

108-NLP @ NCTU

e-Lab 4

Boaz



Good morning!

Please make sure your **microphone** and **camera** are **OFF**

We'll take a break or two 🕒🕒🕒🕒

Groups: [join a group](#) (1~3 people) if you haven't done so

Lab 3, lessons learned

Incorrect probability

$$\text{gamma } p(w_2|w_1) + (1-\text{gamma}) p(w_1|w_2)$$

Incorrect N computation of cross entropy $-1/N \sum(\log_2(p_i))$

unicodecode()

Creating a vocabulary of INFREQUENT words

```
def oov_replace(sentence, unknown_tokens):  
    for idx, token in enumerate(sentence):  
        if token in unknown_tokens:  
            sentence[idx] = "<UNK>"  
    return sentence
```

How to use Counter()

```
sentence = tokenize('the quick brown fox ...')
```

```
count = Counter()  
for token in sentence:  
    count[token] += 1
```

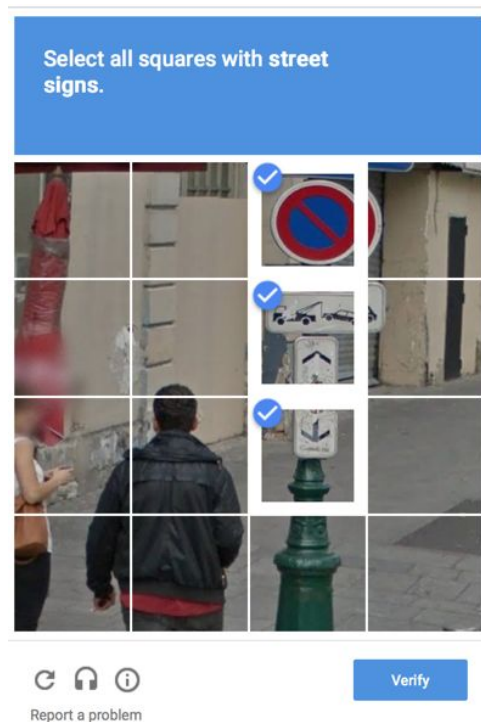
```
count = Counter()  
count.update(sentence)
```

Something different

Crowdsourcing (眾包)

Why?

- Create datasets
- Add labels to data
- Many other uses




Amazon Mechanical Turk

Crowdsourcing website to hire remote workers to perform small, well-defined tasks that computers are unable to do.



Instructions: Given an image, write a sentence summarizing what it shows
Use punctuation and don't mention that you're describing an image.



Summarize the image with a sentence...

The above description is 100% correct... sorry, but the worst
waiters we ever encountered. But Food is absolutely gorgeous.

(None)
☒ Positive
☐ Negative

Some MTurk terminology

Requesters are the crowdsourcing “employers”

Workers (or **mturkers**) are the (invisible) crowdsourcing “employees”

HITs (Human Intelligence Tasks) are the tasks

HIT Group: HITs with identical parameters

Assignment: a HIT assigned to a worker

Requesters

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



Workers

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

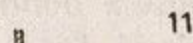
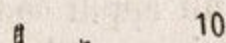
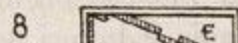
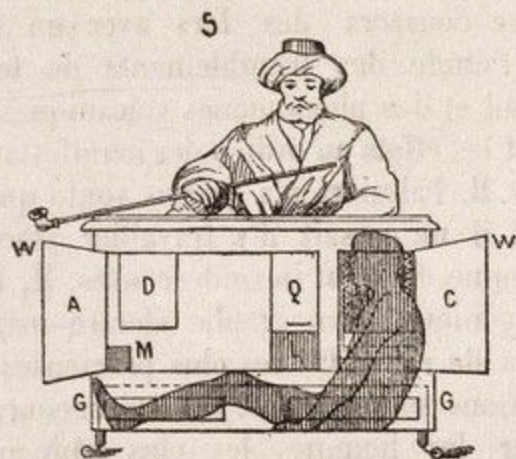
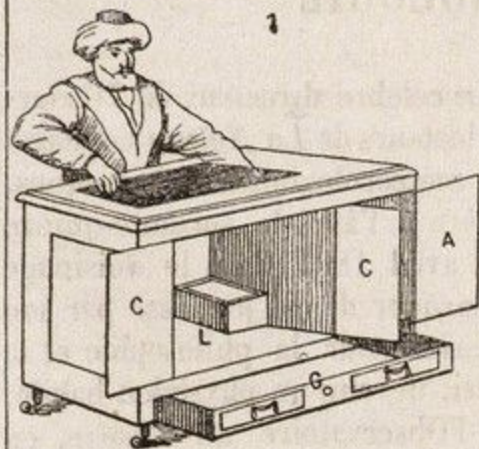


Why is it called **Mechanical Turk**?



[Wikipedia Article](#)





Who are the Workers?

