Information Security Engineering

2020.10.21

# Human Computation

北京大學 软件与微电子学院
School of Software and Microelectronics, Peking University

Huiping Sun(孙惠平)
sunhp@ss.pku.edu.cn

# 上次课程内容回顾

## 1 可用安全

- 可用性
- 可用安全
- SOUPS
- 目标挑战
- 例子

## 2 文本口令

- 定义
- 优缺点
- 历史
- 指纹攻击
- 理论 vs. 实践

## 3 图形口令

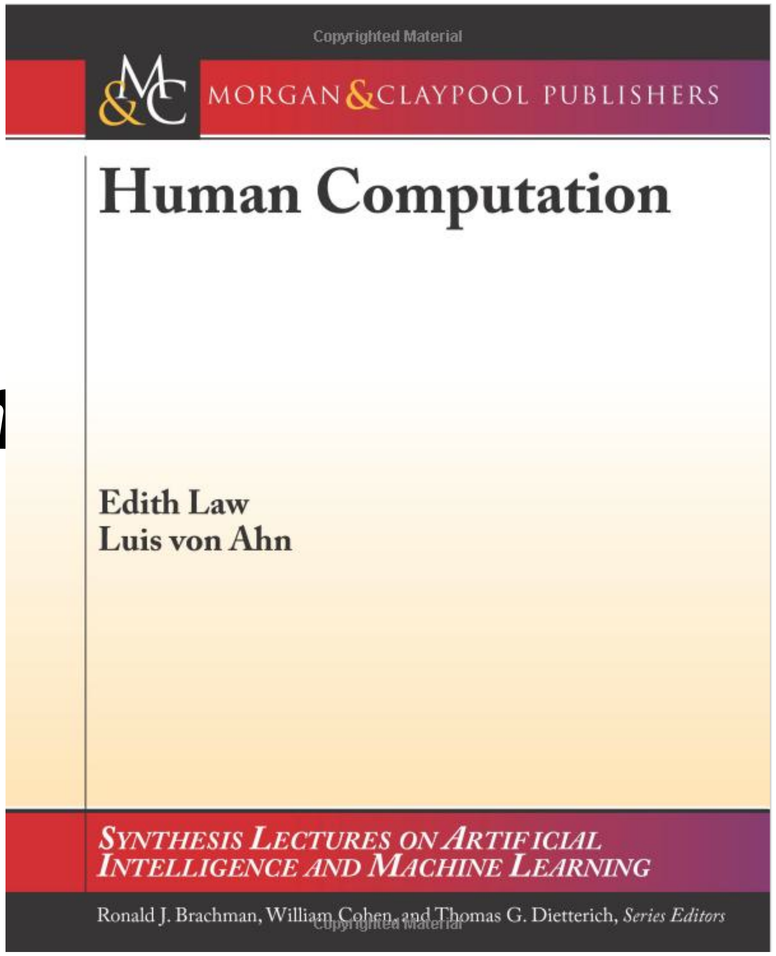
- 心理学基础
- Deja Vu
- PassFaces
- PassGo
- PatternLock

## 4 PassApp

- 背景
- 相关工作
- 概念和机制
- 用户实验
- 安全分析

# 参考书

- ***Introduction***
- ***Human Computation Algorith***
- ***Aggregating Outputs***
- ***Task Routing***
- ***Understanding Workers and Requesters***
- ***The Arts of Asking Questions***
- ***Conclusions***



