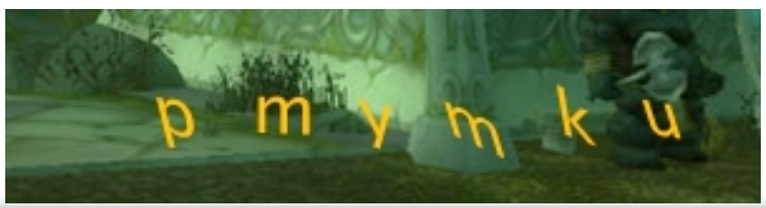

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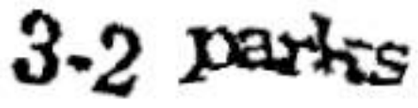

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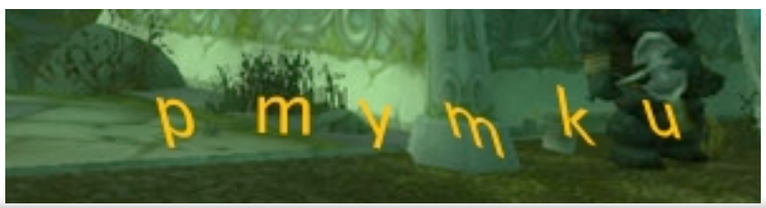

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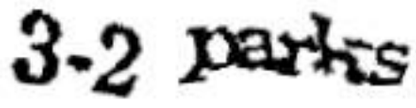

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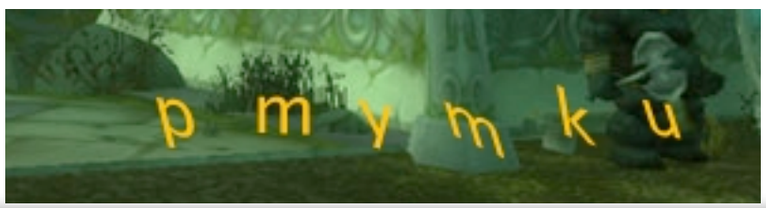

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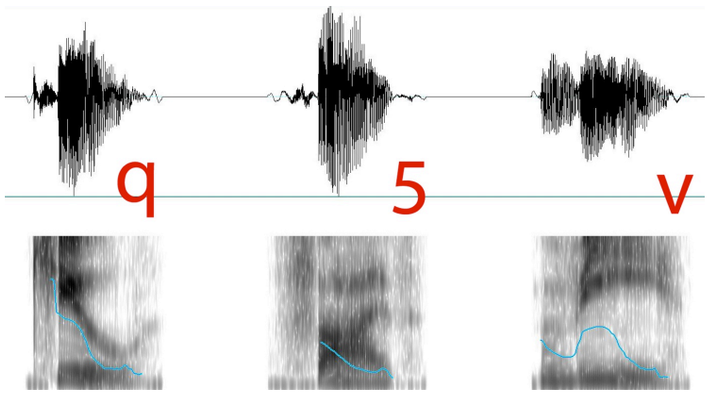

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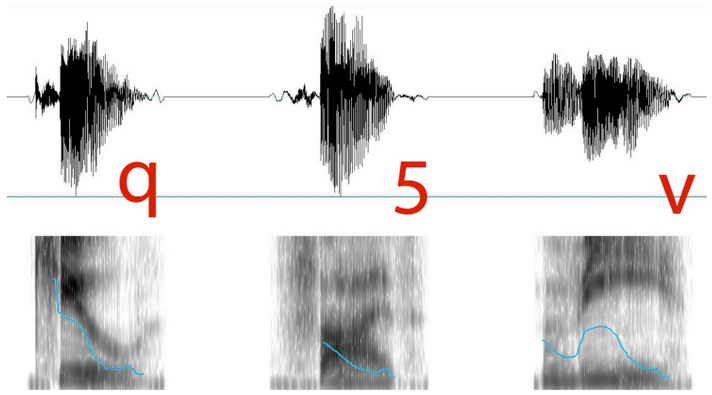

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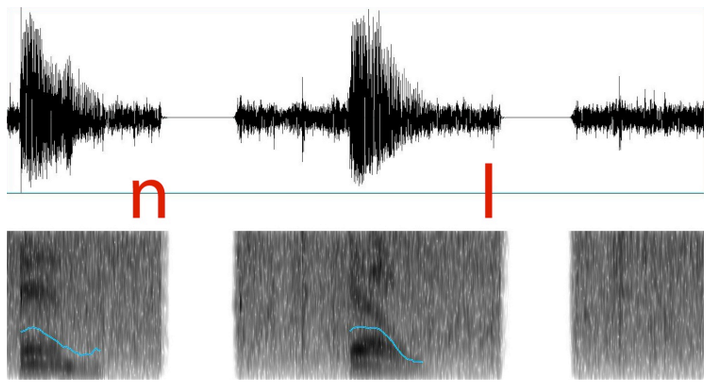

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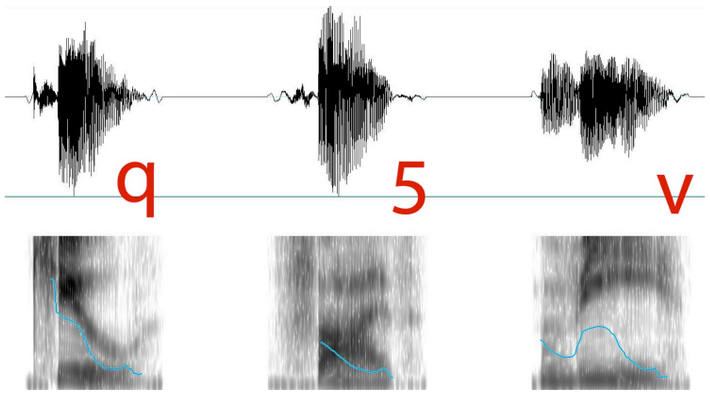

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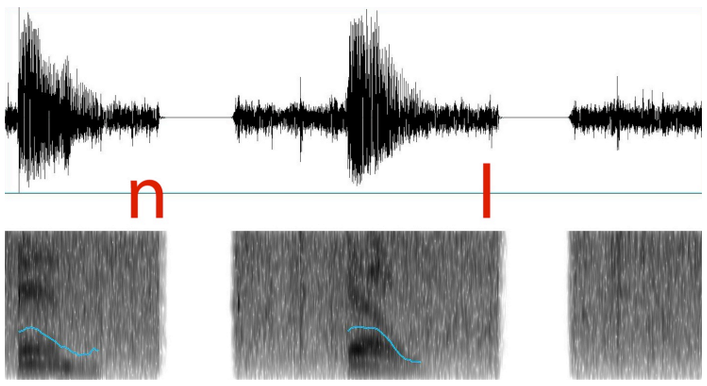

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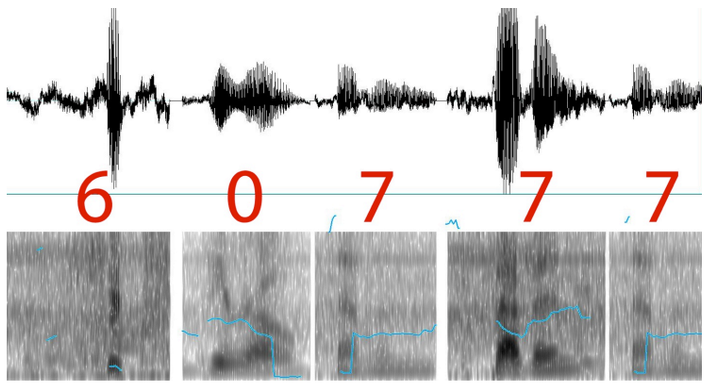

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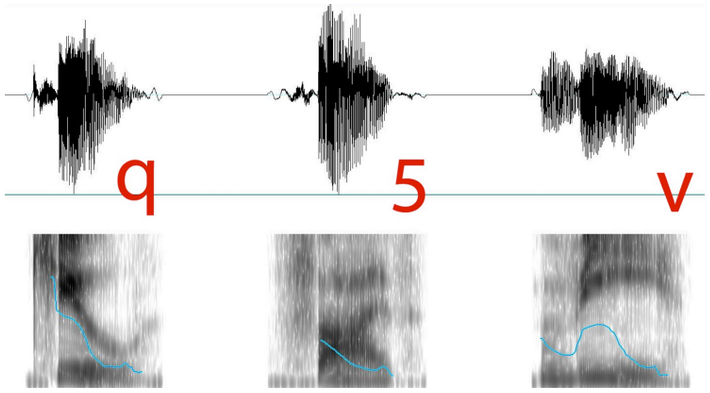

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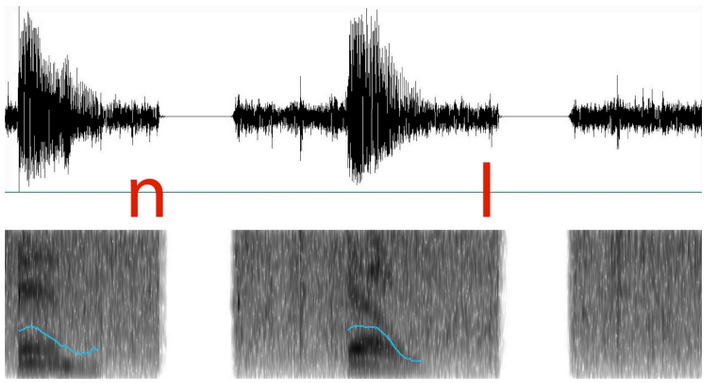

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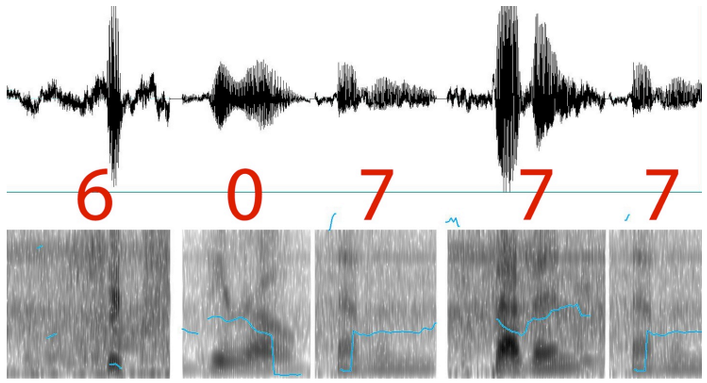

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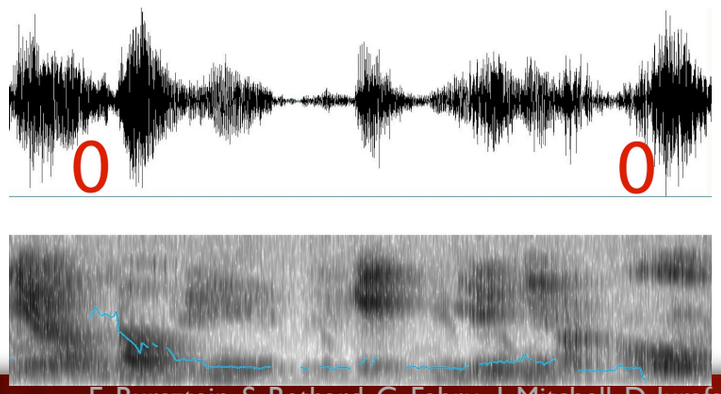

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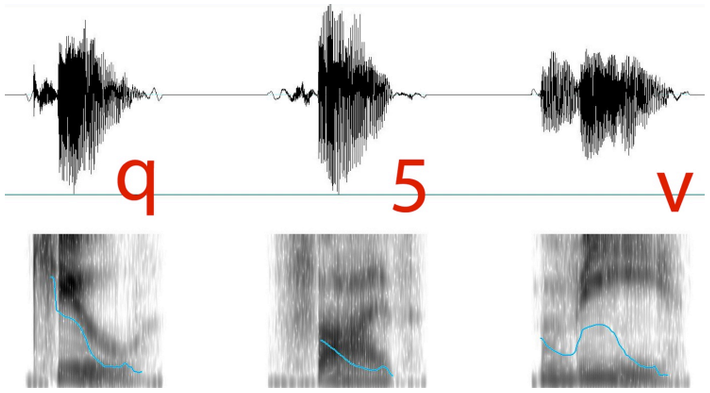