Mostly (but not only) from:

- India (mostly use MTurk as main income)
- USA (mostly use MTurk as extra income)

Many MTurker forums/websites, e.g.:

<https://turkopticon.ucsd.edu/>

<https://forum.turkerview.com/>

Walther Glodstad A1MYJLUMH2FHMM HIT Group »	PRV: 1.00 / 5 FAST: 1.00 / 5 FAIR: 1.00 / 5 COMM: 1.00 / 5	2
Margaret Ena Inesi A1B1Y7CUNXAFAP4 HIT Group »	PRV: 2.56 / 5 FAST: 2.16 / 5 FAIR: 2.25 / 5 COMM: 1.41 / 5	69
LBC Mechanical Turk A1YU4YZP4ASF6M HIT Group »	PRV: 3.07 / 5 FAST: 4.44 / 5 FAIR: 4.57 / 5 COMM: 4.45 / 5	52
Keith Sanford A1BNGSS2CSINH2 HIT Group »	PRV: 2.50 / 5 FAST: 1.50 / 5 FAIR: 2.00 / 5 COMM: 5.00 / 5	2
Ahmet Ozturk AXSQPC6MXYTT9 HIT Group »	PRV: 2.40 / 5 FAST: 3.67 / 5 FAIR: 3.67 / 5 COMM: no data	5
Behavioral Lab A3QSKTUM1QEXNY HIT Group »	PRV: 3.23 / 5 FAST: 4.13 / 5 FAIR: 4.35 / 5 COMM: 3.40 / 5	667
ICS AI team A2SAUCU1B6BDTS HIT Group »	PRV: 2.89 / 5 FAST: 3.29 / 5 FAIR: 3.41 / 5 COMM: 1.86 / 5	24
Brooke N. Macnamara AGXMSUYVA3O7O HIT Group »	PRV: 1.50 / 5 FAST: 5.00 / 5 FAIR: 5.00 / 5 COMM: no data	2
cbresearchlab AW8LX7H3UHVVRM HIT Group »	PRV: 3.67 / 5 FAST: 4.54 / 5 FAIR: 4.68 / 5 COMM: 3.73 / 5	74
ds-exp A2AAGUCSNIKSNL	PRV: no data FAST: no data	1

Some VERY IMPORTANT Rules

Treat workers ethically and with respect

Pay QUICKLY and FAIRLY

Estimate the required time, pay at least MINIMUM WAGE

Let's take a look

<https://WorkerSandbox.mturk.com/>

Sandbox



HIT properties

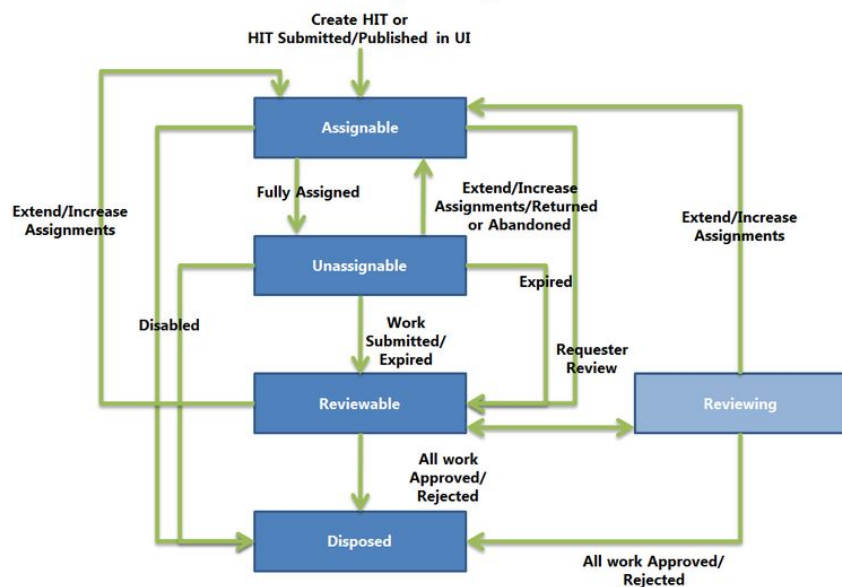
- ❑ Title
- ❑ Description
- ❑ Tags
- ❑ Assignments per HIT
- ❑ Reward per assignment (\$\$\$)
- ❑ Time allotted per assignment
- ❑ HIT expiration
- ❑ How long to pay workers
- ❑ **Worker requirements**

HIT States

- Assignable — HIT can be accepted by a worker
- Unassignable — HIT accepted, work in progress
- Reviewable — HIT finished
- Disposed — the HIT has been deleted

Optional:

- Reviewing — HIT currently being reviewed by Requester



Worker Requirements

- ❑ Geographical location (e.g., TW)
- ❑ Language spoken
- ❑ Minimum HIT approval rate
- ❑ Minimum number of HITs approved
- ❑ More...