MORGAN & CLAYPOOL PUBLISHERS

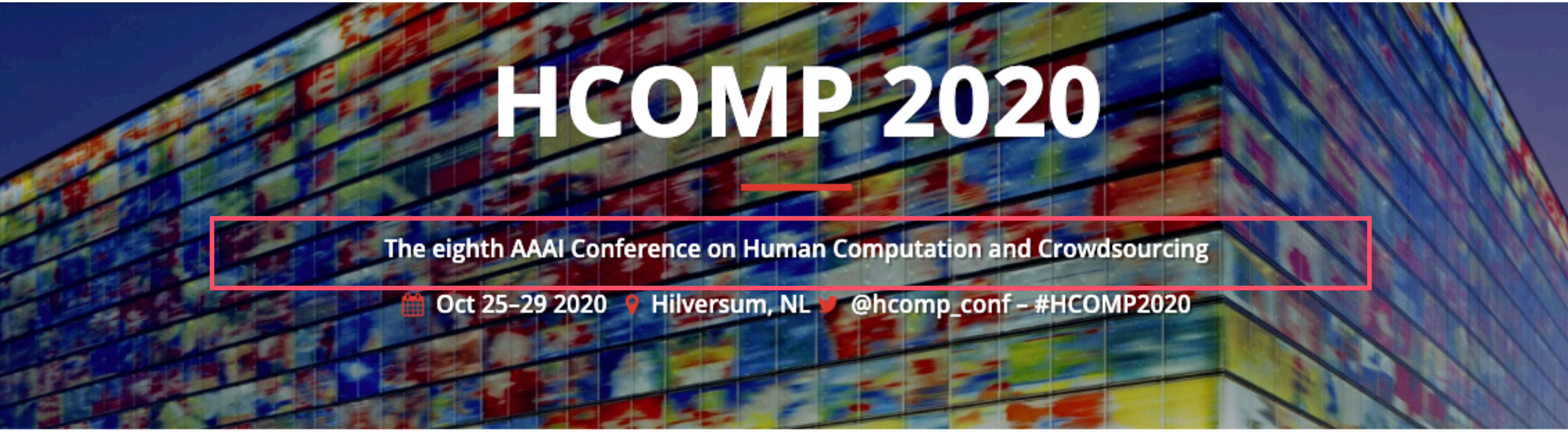
Human Computation

Edith Law
Luis von Ahn

*SYNTHESIS LECTURES ON ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING*

Ronald J. Brachman, William Cohen, and Thomas G. Dietterich, *Series Editors*

# 旗舰会议



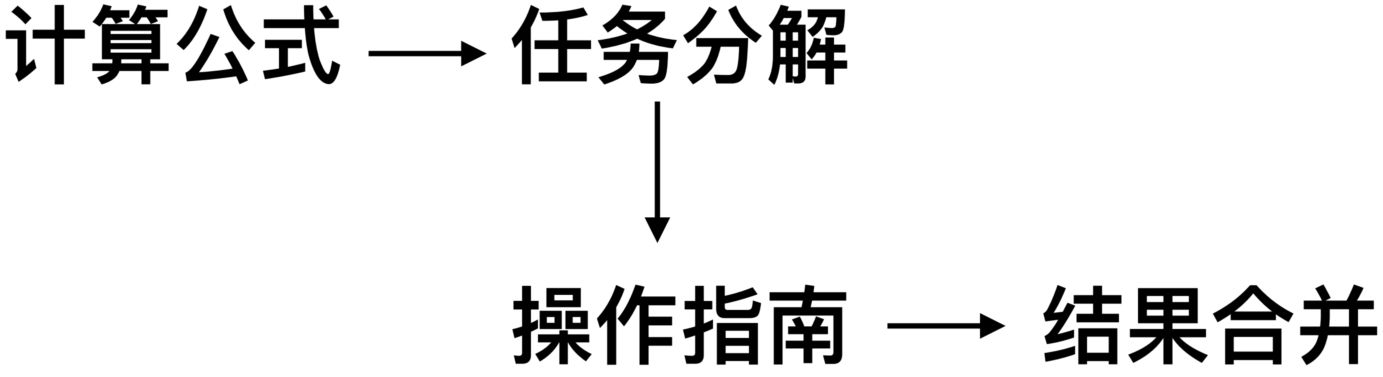
HCOMP 2020