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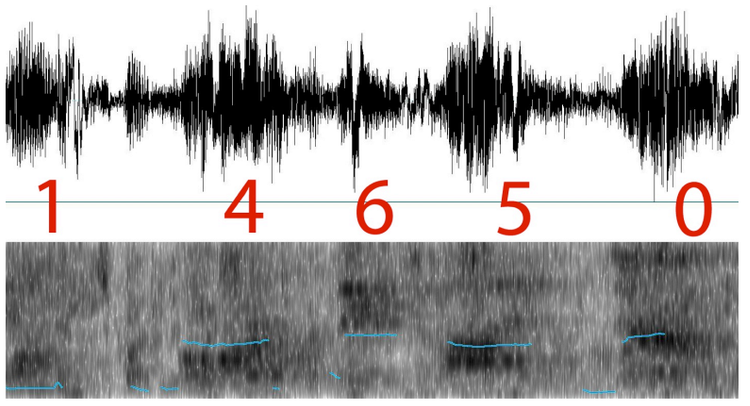

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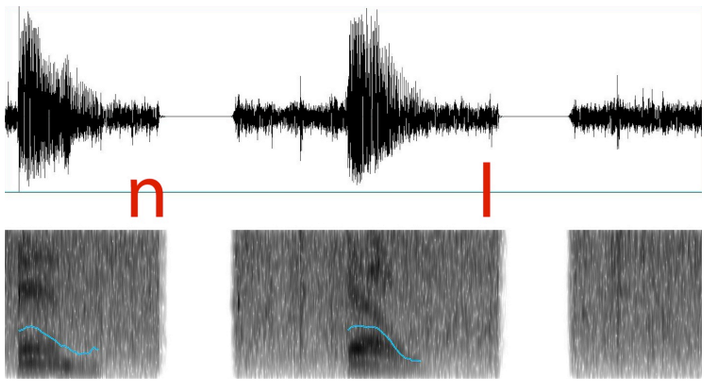

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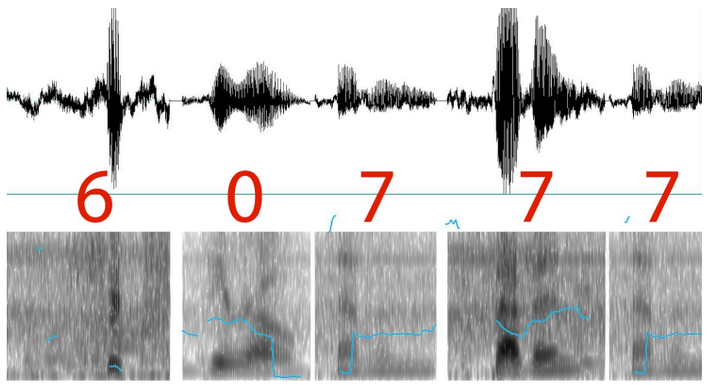

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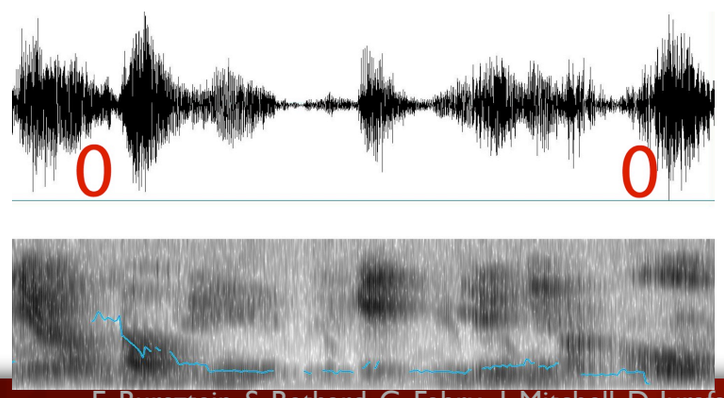

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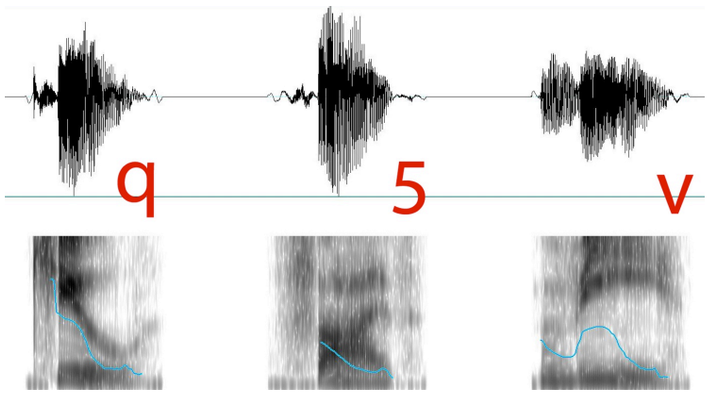

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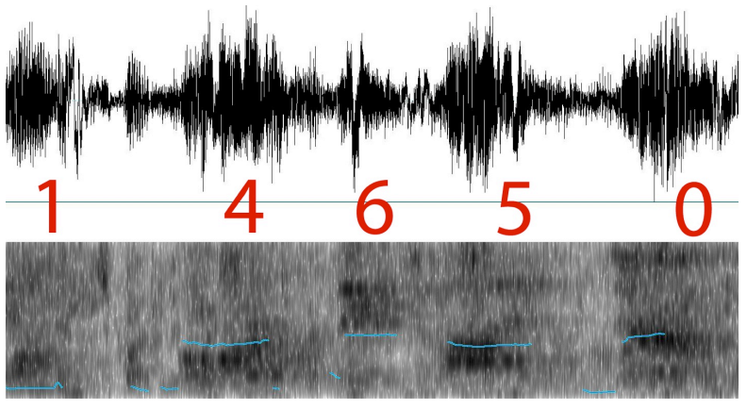

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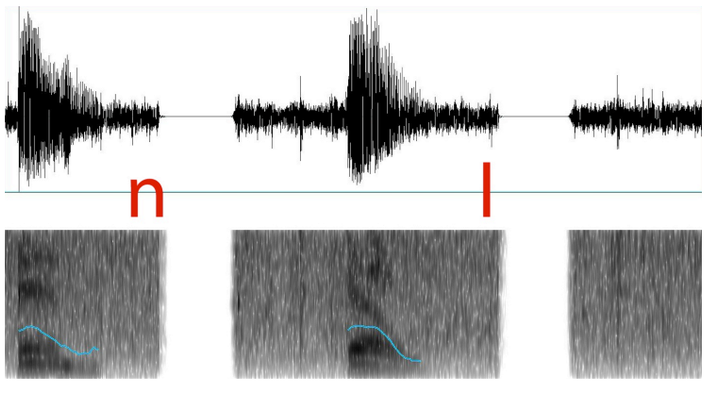

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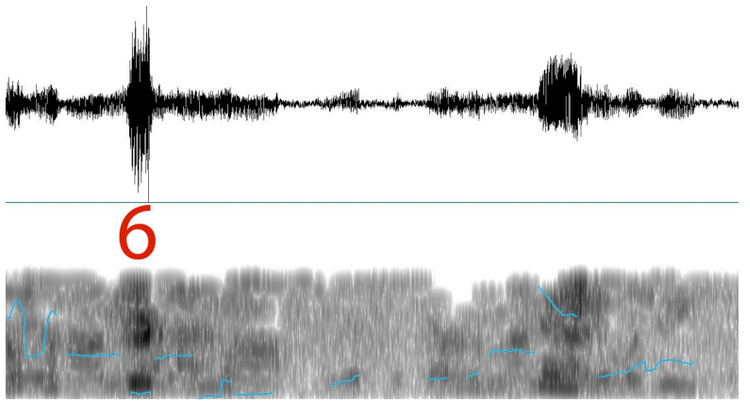

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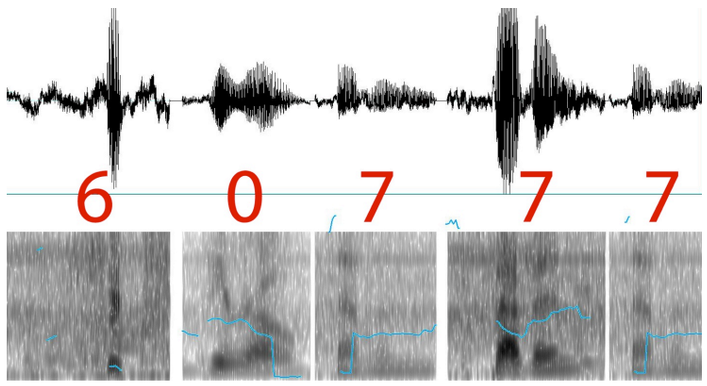

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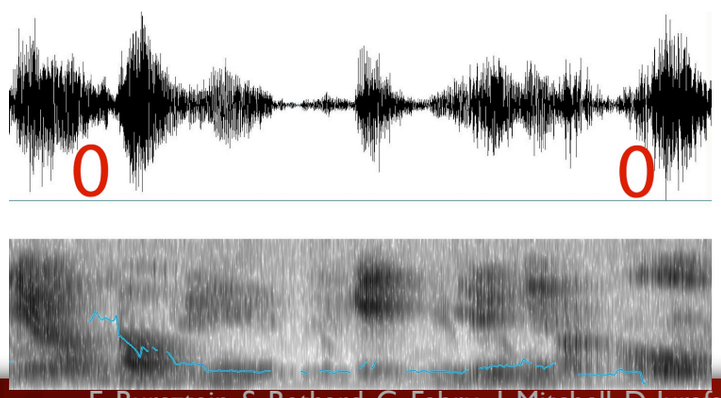

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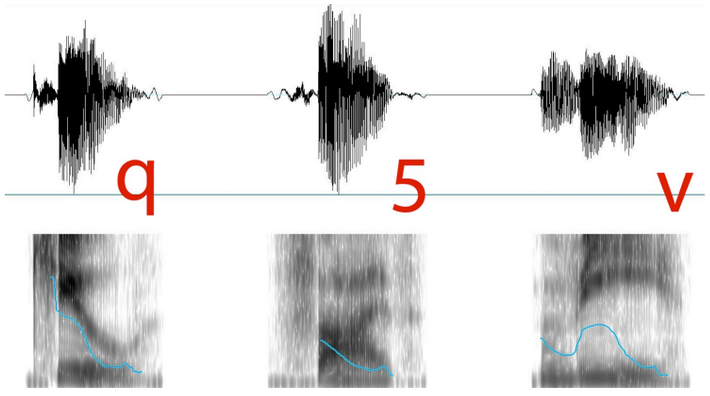

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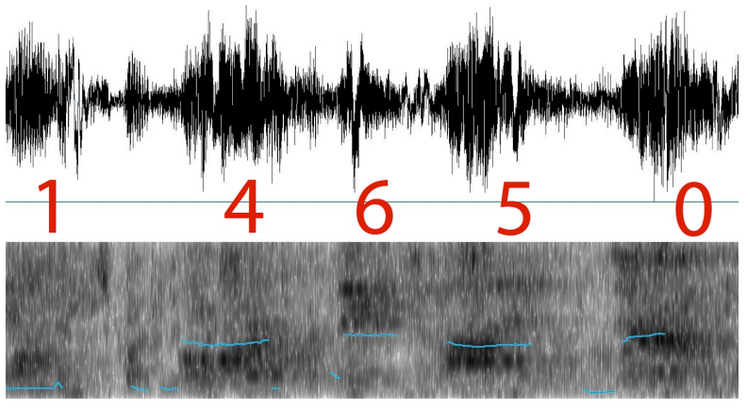

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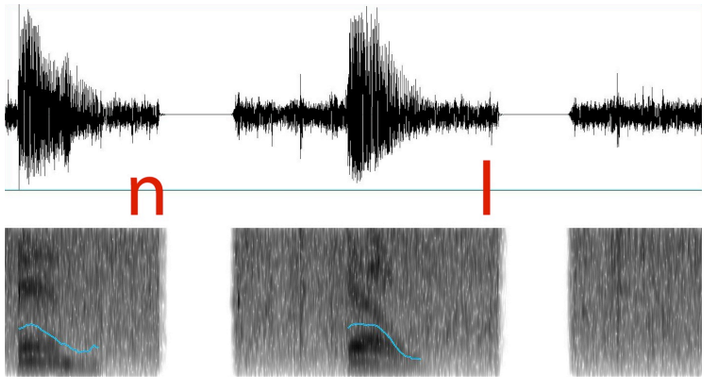