A screenshot of a scrollable list of worker requirements. The list is contained within a rectangular frame with a vertical scrollbar on the right side. The text is left-aligned and includes various categories of requirements such as employment industry, sector, status, exercise frequency, and financial assets.

Employment Industry - Media & Entertainment
Employment Industry - Retail, Wholesale & Distribution
Employment Industry - Software & IT Services
Employment Sector - Non-Profit
Employment Status - Full time (35+ hours per week)
Employment Status - Part time (1-34 hours per week)
Employment Status - Unemployed
Exercise - Every Day
Exercise - Four Plus Times a Week
Exercise - Not at All
Exercise - Once a Week
Exercise - Two to Three Times a Week
Facebook Account Holder
Financial Asset Owned - Certificate of Deposit (CD)
Financial Asset Owned - Checking Account
Financial Asset Owned - Common Share Stocks
Financial Asset Owned - Exchange-Traded Fund (ETF)
Financial Asset Owned - Money Market Account
Financial Asset Owned - Mutual Funds

MTurk Options for Requesters

- ✓ Graphical User Interface (GUI)
- ✓ Command Line Interface (CLI)
- ✓ **Software Development Kit using the MTurk API**

Boto

Python SDK
(Software Development Kit)

for

AWS (Amazon Web Services)

<https://boto.readthedocs.io/en/latest/ref/mturk.html>



Let's create an experiment

Relation between LANGUAGE and COLOR

- ✓ Created an account on Amazon Web Services (AWS) to use the API
- ✓ Created an account on Amazon Mechanical Turk (MTurk) as a REQUESTER
- ✓ Linked the two accounts
- ✓ Created an external question <https://bshmueli.github.io/108-nctu-mturk/pink.html>

Behind the scenes

The Form Action

The form on the external website must post the result data back to Amazon Mechanical Turk using the following URL:

```
https://www.mturk.com/mturk/externalSubmit
```

Or, if you are using the Amazon Mechanical Turk sandbox, you should post the result data back to Mechanical Turk using the following sandbox URL:

```
https://workersandbox.mturk.com/mturk/externalSubmit
```

<https://bshmueli.github.io/108-nctu-mturk/pink.html?assignmentId=123RVWYBAZW00EXAMPLE456RVWYBAZW00EXAMPLE&hitId=123RVWYBAZW00EXAMPLE&turkSubmitTo=https://www.mturk.com&workerId=AZ3456EXAMPLE>

```

<!doctype html>
<html lang="en">
<head>
  <meta content="text/html; charset=UTF-8" http-equiv="Content-Type" />
  <script src='https://s3.amazonaws.com/mturk-public/externalHIT_v1.js' type='text/javascript'></script>
</head>
<body>
  <form id="mturk_form" method="post" name="mturk_form">
    <input type="hidden" id="assignmentId" value="" name="assignmentId"/>

    <h2>Which of the following best represents the color pink?</h2>

    <fieldset style="font-size: 150%">
      <p><input name="darknessVal" type="radio" value="pink" /> <span style="
      <p><input name="darknessVal" type="radio" value="lightpink" /> <span style="
      <p><label><input name="darknessVal" type="radio" value="hotpink" /> <span style="backgr
      <p><label><input name="darknessVal" type="radio" value="deeppink" /> <span style="backgr
      <p><label><input name="darknessVal" type="radio" value="palevioletred" /> <span style="backgr
      <p><label><input name="darknessVal" type="radio" value="mediumvioletred" /> <span style="backgr
    </fieldset>
    <br>
    <input type="submit">
  </form>
  <script language='Javascript'>turkSetAssignmentID();</script>
</body>
</html>

```

https://docs.aws.amazon.com/AWSMechTurk/latest/AWSMTurkAPI/ApiReference_ExternalQuestionArticle.html

Team Assignment:

Create an MTurk Experiment to

Label the emotion in a short text

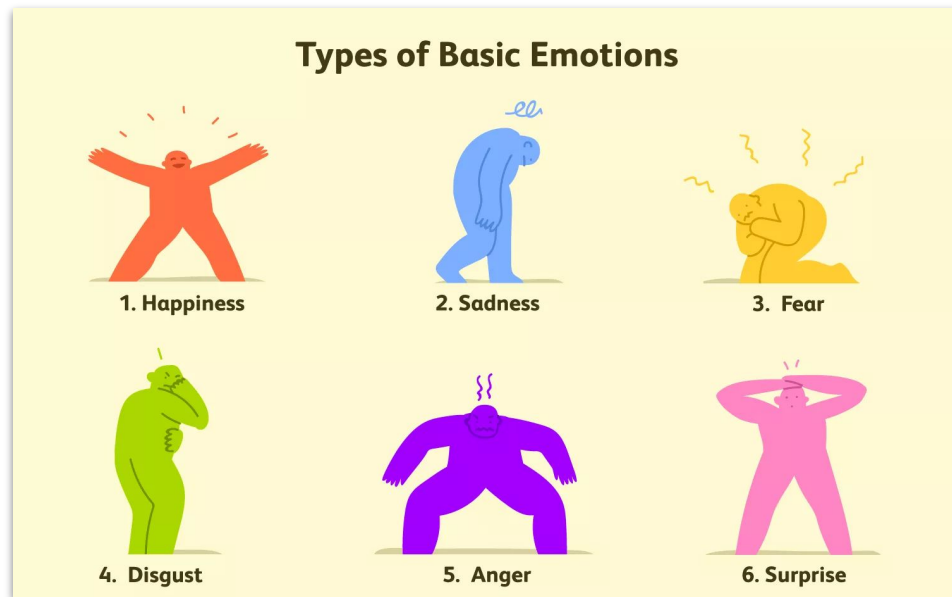
Group Assignment: same teams as **Final Project**