The eighth AAAI Conference on Human Computation and Crowdsourcing

Oct 25–29 2020 Hilversum, NL @hcomp_conf – #HCOMP2020

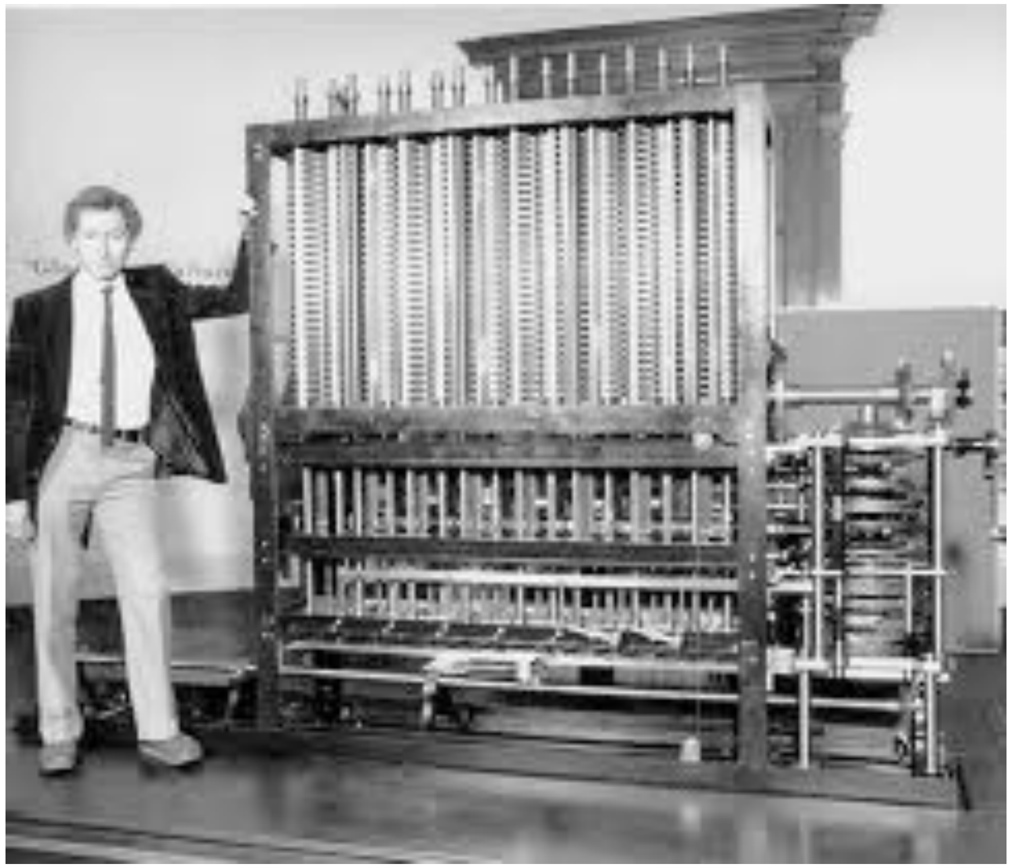
# Human Computation
# 概念

# Computation历史



计算公式 → 任务分解

操作指南 → 结果合并



# Human Computation

- 计算

  ✶使用算法映射输入到输出的过程

- Human Computation

  2005

  ✶人来执行的计算 → 人工智能难题

---

思考

现在有哪些Human Computation应用?