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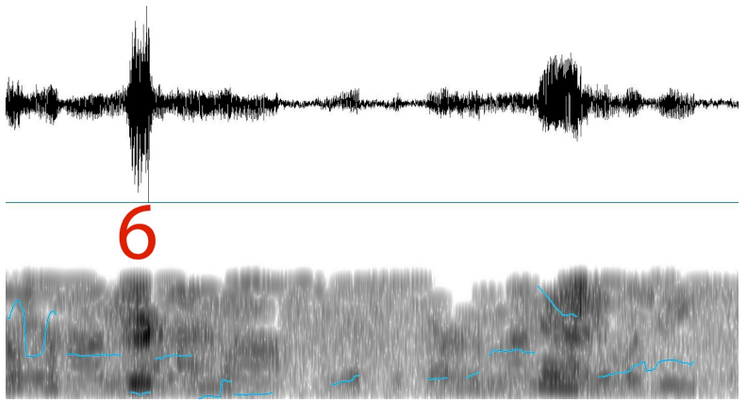

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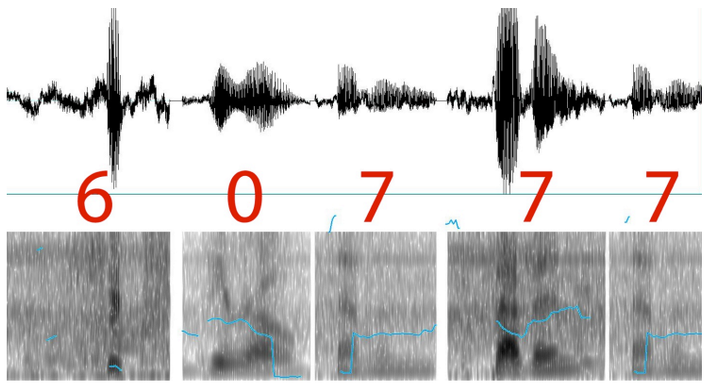

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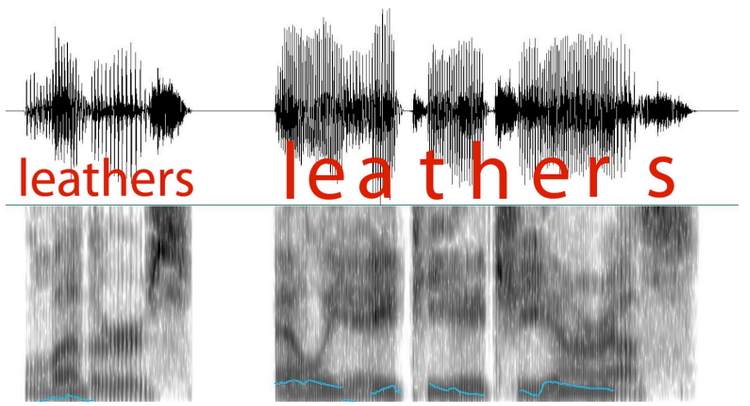

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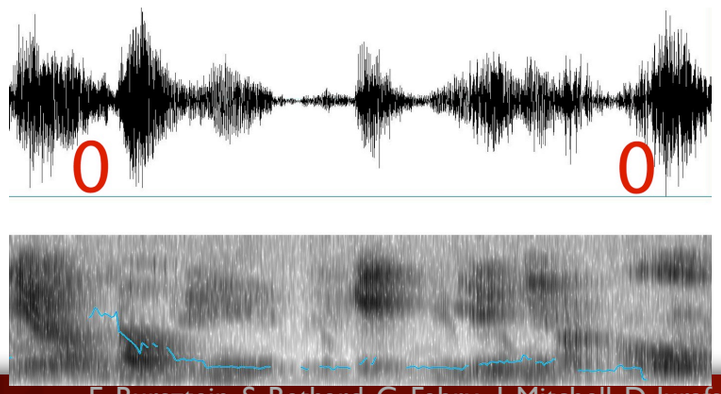

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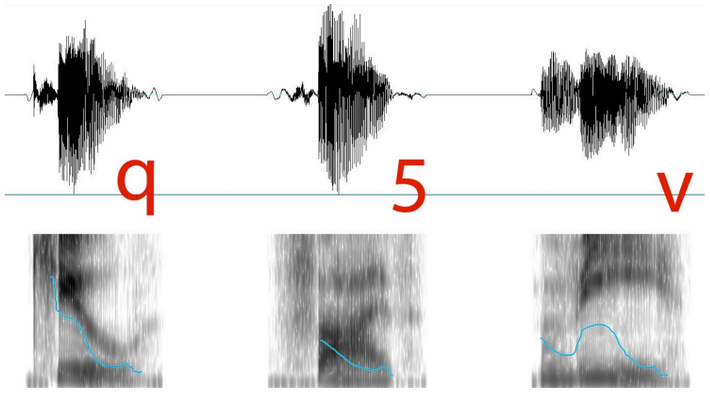

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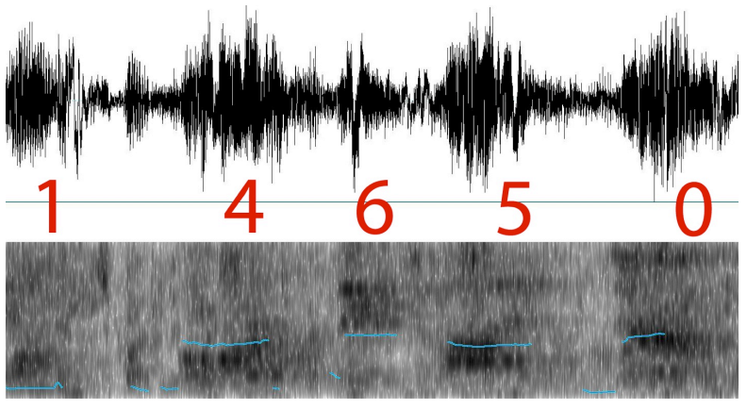

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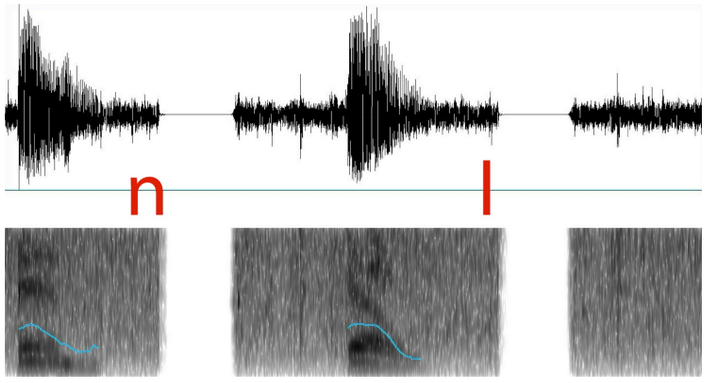

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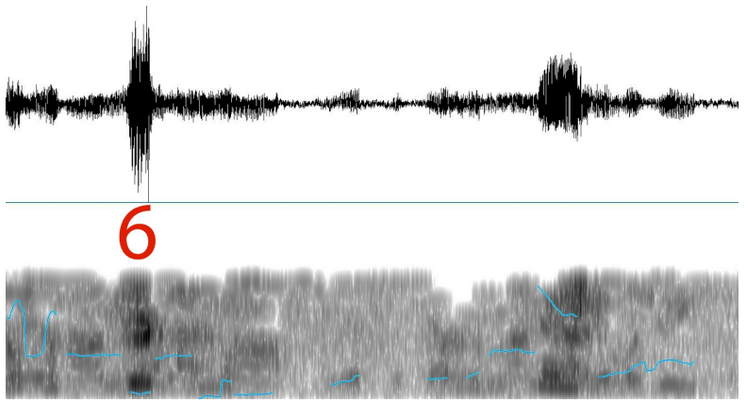

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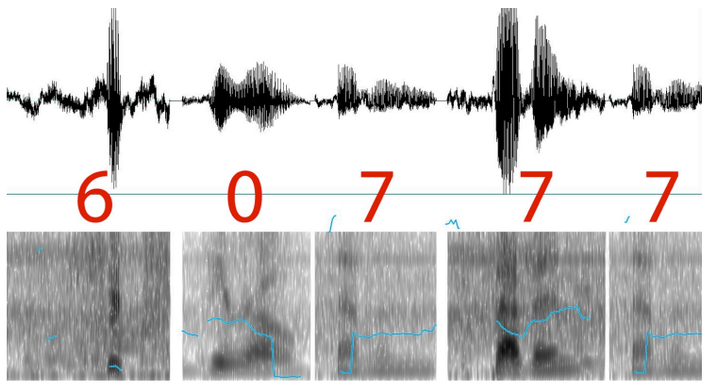

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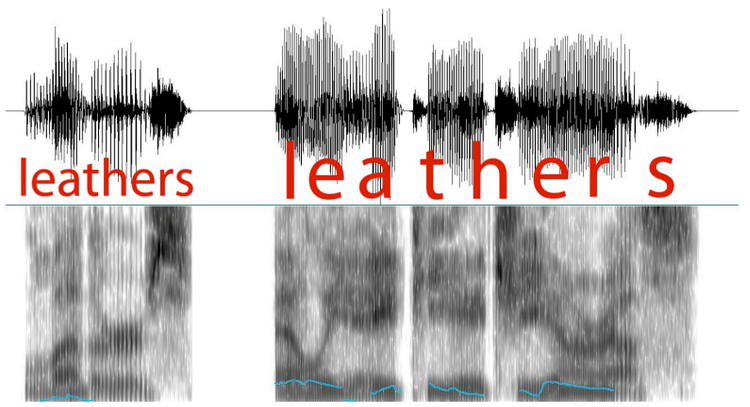

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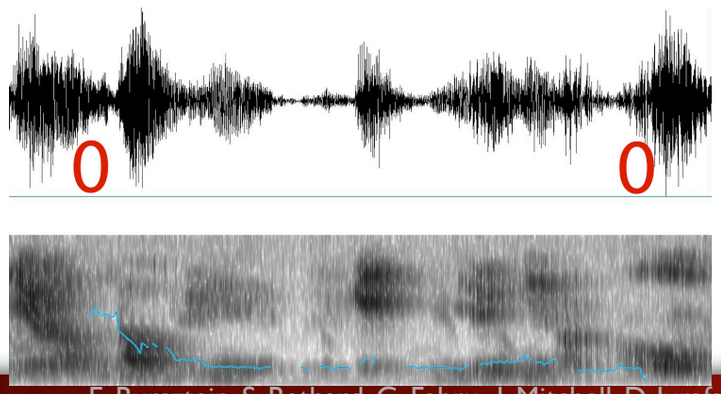
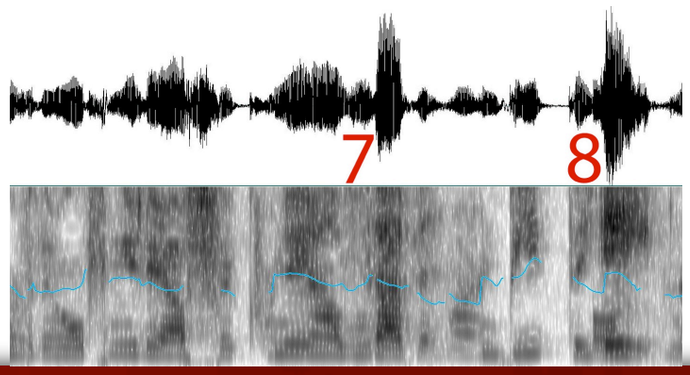


Google



Yahoo

Precision is costly

Precision is costly

1000

0.1% Precision
accuracy

Precision is costly

1000

x

3

0.1% Precision accuracy

Knowing the probable answer

Precision is costly

1000

x

3

3000

0.1% Precision accuracy

Knowing the probable answer

by scheme

Precision is costly

Precision is costly

63000

captcha

Underground API

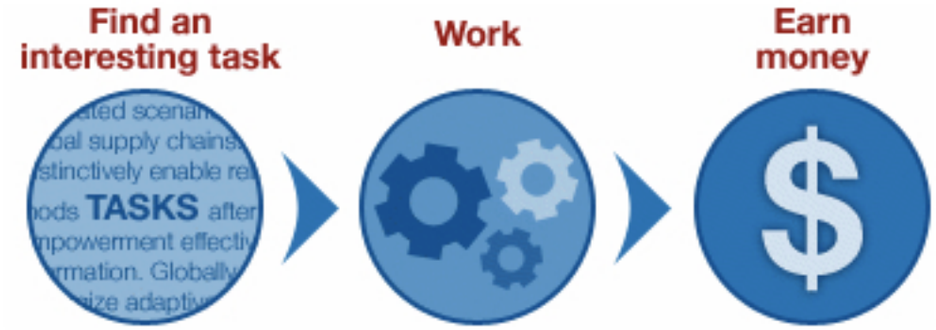
MTurk by Amazon

Make Money
by working on HITs

HITs - *Human Intelligence Tasks* - are individual tasks that you work on. Find HITs now.