Only one submission per team

Emotion Models

Discrete

- Happy
- Sad
- Angry
- Jealous
- Surprised
- ...

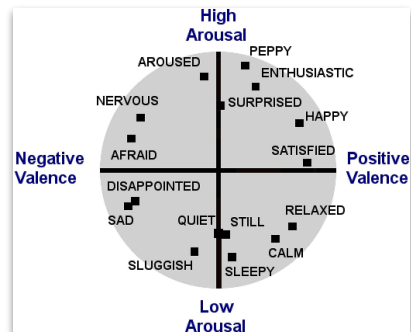


Emotion Models

Dimensional

2 or 3 (almost) independent dimensions

- **Valence** (Pleasure)
- **Arousal**
- **Dominance**



	Hostility	Guilt	Fear	Sadness	Shyness	Fatigue	Surprise	Calmness	Attentive	Self-assurance	Joviality
Valence											
Mean	-3.73	-3.48	-3.28	-3.26	-2.65	-2.04	0.58	2.53	3.02	3.19	4.17
SD	0.78	1.05	0.88	1.15	0.98	1.35	0.93	1.07	1.10	0.97	0.58
Assignment	NEG	NEG	NEG	NEG	NEG	NEG	POS	POS	POS	POS	POS
Arousal											
Mean	3.08	1.69	2.36	0.04	0.44	-1.00	2.62	-0.91	2.18	3.50	3.93
SD	1.12	1.76	1.15	2.16	1.76	2.18	1.28	2.06	1.56	1.03	0.77
Assignment	HI	MD	HI	LO	LO	LO	HI	LO	HI	HI	HI
Dominance											
Mean	1.81	-1.24	-0.93	-2.52	-3.10	-3.34	0.12	-1.73	2.03	3.38	2.80
SD	1.64	1.68	1.64	1.56	1.56	1.41	1.40	1.72	1.52	1.06	1.16
Assignment	HI	LO	LO	LO	LO	LO	MD	LO	HI	HI	HI

Assignment (1)

Data: <https://bit.ly/nlp-amt-data>

1ab4-data.csv	
Search this file...	
idx	text
43142	Why did Nervous Nancy allow corrupt politician Shifty Schiff to lie before Congress? He must be a Witness, and so should she!
55375	if you say Dragonball (Z , Kai etc) your opinion is invalid on anime takes 😊
2522	With @realDonaldTrump I took all of the bluster for self confidence, I missed it. Didn't realize he was over compensating for very low self-esteem. Also
44950	Cryin' Chuck Schumer just said, "The American people want a fair trial in the Senate." True, but why didn't Nervous Nancy and Corrupt politician Adam
59256	you broke as hell if you order bottomless mimosas. you cant afford individual drinks? tacky.
8822	Virginia has the best Unemployment and Economic numbers in the history of the State. If the Democrats get in, those numbers will go rapidly in the c
3300	Never Trumper Republican John Bellinger, represents Never Trumper Diplomat Bill Taylor (who I don't know), in testimony before Congress! Do Nothin
51987	Senate hearing on the Impeachment Hoax starts today at 1:00 P.M.
9021	The Whistleblower gave false information & dealt with corrupt politician Schiff. He must be brought forward to testify. Written answers not acceptable
62394	ill say it once i'll say it 1,000 times if racists die i celebrate. trump dies? party. kaitlin bennett shits herself to death? celebrate. richard spencer gets pun
23920	Just landed in the United Kingdom, heading to London for NATO meetings tomorrow. Prior to landing I read the Republicans Report on the Impeachm
33795	SCRAPE WINS FC
25735	The DA has a disorder called Hemophilia in which a person's blood is not able to clot normally! It is hemorrhaging blood from self inflicted injuries! I c
6492	Why are House Dems afraid of due process? What are they hiding in their sham impeachment process?
47573	In USA to speak properly is to sound white....to act responsible in life is to act white..and to go to a white school is embarrassing 😂😂
13538	i swear charles melton is avoiding me i can't find that dude NOWHERE!! imma get my pic idc

Assignment (2)