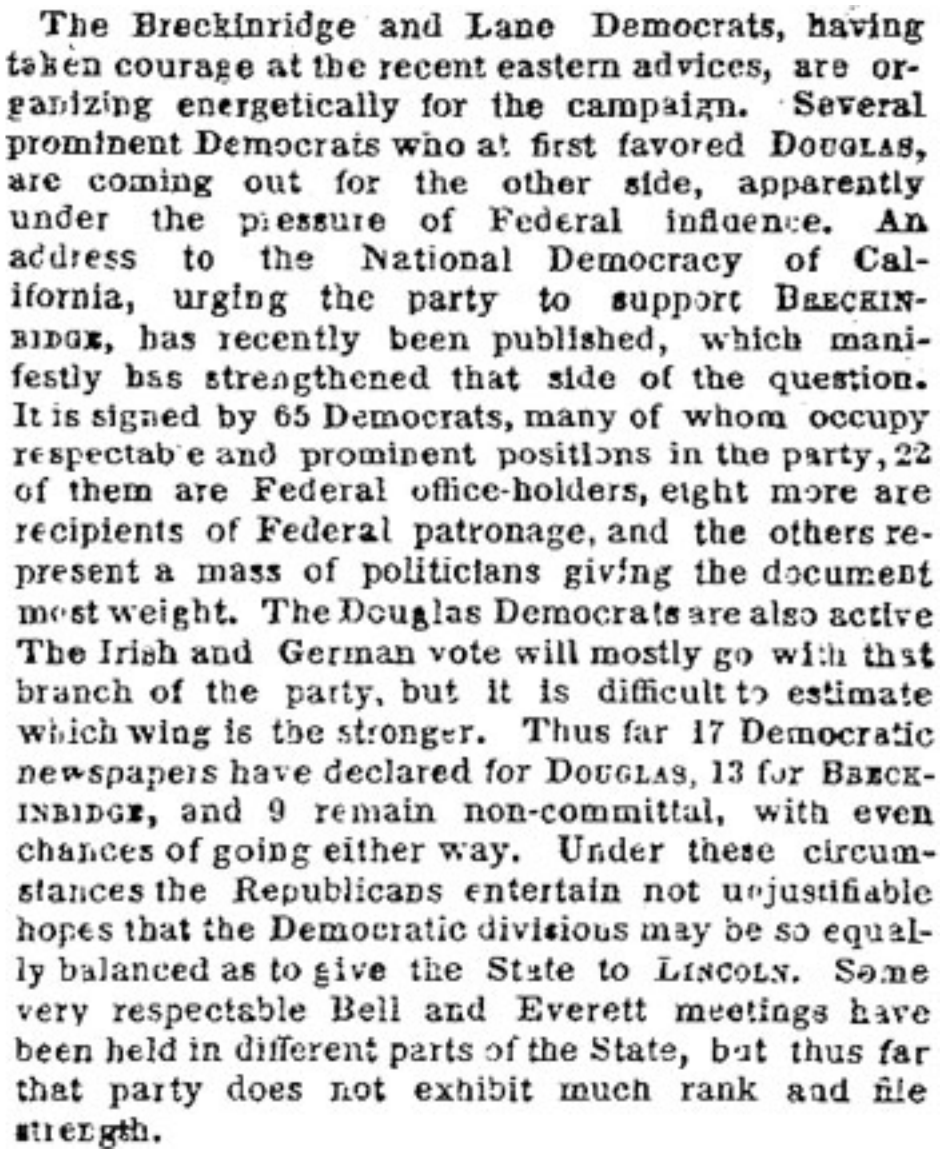
Human Computation产生需要什么基础?