As a Mechanical Turk Worker you:

- Can work from home
- Choose your own work hours
- Get paid for doing good work



Get Results
from Mechanical Turk Workers

Ask workers to complete HITs - *Human Intelligence Tasks* - and get results using Mechanical Turk. Register Now

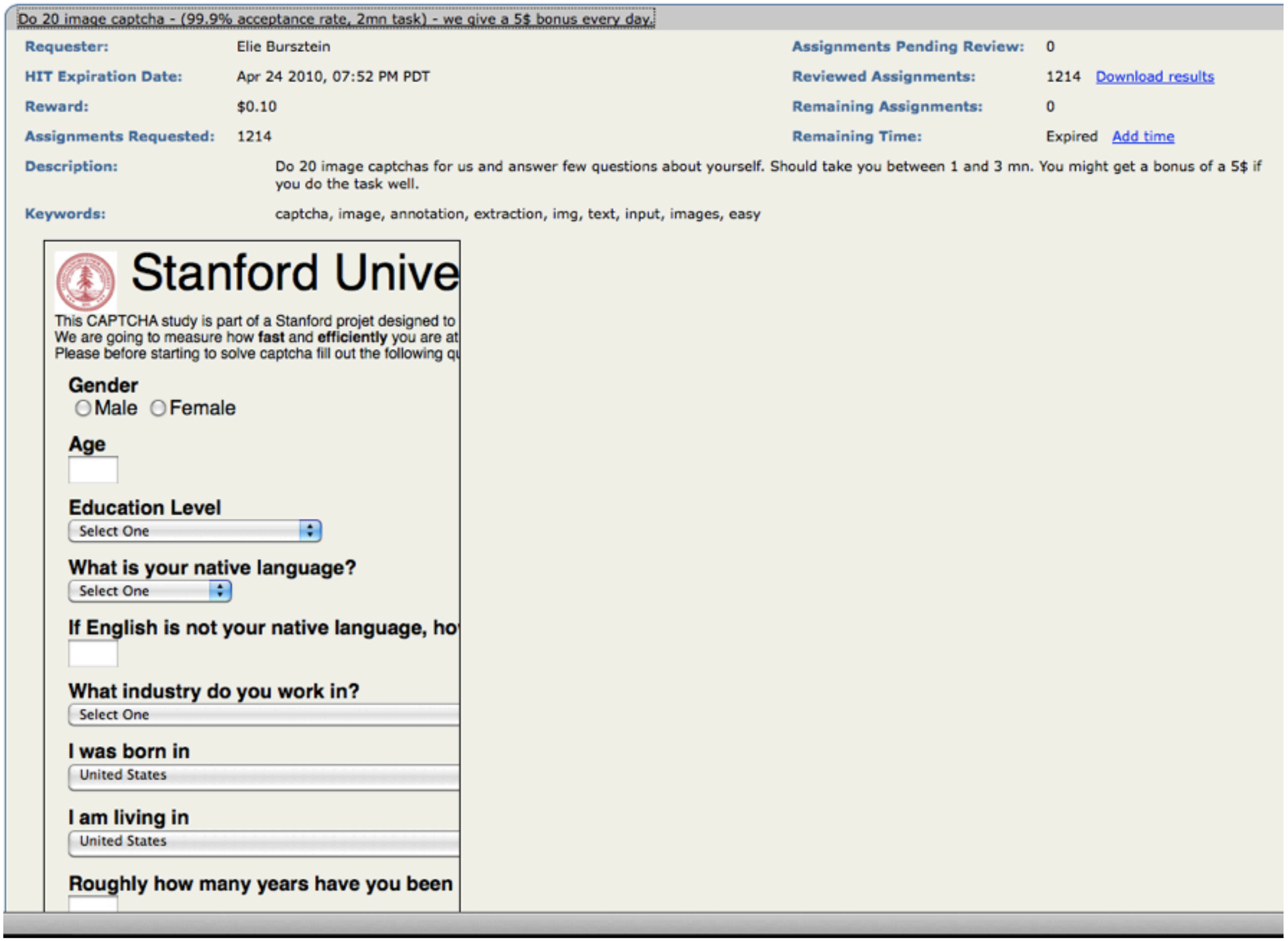
As a Mechanical Turk Requester you:

- Have access to a global, on-demand, 24 x 7 workforce
- Get thousands of HITs completed in minutes
- Pay only when you're satisfied with the results

Worker(s)

Requester (us)

Requester interface



Worker interface

Elie Bursztein

amazonmechanical turk
Artificial Artificial Intelligence

Your Account | HITs | Qualifications

160,530 HITs available now

Introduction | Dashboard | Status | Account Settings

Search for HITs containing that pay at least $ 0.00 for

Dashboard - Elie Bursztein (If you're not Elie Bursztein, click here.)

Total Earnings (What's this?)

Rewards You Have Earned	Value
Approved HITs	$0.00
Bonuses	$0.00
Total Earnings	$0.00

HIT Totals (What's this?)

HITs You Have Accepted	Value	Rate	HITs You Have Submitted	Value	Rate
HITs Accepted	0	—	HITs Submitted	0	—
... Submitted	0	—	... Approved	0	—
... Returned	0	—	... Rejected	0	—
... Abandoned	0	—	... Pending	0	—

HITs Available to You (What's this?)

Title	Requester	Reward	# of HITs
Find 5 Number's Link & Get Money - 2	Kaan SAKA	$3.50	1
!!! Find broken links or repeated photos !!! - 4	Kaan SAKA	$3.50	1
!!! Find broken links or repeated photos !!! - 1	Kaan SAKA	$3.50	1
!!! Find broken links or repeated photos !!! - 3	Kaan SAKA	$3.50	1
!!! Find broken links or repeated photos !!! - 2	Kaan SAKA	$3.50	1
Test our website's functionality!	Viky Shamwow	$2.00	3
Check the Functionality of Our Site!	John Pinskiy	$2.00	2

Largest captcha experiment ever

Largest captcha experiment ever

- 8 audio schemes

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- 13 images schemes

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- 1000 x 3 image captchas / scheme (bypass-captcha)

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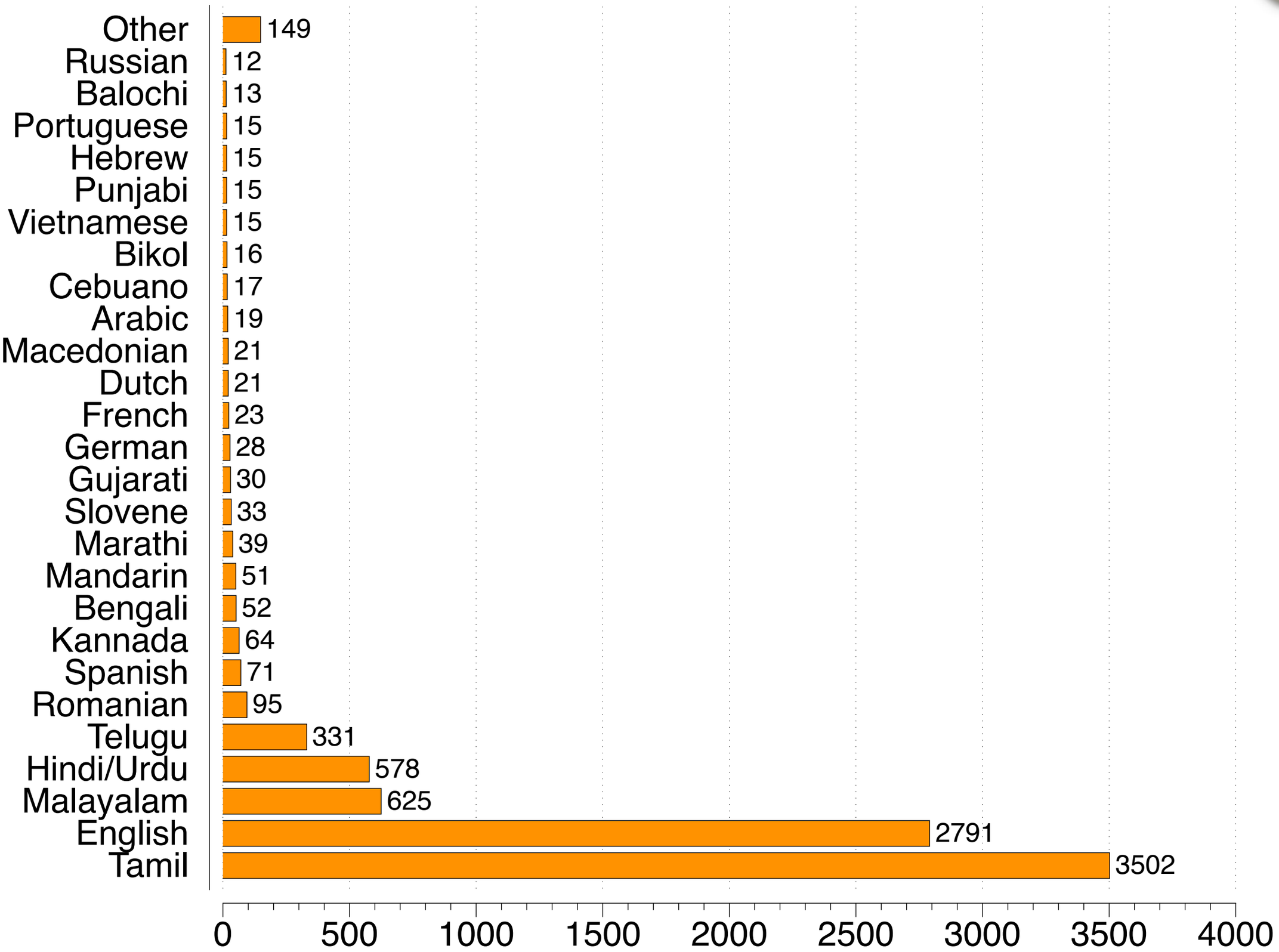
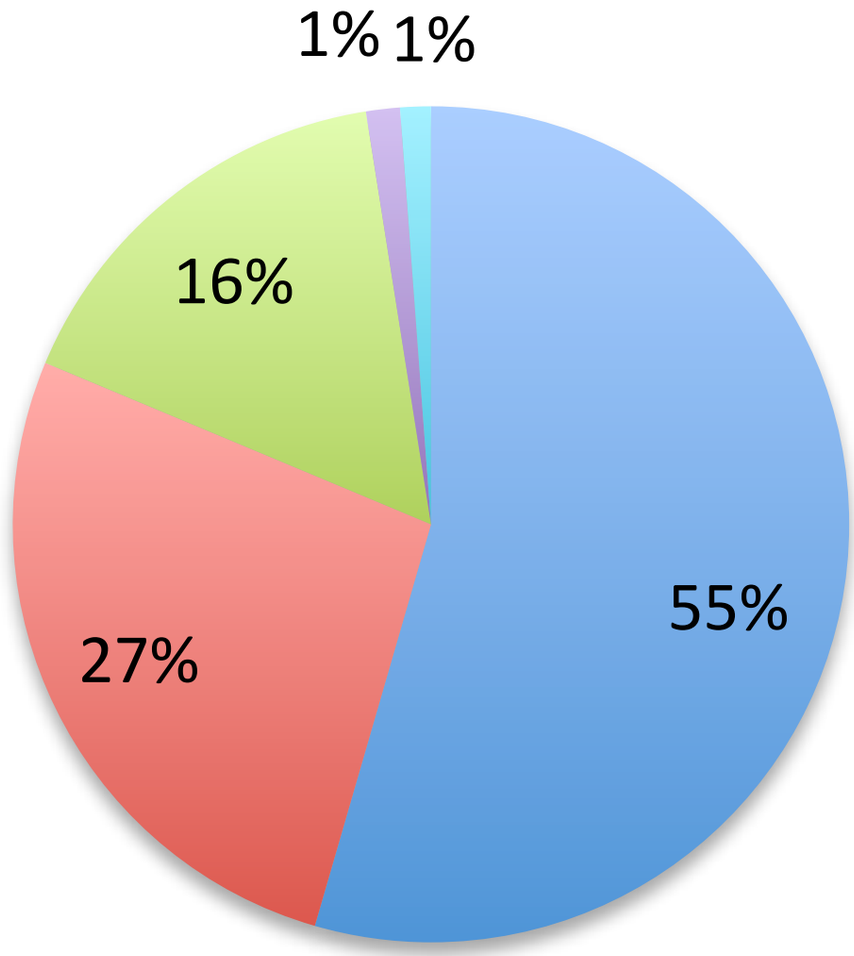
- 3500 x 3 audio captchas / scheme (MTurk)
- 5000 x 3 image captchas / scheme (MTurk)
- 318 000 captchas annotated overall