Data: <https://bit.ly/nlp-amt-data>

Each HIT is one tweet

Display the tweet and a VAD form

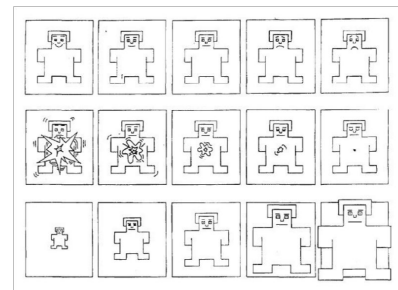
Make sure worker reads tweet:

enable SUBMIT only after **C * (number of words)**

Return:

- VAD scores (1~5, 1~5, 1~5)
- Time invested by worker

Scale	Valence rating	Arousal rating	Dominance rating
5	Pleasant	Excited	Dependent
4	Pleased	Wide-awake	Powerlessness
3	Neutral	Neutral	Neutral
2	Unsatisfied	Dull	Powerful
1	Unpleasant	Calm	Independent



Assignment (3)

- Worker Qualification
 - Residing in Taiwan or English speaking countries
 - Agree to work on offensive materials (tweets can be offensive!)
- Payment according to length
 - Calculate average number of tokens *avgw*
 - \$0.50 for short tweets (less than *avgw*)
 - \$1.00 for long tweets (more than *avgw*)
- 3 assignments per HIT
- HITs expire in 8 weeks
- Once started, worker has 30 minutes to complete each HIT
- Payment is 1 hour after completion

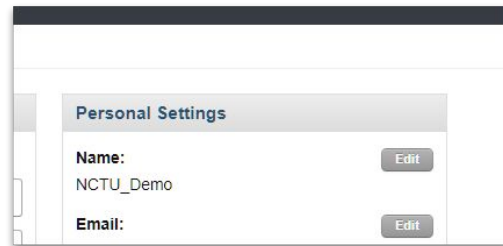
Assignment (4)

Set user name to NCTU_{Team_Name}

- For example, **NCTU_Team_Pudding**

Host HITs on External Website (ExternalQuestion)

- [Fast.io](https://fast.io/) is free, can serve HTML files from GDrive, Dropbox, Github, ...



Deliverable: Colab notebooks

3 parts:

1. Create and upload the HITs (using **Full Access** credentials)
2. Work as MTurker :)
3. Fetch and save the results to a CSV file (using **Read-only** credentials)
 - Computes average for each tweet
 - CSV columns: idx, avg_valence, avg_arousal, avg_dominance, time

See [Lab 4 Assignment](#) for detailed homework information

SOP for assignment submission

- ☐ Open your Python notebook
- ☐ Rename your notebook to lab4-<studentID>.ipynb
- ☐ “Restart and run all”
- ☐ Make sure the output is correct
- ☐ Download the Python file (File, Download .py)
- ☐ **Share the Google colab using “Get shareable link”; Copy link**
- ☐ Submit both link and file in e3:
 - ☐ Paste link into e3 (link starts with **<https://colab.research.google.com/>**...)
 - ☐ Upload file into e3 (file name is lab4-<studentID>.py)
- ☐ Also attach credentials.csv file for user with Read-Only access

Appendix

Useful Links

Mechanical Turk

<https://www.mturk.com/>

<https://requester.mturk.com/>

Sandbox

<https://requestersandbox.mturk.com/>

<https://workersandbox.mturk.com/>

Amazon Web Services

<https://aws.amazon.com/>

Developer Reference

<https://docs.aws.amazon.com/AWSMechTurk/latest/AWSMechanicalTurkRequester/>



<https://docs.aws.amazon.com/AWSMechTurk/latest/AWSMechanicalTurkRequester/amt-dg.pdf>

API Reference

<https://docs.aws.amazon.com/AWSMechTurk/latest/AWSMturkAPI/>



<https://docs.aws.amazon.com/AWSMechTurk/latest/AWSMturkAPI/amt-API.pdf>

Python SDK (Boto 3)

<https://boto.readthedocs.io/en/latest/ref/mturk.html>

Setup

<https://docs.aws.amazon.com/AWSMechTurk/latest/AWSMechanicalTurkGettingStartedGuide/SetUp.html>


Follow Steps 1~5

- Step 1: Sign Up for an AWS Account
- Step 2: Create a Requester Account
- Step 3: Link Your AWS account to your MTurk Requester account
- Step 4: Create an IAM User
- Step 5: Set up the Developer Sandbox
- ~~Step 6: Set up an AWS SDK~~
- ~~Step 7: Prepay for Your HITs or Enable AWS Billing~~

No need for Credit Card account (hopefully!)

Payment Information

We use your payment information to verify your identity and only for usage in excess of the [AWS Free Tier Limits](#). We will not charge you for usage below the AWS Free Tier Limits. For more information, see the [frequently asked questions](#).