# 人工智能难题

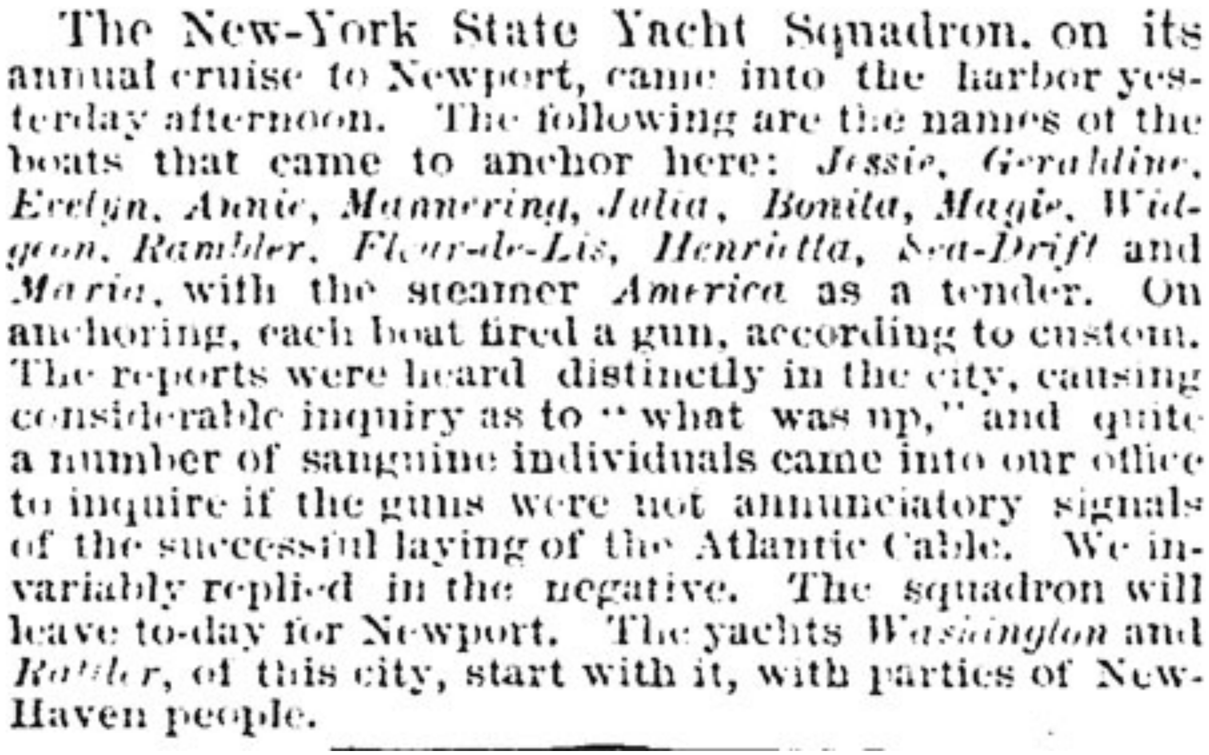
- 现在依然存在许多人工智能难题
  - ✴人很容易解决
  - ✴但是复杂的计算机算法很难解决

- 常见的人工智能难题
  - ✴感知（目标识别、分类）
  - ✴自然语言分析（观点分析、翻译）
  - ✴认知（计划、推理）

# OCR难题



The Breckinridge and Lane Democrats, having taken courage at the recent eastern advices, are organizing energetically for the campaign. Several prominent Democrats who at first favored DOUGLAS, are coming out for the other side, apparently under the pressure of Federal influence. An address to the National Democracy of California, urging the party to support BRECKINRIDGE, has recently been published, which manifestly has strengthened that side of the question. It is signed by 65 Democrats, many of whom occupy respectable and prominent positions in the party, 22 of them are Federal office-holders, eight more are recipients of Federal patronage, and the others represent a mass of politicians giving the document most weight. The Douglas Democrats are also active The Irish and German vote will mostly go with that branch of the party, but it is difficult to estimate which wing is the stronger. Thus far 17 Democratic newspapers have declared for DOUGLAS, 13 for BRECKINRIDGE, and 9 remain non-committal, with even chances of going either way. Under these circumstances the Republicans entertain not unjustifiable hopes that the Democratic divisions may be so equally balanced as to give the State to LINCOLN. Some very respectable Bell and Everett meetings have been held in different parts of the State, but thus far that party does not exhibit much rank and file strength.