Language repartition

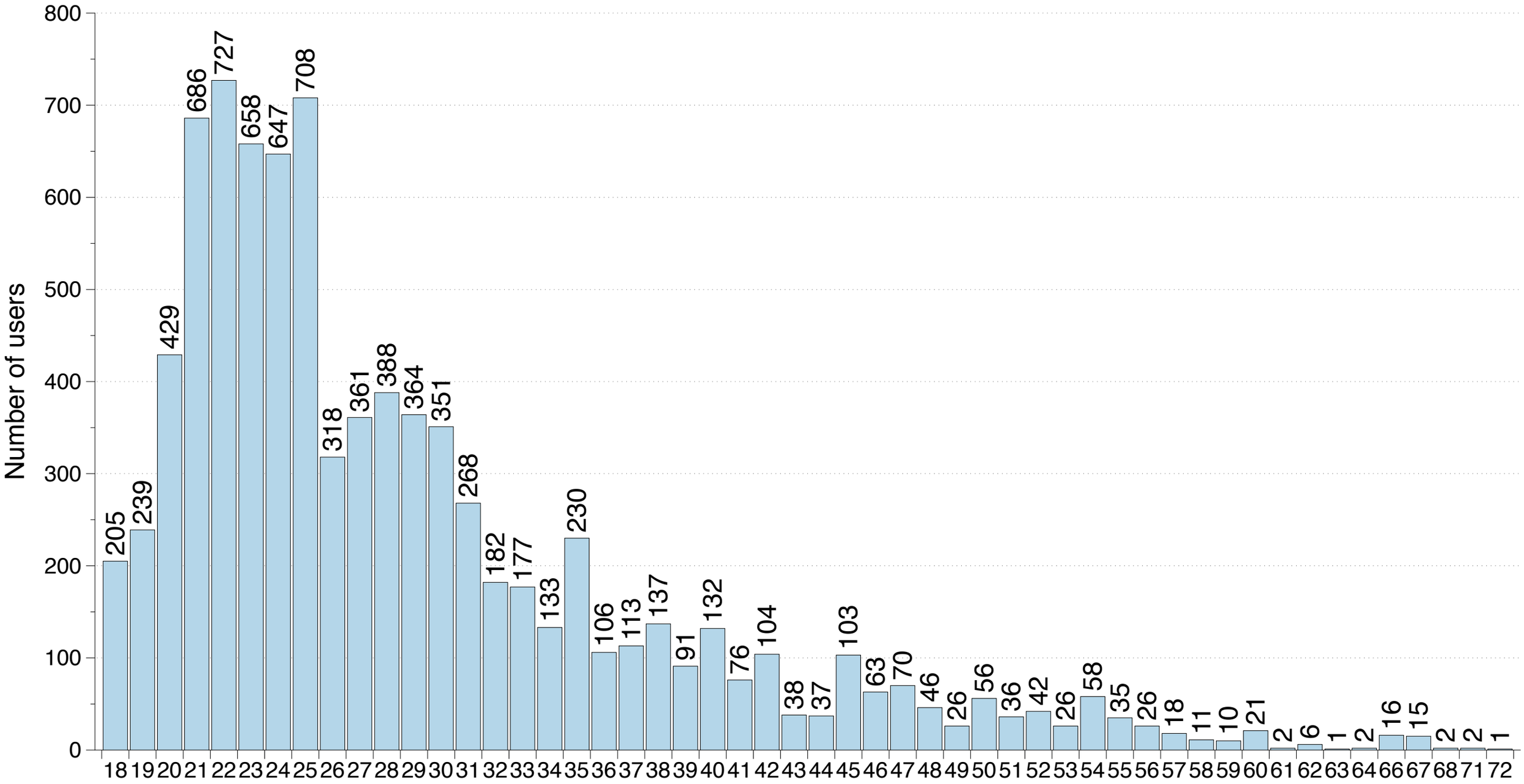


Repartition by education

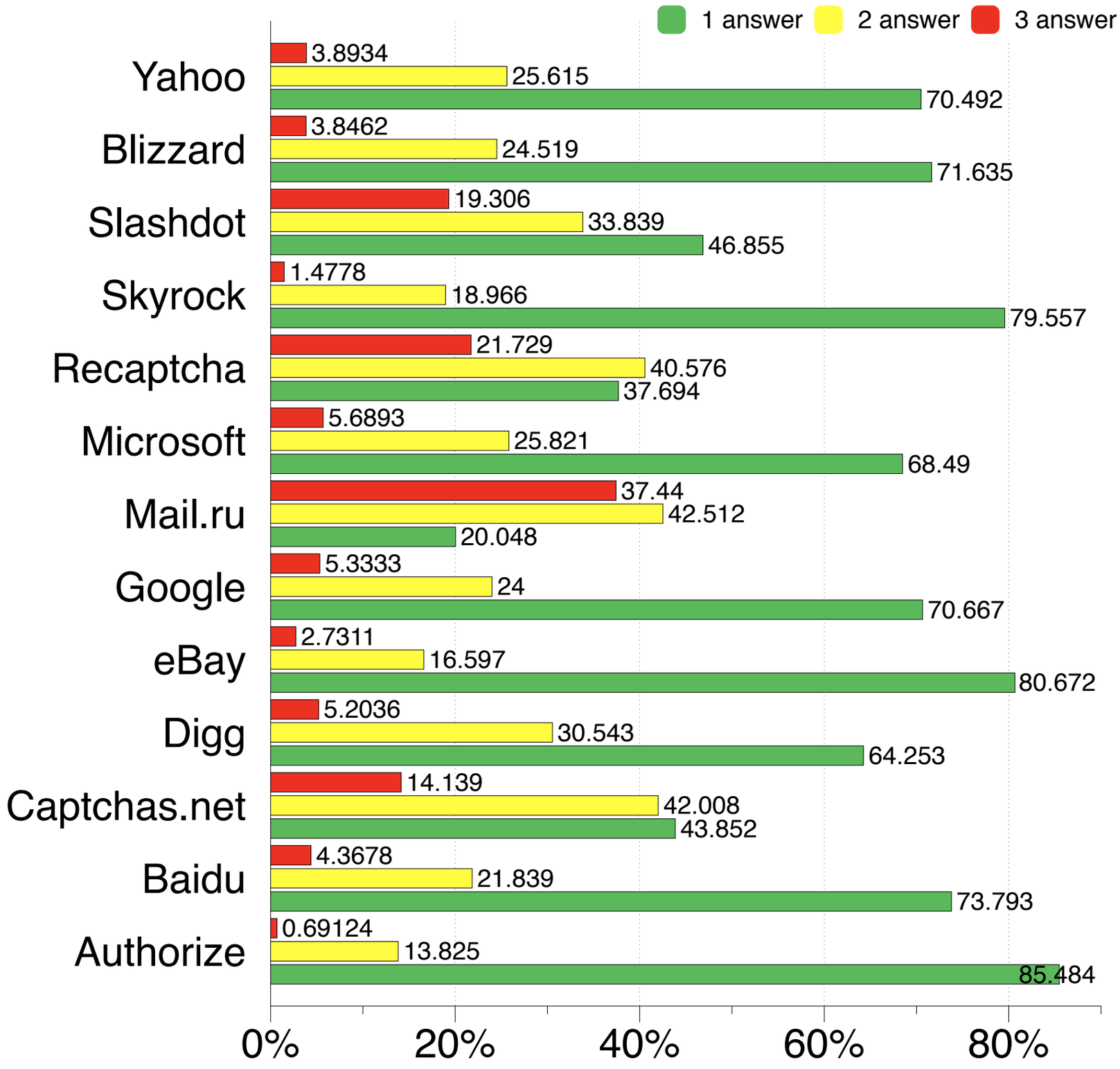


Bachelors High School Master No formal education Ph.D

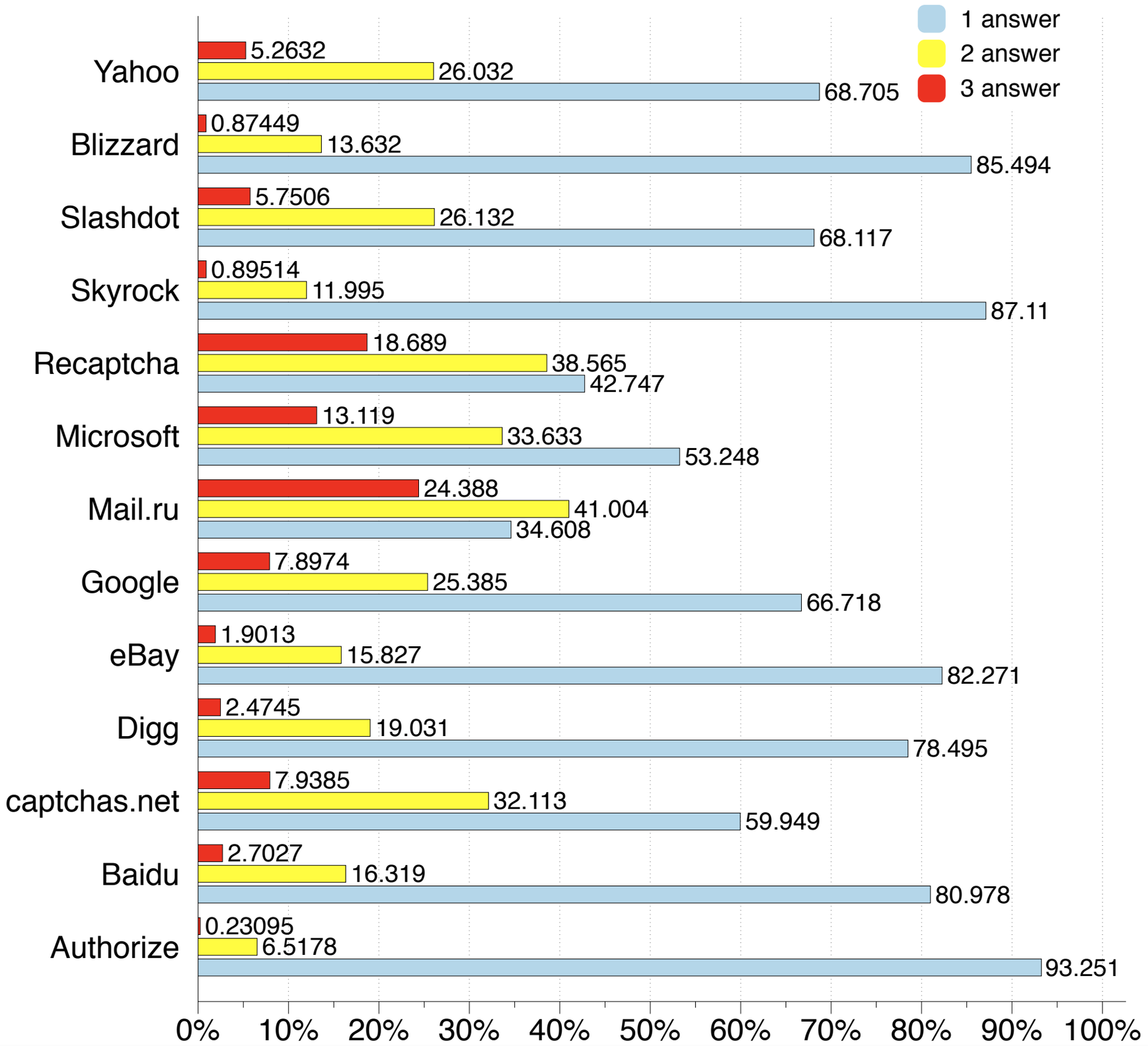
Age repartition



Nb of user distinct answer for image scheme (bp)



Nb of user distinct answer for image scheme (mk)