When you submit your payment information, we will charge \$1 USD/EUR to your credit card as a verification charge to ensure your card is valid. The amount may show as pending in your credit card statement for 3-5 days until the verification is completed, at which time the charge will be removed. You may be redirected to your bank website to authorize the verification charge.

Credit/Debit card number

Expiration date

05

▼

2020

▼

Cardholder's name

Billing address

☐ Use my contact address

Create an Amazon Mechanical Turk Account

Contact Information

Please enter your contact information below.

* Required

Company name: * ([See details](#))

Address: *

City: *

State, province or region:

Zip or postal code: *

Country: *

[Don't see your country?](#)

Phone number: *

Your phone number may be used to verify your identity.

Your phone number may be used to verify your identity.

Tell us how you plan to use MTurk:

- ☐ Conduct surveys or market research
- ☐ Moderate user-generated content, e.g. comments, images, or videos
- ☒ Annotate data sets to train machine learning models
- ☐ Collect data sets, e.g. gather the contact info for a list of businesses
- ☐ Clean or categorize data for data analysis
- ☐ My use for MTurk isn't listed above

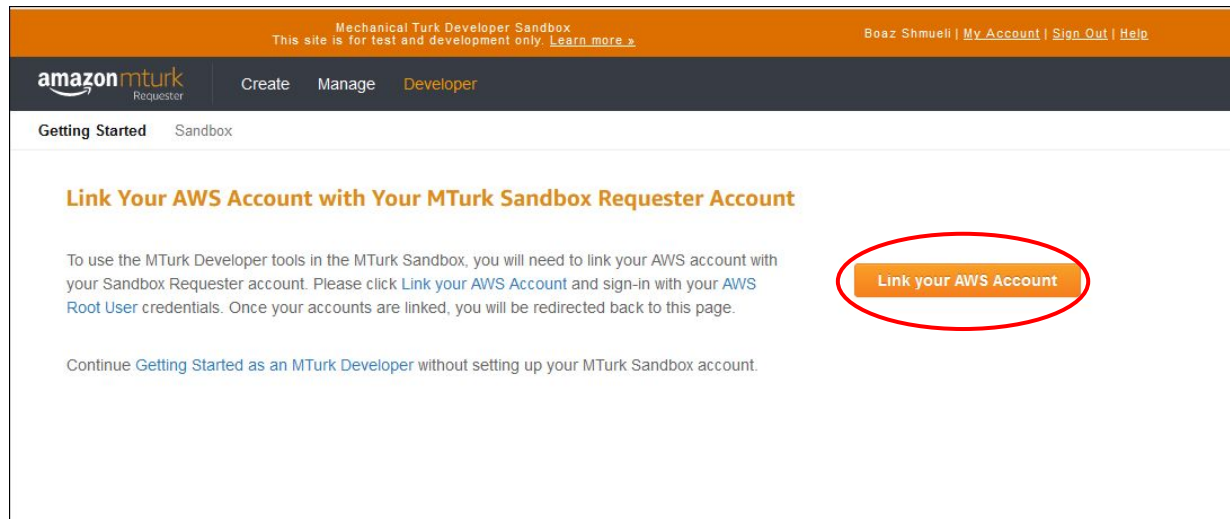
How often do you expect to use MTurk?

- ☐ I have a recurring need, e.g. processing data regularly
- ☐ I have a one-time need, e.g. a specific project
- ☒ I will occasionally use MTurk

By creating an account, you agree to Amazon Mechanical Turk's [Participation Agreement](#). Please see

Create Account

Link Sandbox with AWS account



Mechanical Turk Developer Sandbox
This site is for test and development only. [Learn more »](#)

Boaz Shmueli | [My Account](#) | [Sign Out](#) | [Help](#)

amazonmturk
Requester

Create Manage Developer

Getting Started Sandbox

Link Your AWS Account with Your MTurk Sandbox Requester Account

To use the MTurk Developer tools in the MTurk Sandbox, you will need to link your AWS account with your Sandbox Requester account. Please click [Link your AWS Account](#) and sign-in with your [AWS Root User](#) credentials. Once your accounts are linked, you will be redirected back to this page.

[Link your AWS Account](#)

Continue [Getting Started as an MTurk Developer](#) without setting up your MTurk Sandbox account.

amazonmturkRequester

CreateManageDeveloper

Getting StartedSandbox

Developer Sandbox


A simulated environment to test your tasks.

About the Sandbox

The Mechanical Turk Developer Sandbox is a simulated environment that lets you test your applications and tasks prior to publication in the marketplace.

Benefits:

- Free to use for registered Mechanical Turk requesters. Fees will not be withdrawn and payments are not made to Worker accounts.
- Has functional parity with the production website.
- Requires only a URL change to configure your application to work against the developer sandbox or the production website.



Get Started

To access the sandbox, you will need a [Mechanical Turk Requester account](#) and, in order to access the sandbox programmatically, you will need an [Amazon Web Services \(AWS\) account](#).