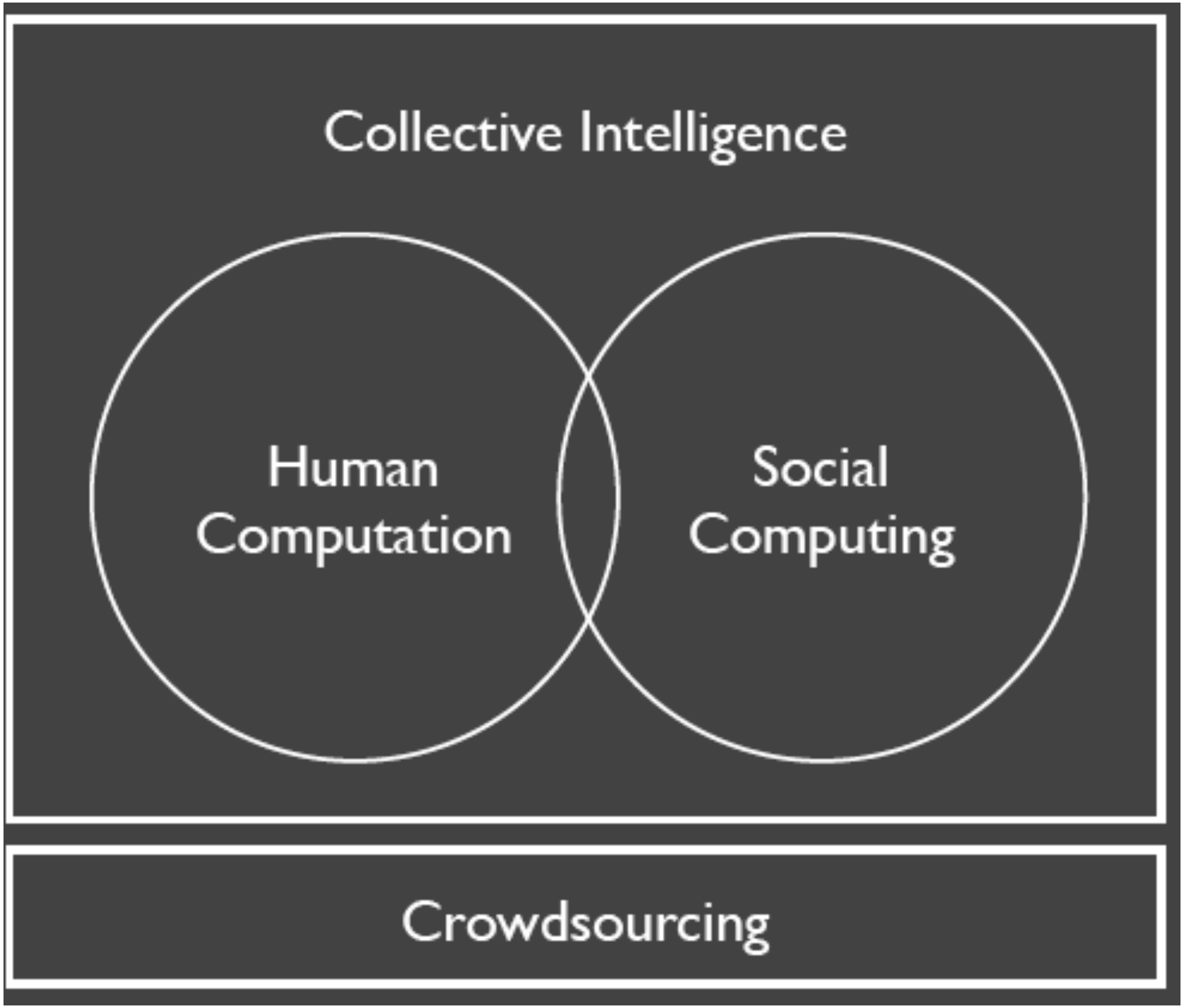


The New-York State Yacht Squadron, on its annual cruise to Newport, came into the harbor yesterday afternoon. The following are the names of the boats that came to anchor here: *Jessie*, *Geraldine*, *Evelyn*, *Annie*, *Mannering*, *Julia*, *Bonita*, *Magie*, *Widgeon*, *Rambler*, *Fleur-de-Lis*, *Henrietta*, *Sea-Drift* and *Maria*, with the steamer *America* as a tender. On anchoring, each boat fired a gun, according to custom. The reports were heard distinctly in the city, causing considerable inquiry as to "what was up," and quite a number of sanguine individuals came into our office to inquire if the guns were not annunciatory signals of the successful laying of the Atlantic Cable. We invariably replied in the negative. The squadron will leave to-day for Newport. The yachts *Washington* and *Rattler*, of this city, start with it, with parties of New-Haven people.