Nb of user distinct answer for audio scheme

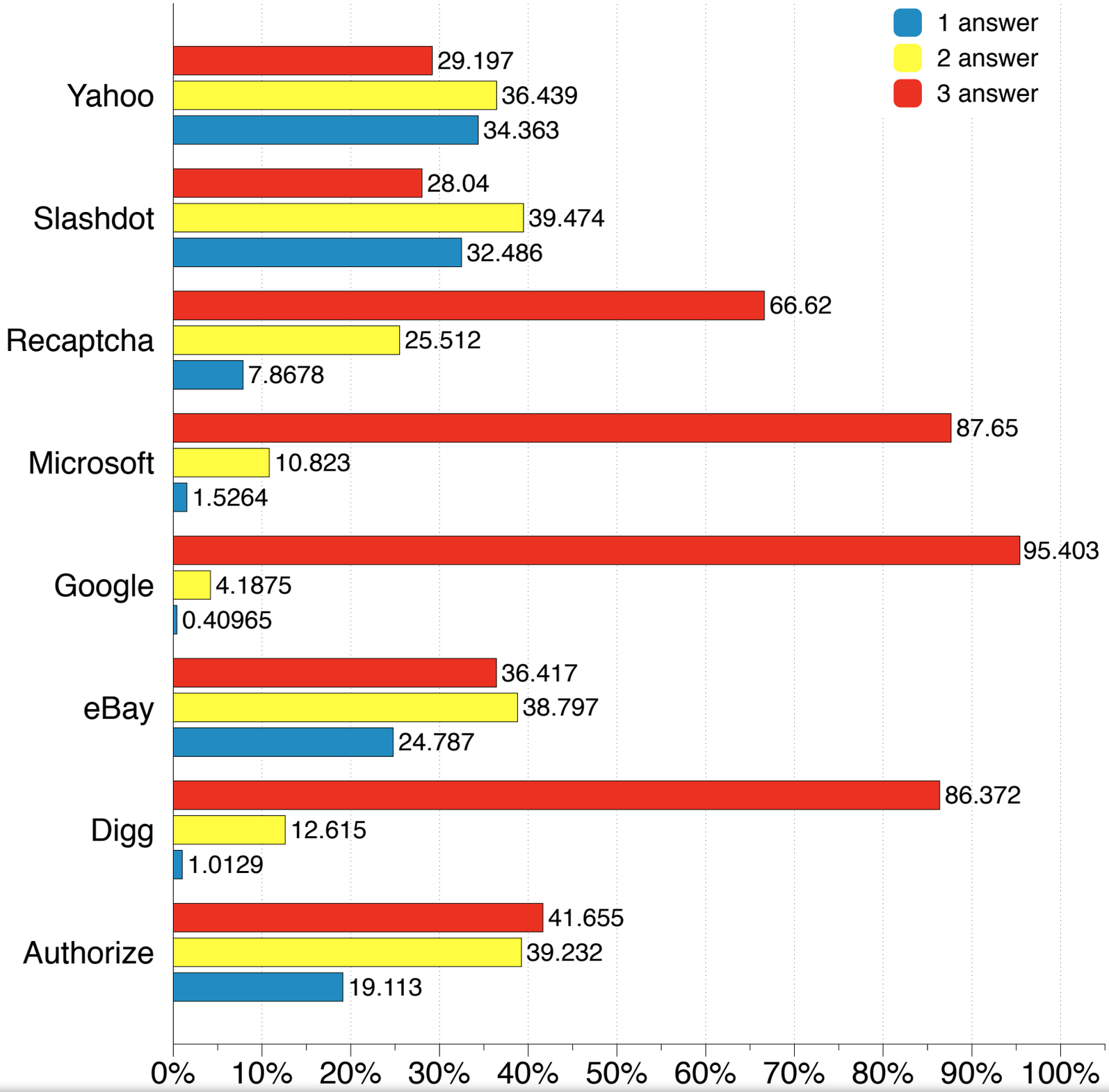
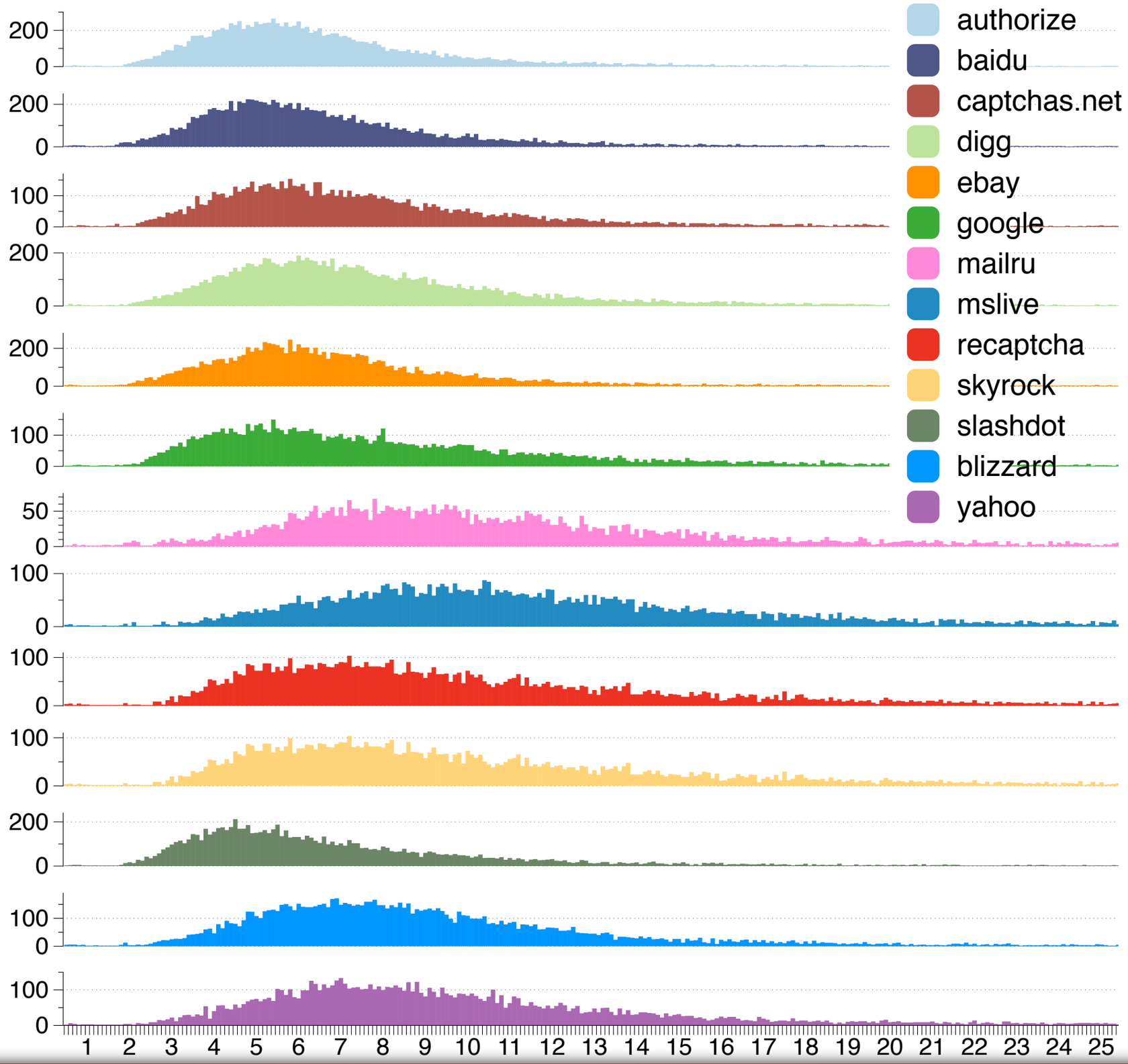
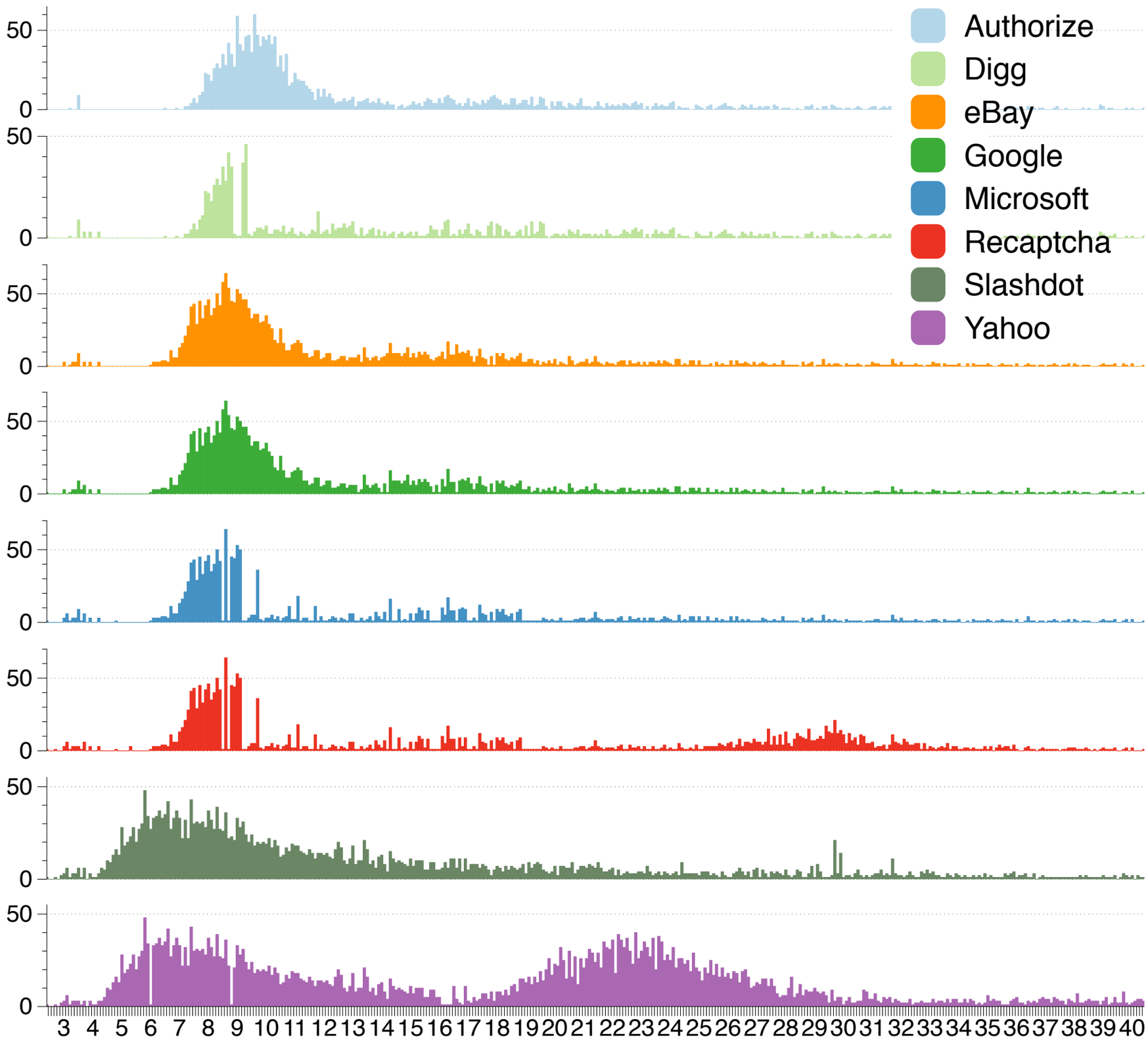