[Requester Sandbox »](#)

Requester Site Sandbox


You can create test tasks in the Requester Sandbox to make sure your design or application works.

[Visit the Requester Sandbox »](#)

Worker Site Sandbox

You can view tasks created in the Requester Sandbox to see how they will appear to Workers.

[Visit the Worker Sandbox »](#)



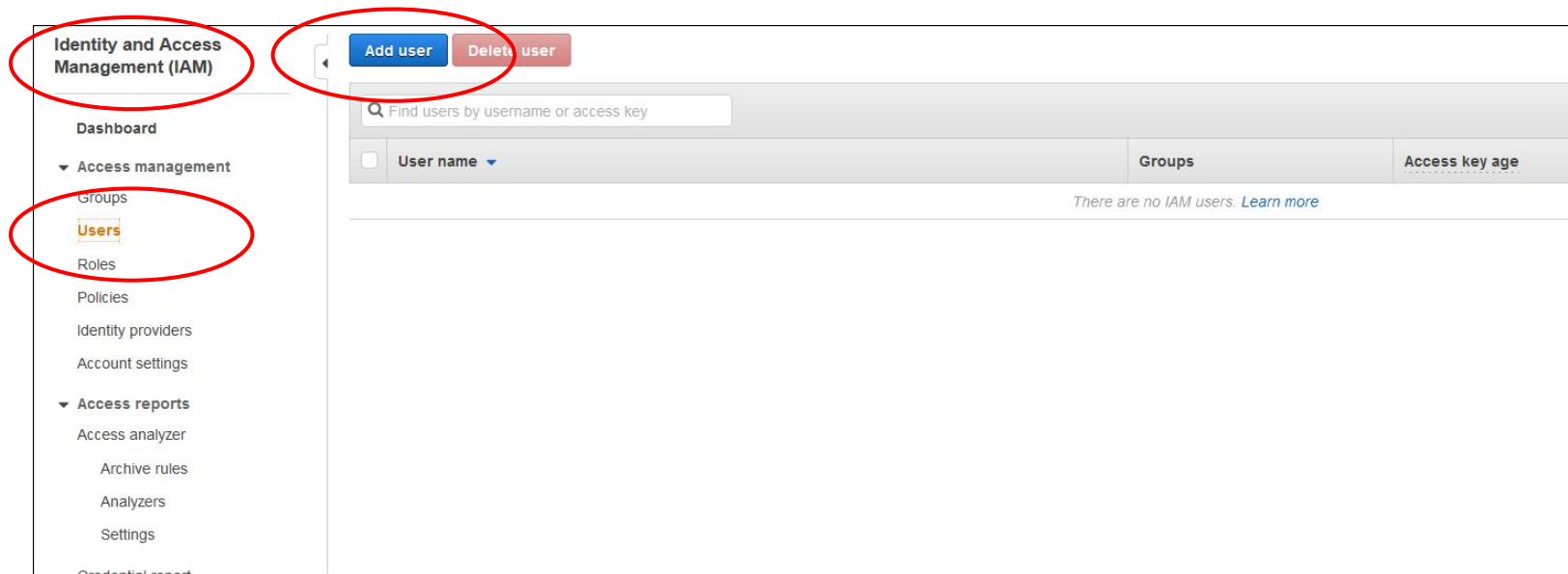
Developer Forum

Have a question about the Application Program Interface (API) or Command Line Tools (CLTs)? Post your questions and comments in the developer forum.

[Visit the Developer Forum »](#)

Sandbox FAQs

Create User Credentials on AWS



Create User Credentials on AWS

Add user

1

2

3

4

5

Set user details

You can add multiple users at once with the same access type and permissions. [Learn more](#)

User name*

NCTU_Demo

+

Add another user

Select AWS access type

Select how these users will access AWS. Access keys and autogenerated passwords are provided in the last step. [Learn more](#)

Access type*

☒ **Programmatic access**
Enables an **access key ID** and **secret access key** for the AWS API, CLI, SDK, and other development tools.

☐ **AWS Management Console access**
Enables a **password** that allows users to sign-in to the AWS Management Console.

* Required

Cancel

Next: Permissions

40

Create User Credentials on AWS

Add user

12345

Set permissions

Add user to group

Copy permissions from existing user

Attach existing policies directly

Create policy

Filter policies Search Showing 530 results

	Policy name	Type	Used as
<input type="checkbox"/>	AdministratorAccess	Job function	None
<input type="checkbox"/>	AlexaForBusinessDeviceSetup	AWS managed	None
<input type="checkbox"/>	AlexaForBusinessFullAccess	AWS managed	None
<input type="checkbox"/>	AlexaForBusinessGatewayExecution	AWS managed	None
<input type="checkbox"/>	AlexaForBusinessPolyDelegatedAccessPolicy	AWS managed	None
<input type="checkbox"/>	AlexaForBusinessReadOnlyAccess	AWS managed	None
<input type="checkbox"/>	AmazonAPIGatewayAdministrator	AWS managed	None
<input type="checkbox"/>	AmazonAPIGatewayInvokeFullAccess	AWS managed	None