# 图像识别难题

Tag系统 Q&A系统

# 相关概念



动物机器

社会行为

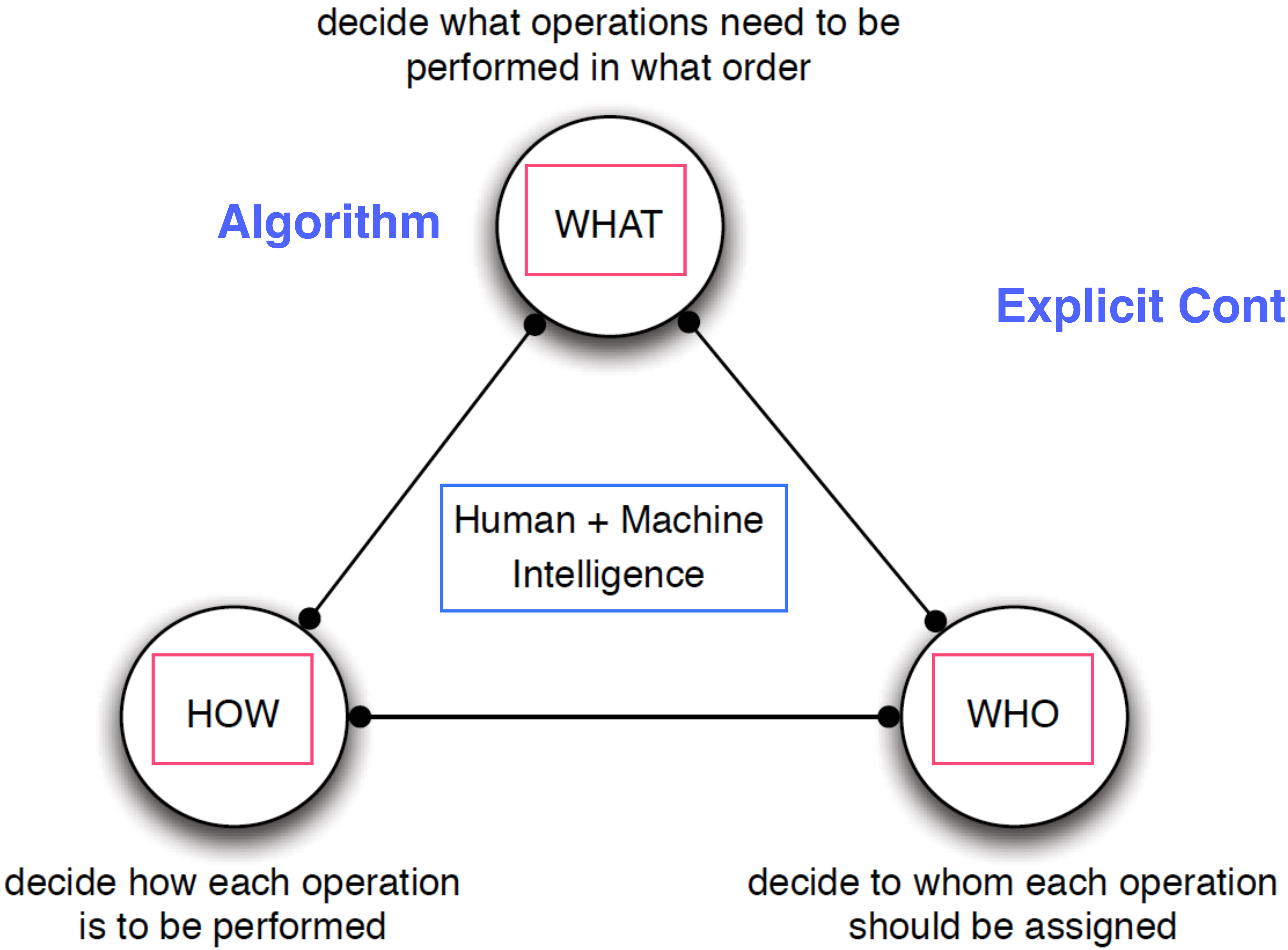
工具方法

群体智能

社会计算

众包

# 三个层面


decide what operations need to be performed in what order
Algorithm
WHAT
Explicit Control
Human + Machine Intelligence
HOW
WHO
decide how each operation is to be performed
decide to whom each operation should be assigned