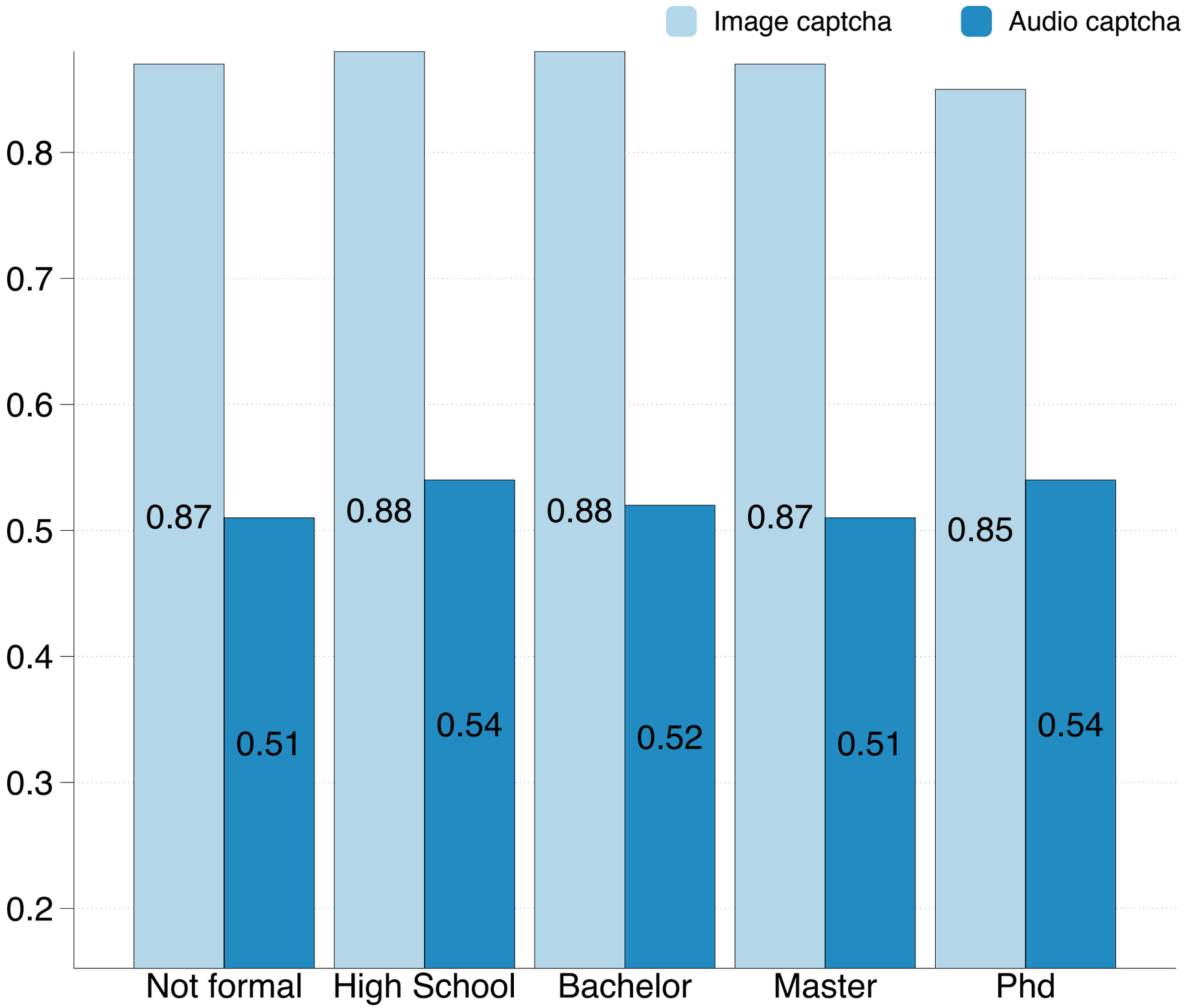
Image solving time



Audio solving time



Accuracy by education



Solving time by education

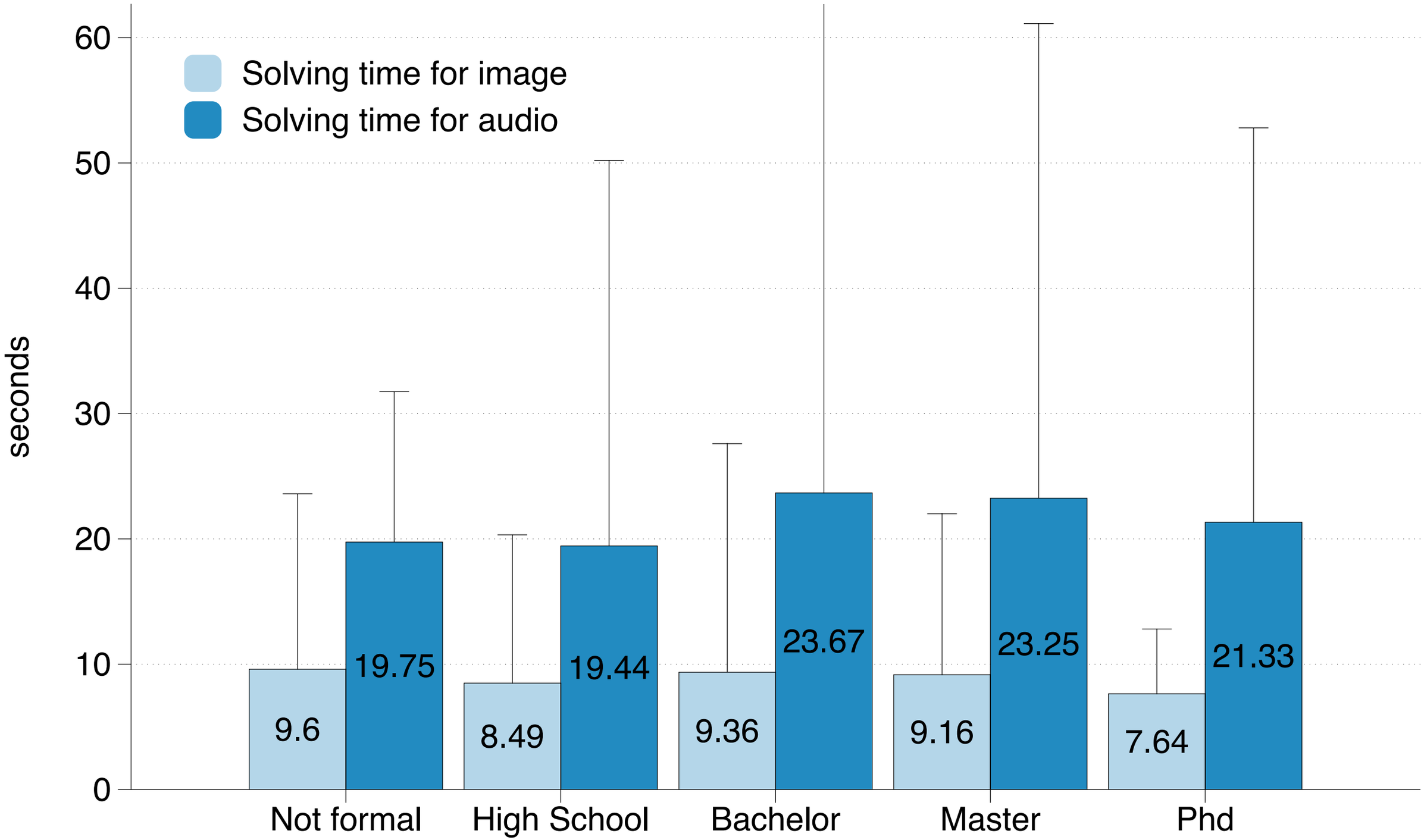


Image captcha accuracy time by language

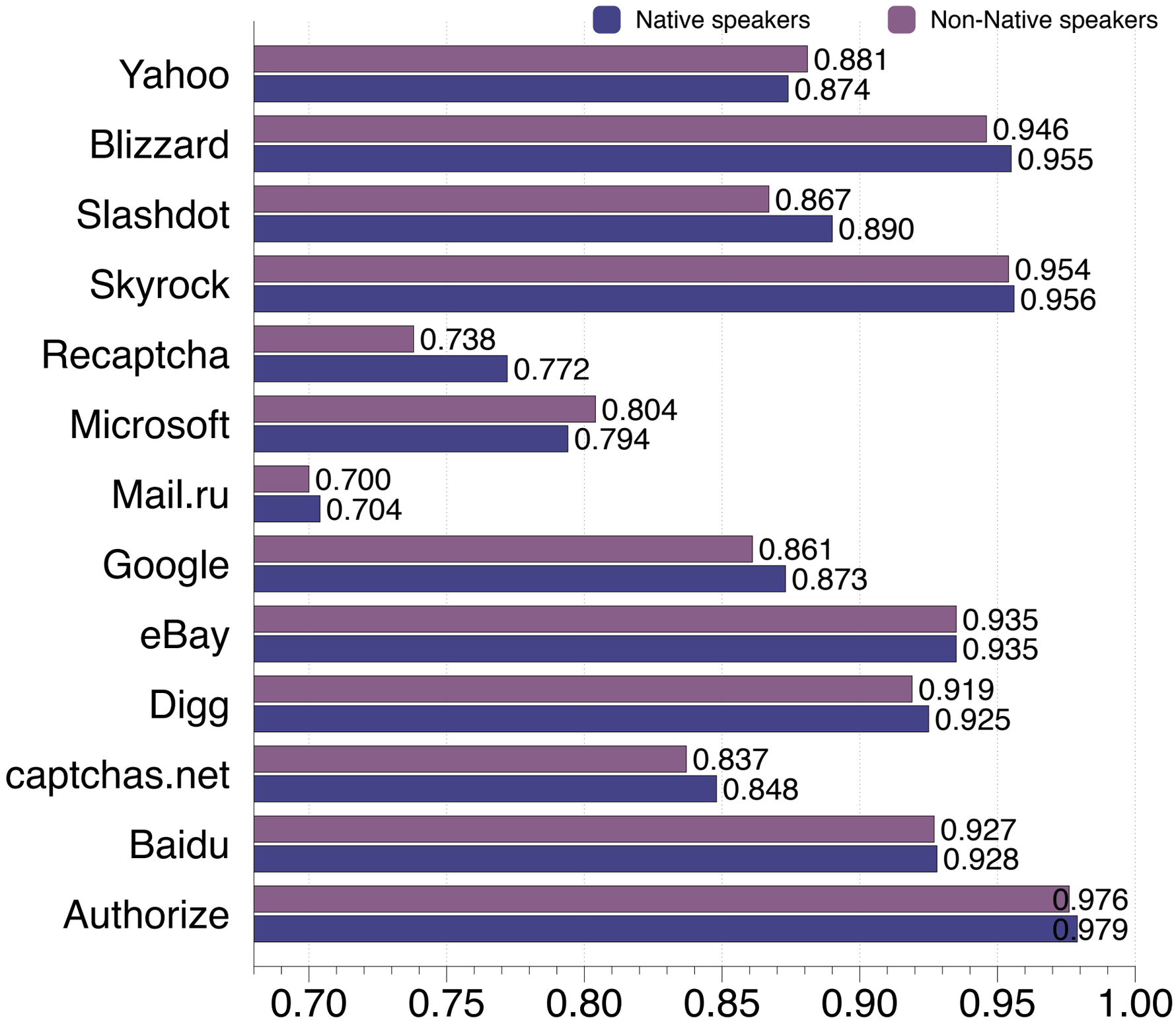
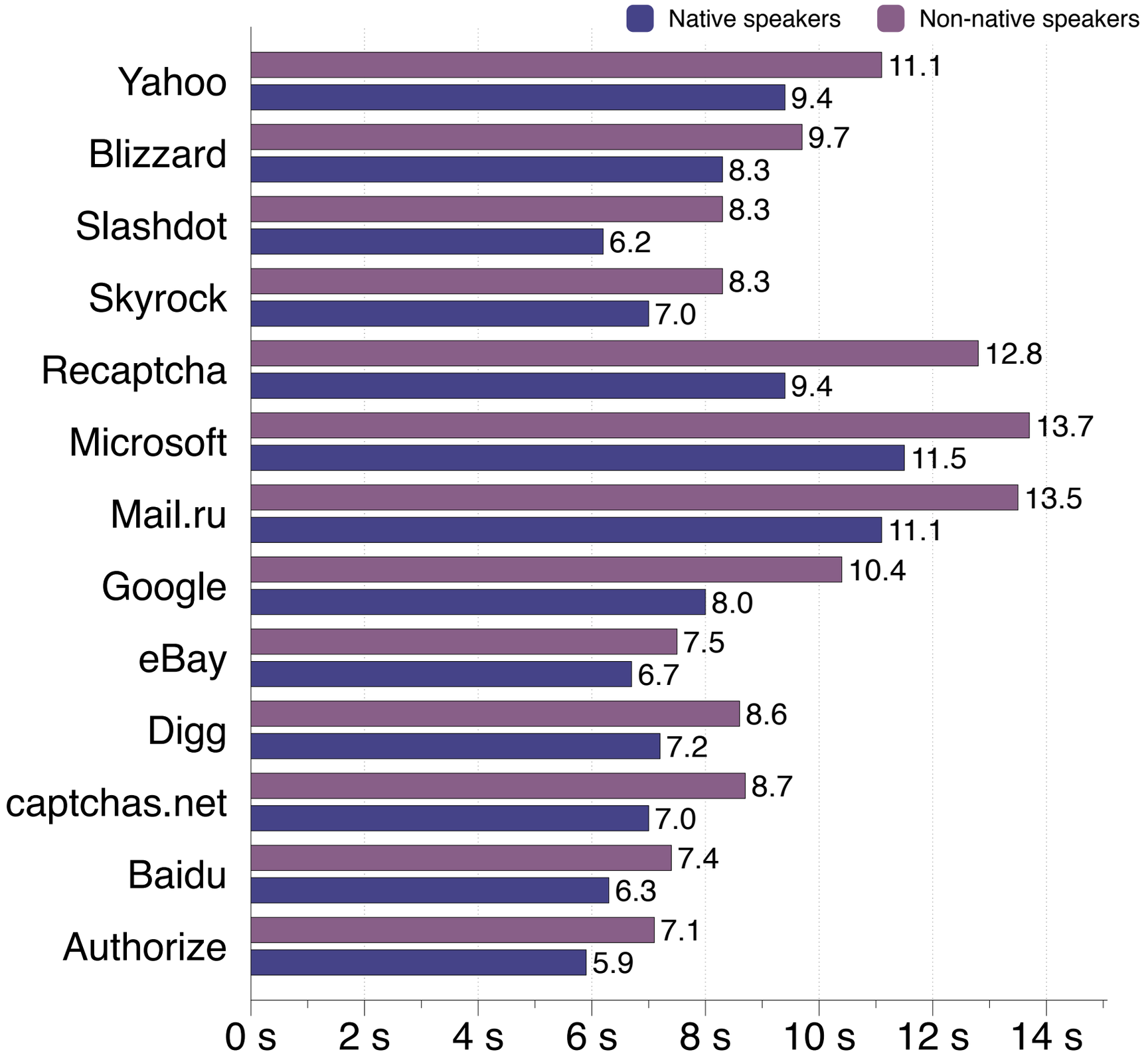
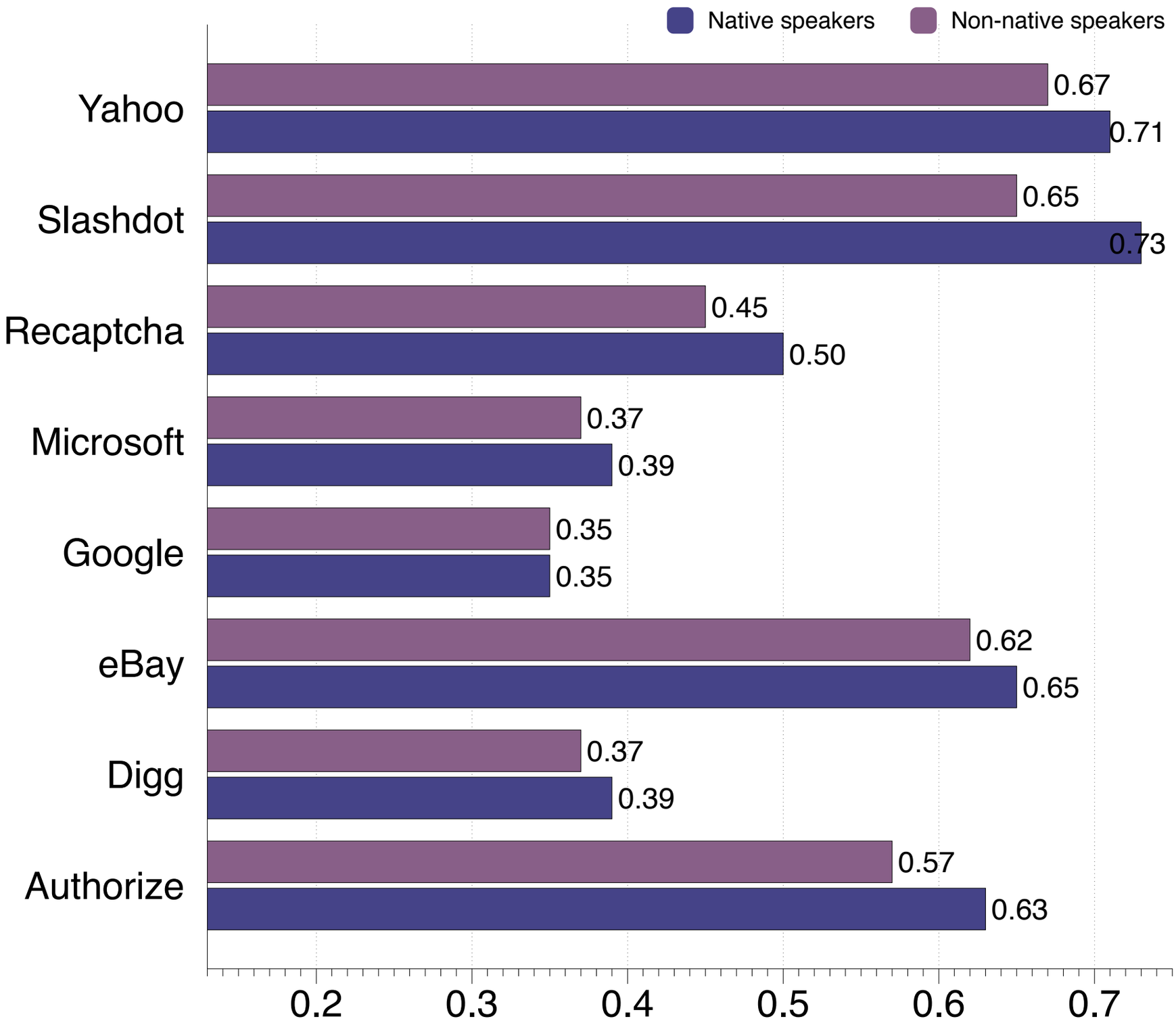