Set permissions boundary

Cancel

Previous

Next: Tags

Create User Credentials on AWS

Add user 1 2 3 4 5

▼ Set permissions

Add user to group Copy permissions from existing user Attach existing policies directly

Create policy

Filter policies Showing 3 results

	Policy name	Type	Used as
<input checked="" type="checkbox"/>	AmazonMechanicalTurkFullAccess	AWS managed	None
<input type="checkbox"/>	AmazonMechanicalTurkReadOnly	AWS managed	None
<input type="checkbox"/>	AmazonSageMakerMechanicalTurkAccess	AWS managed	None

► Set permissions boundary

Cancel Previous Next: Tags

Create User Credentials on AWS

Add user

12345

Add tags (optional)

IAM tags are key-value pairs you can add to your user. Tags can include user information, such as an email address, or can be descriptive, such as a job title. You can use the tags to organize, track, or control access for this user. [Learn more](#)

Key	Value (optional)	Remove
<input type="text" value="Add new key"/>	<input type="text"/>	

You can add 50 more tags.

Cancel

Previous

Next: Review



Create User Credentials on AWS

Add user

12345

Review

Review your choices. After you create the user, you can view and download the autogenerated password and access key.

User details

User name

NCTU_Demo

AWS access type

Programmatic access - with an access key

Permissions boundary

Permissions boundary is not set

Permissions summary

The following policies will be attached to the user shown above.

Type	Name
Managed policy	AmazonMechanicalTurkFullAccess

Tags

No tags were added.

Cancel

Previous

Create user

Create User Credentials on AWS

Add user

12345

✓ Success

You successfully created the users shown below. You can view and download user security credentials. You can also email users instructions for signing in to the AWS Management Console. This is the last time these credentials will be available to download. However, you can create new credentials at any time.

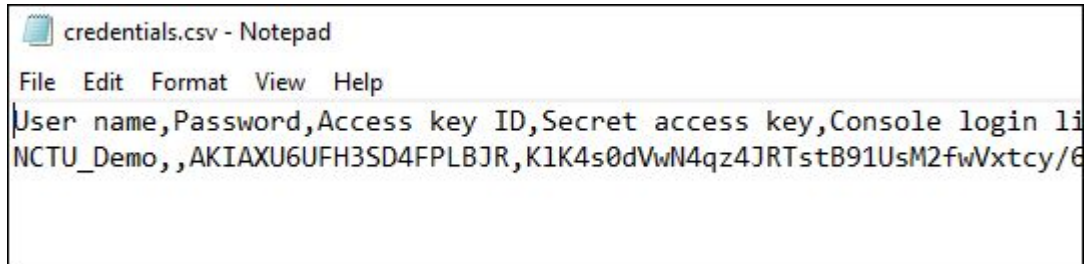
Users with AWS Management Console access can sign-in at: <https://526041562852.signin.aws.amazon.com/console>

Download .csv

	User	Access key ID	Secret access key
▶ ✓	NCTU_Demo	AKIA XU6UFH3SD4FPLBJR	***** Show

Close

credentials.csv



A screenshot of a Notepad window titled "credentials.csv - Notepad". The window has a menu bar with "File", "Edit", "Format", "View", and "Help". The text area contains a single line of CSV data: "User name,Password,Access key ID,Secret access key,Console login li" on the first line and "NCTU_Demo,,AKIAXU6UFH3SD4FPLBJR,K1K4s0dVwN4qz4JRTstB91UsM2fwVxtcy/6" on the second line. The text is in a monospaced font.

```
credentials.csv - Notepad
File Edit Format View Help
User name,Password,Access key ID,Secret access key,Console login li
NCTU_Demo,,AKIAXU6UFH3SD4FPLBJR,K1K4s0dVwN4qz4JRTstB91UsM2fwVxtcy/6
```

Useful Links

Mechanical Turk

<https://www.mturk.com/>

<https://requester.mturk.com/>

Sandbox

<https://requestersandbox.mturk.com/>

<https://workersandbox.mturk.com/>

Amazon Web Services

<https://aws.amazon.com/>

Developer Reference

<https://docs.aws.amazon.com/AWSMechTurk/latest/AWSMechanicalTurkRequester/>



<https://docs.aws.amazon.com/AWSMechTurk/latest/AWSMechanicalTurkRequester/amt-dg.pdf>

API Reference

<https://docs.aws.amazon.com/AWSMechTurk/latest/AWSMturkAPI/>



<https://docs.aws.amazon.com/AWSMechTurk/latest/AWSMturkAPI/amt-API.pdf>

Python SDK (Boto 3)

<https://boto.readthedocs.io/en/latest/ref/mturk.html>