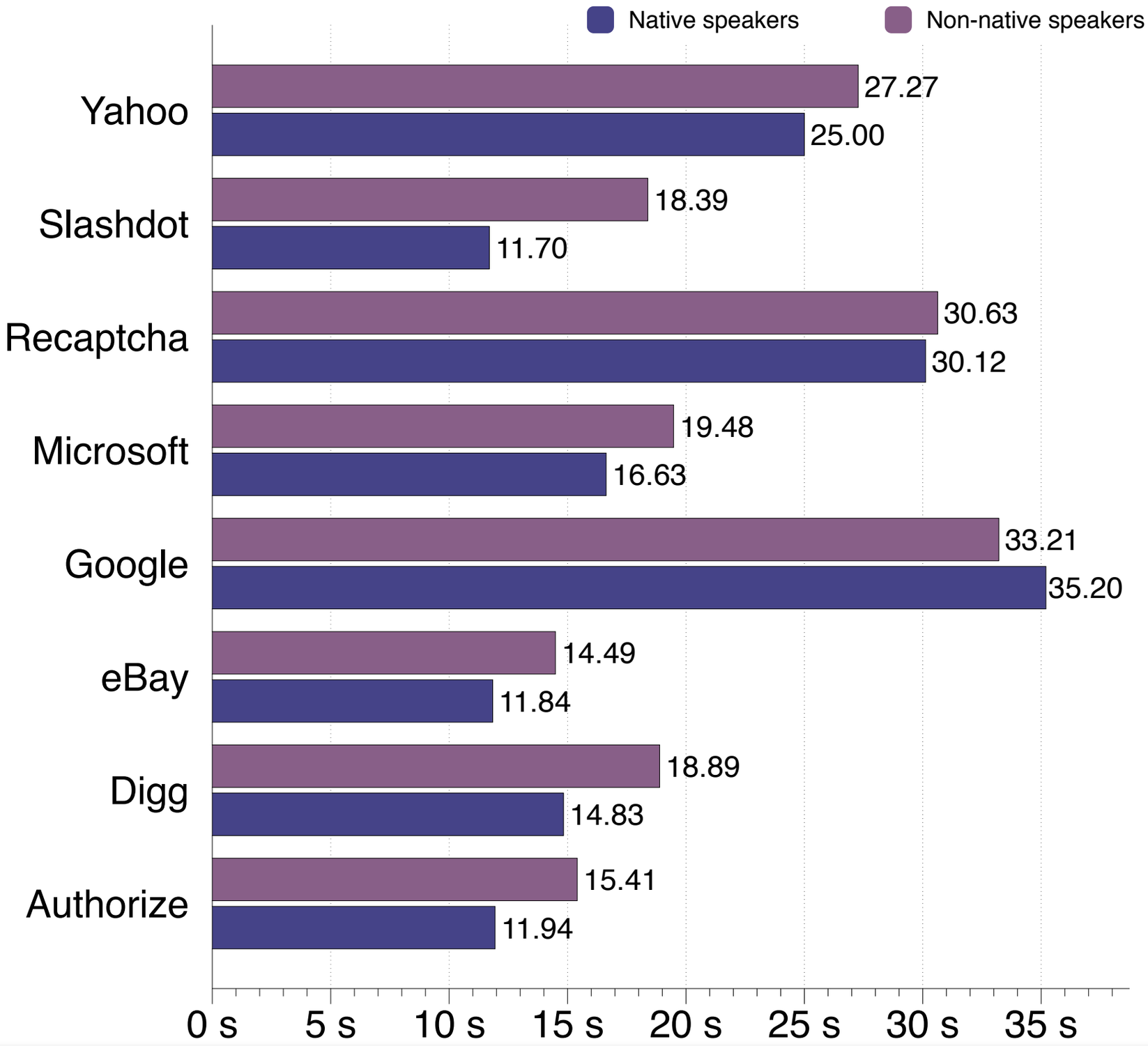
Image captcha solving time by language



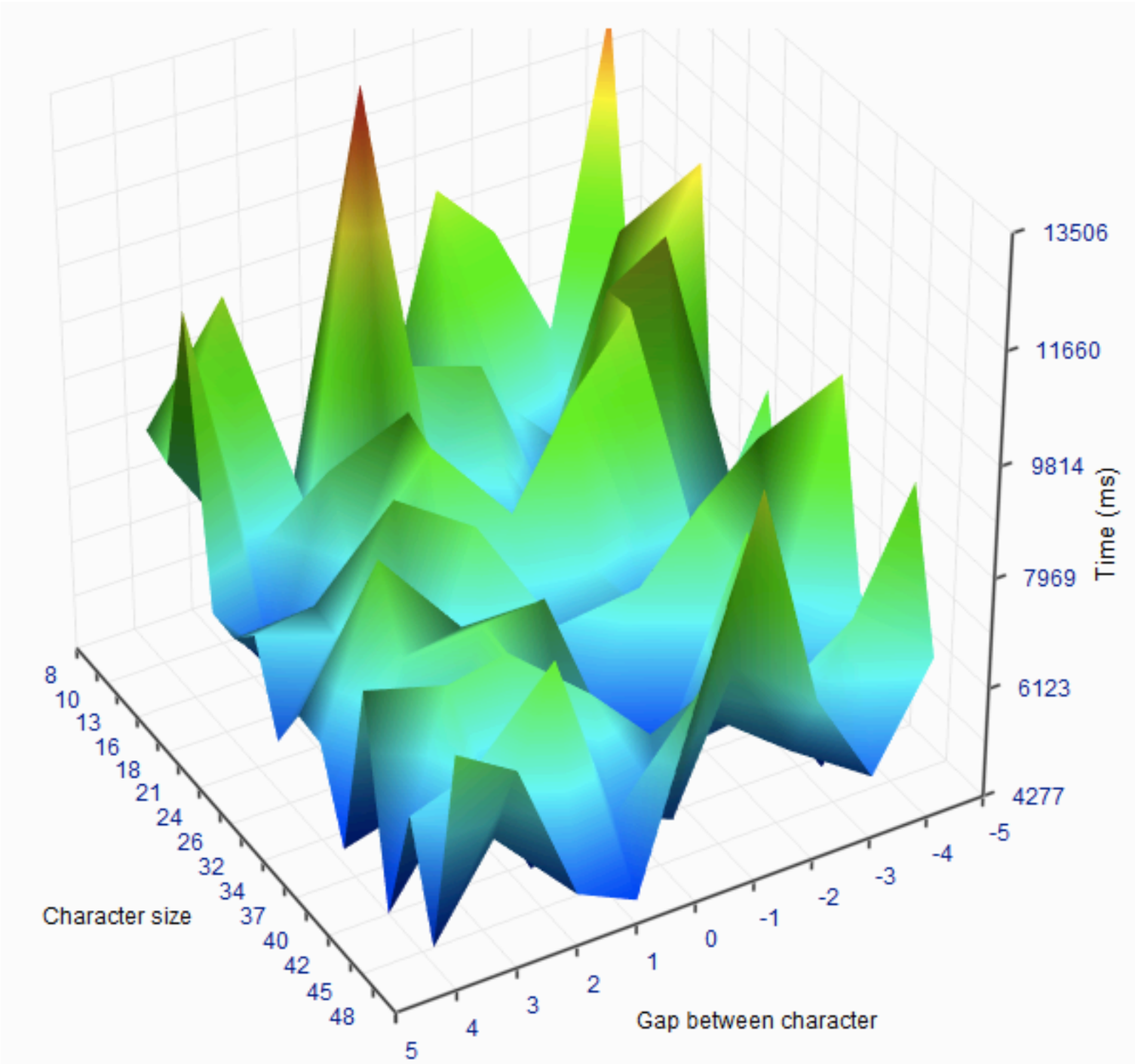
Audio captcha accuracy time by language



Audio captcha solving time by language



Conclusion / ongoing work

- Captcha security rely on many different techniques
- Not clear how to design them well
- Ongoing work
  - What makes a captcha hard/slow for human ?
  - What makes a captcha secure ?

Features interactions