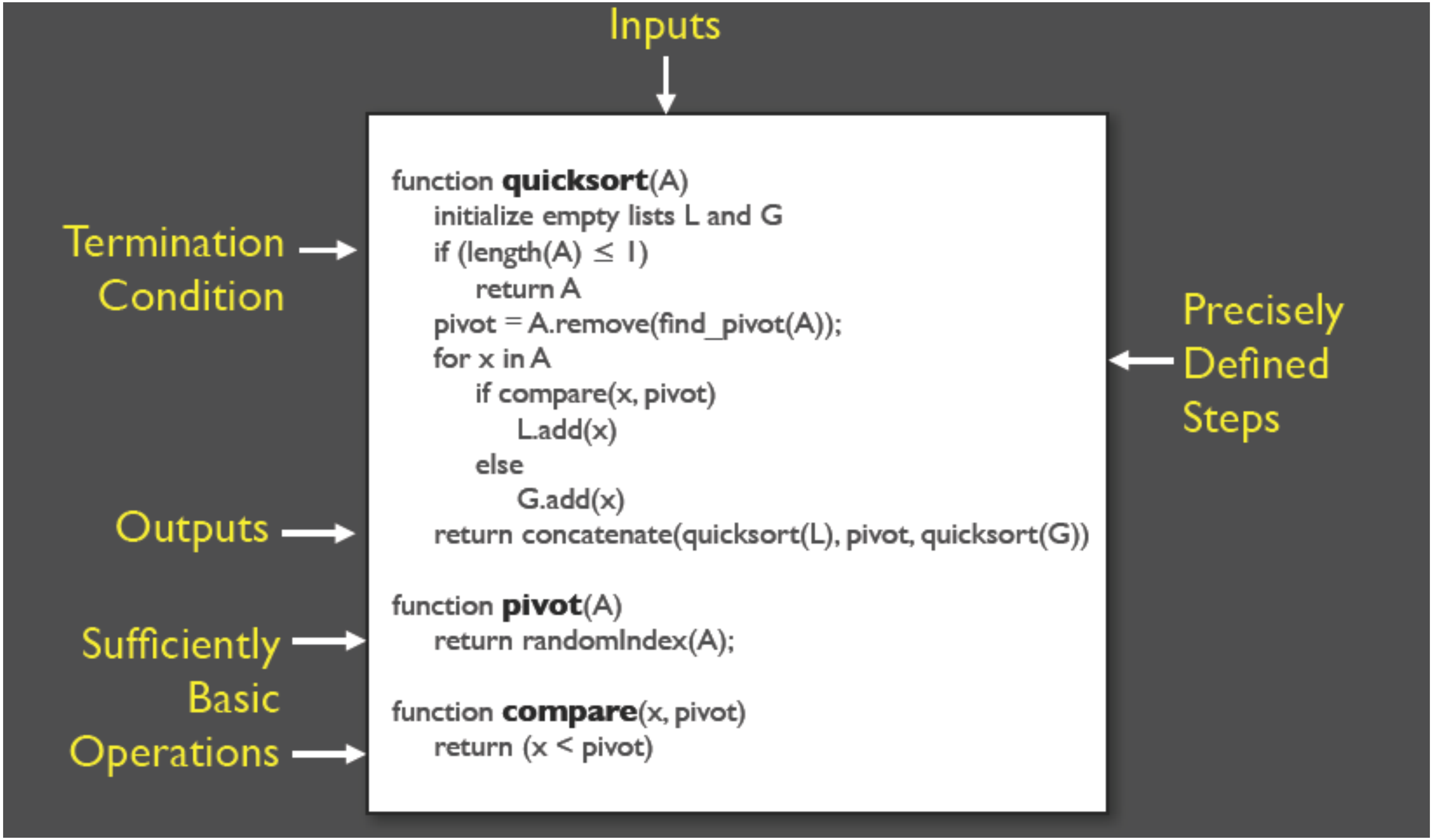
# 人工智能难题分类

- 识别：图像识别、语音识别, …
- 语言：NLP、翻译, …
- 计算密集问题：象棋、围棋、NP问题、生物学基因测序,…
- 自愿计算：SETI@Home, …
- 其余：医疗诊断、文本编辑、计划…

# Human Computation

# 算法

# 算法



Inputs

Termination Condition

Outputs

Sufficiently Basic Operations

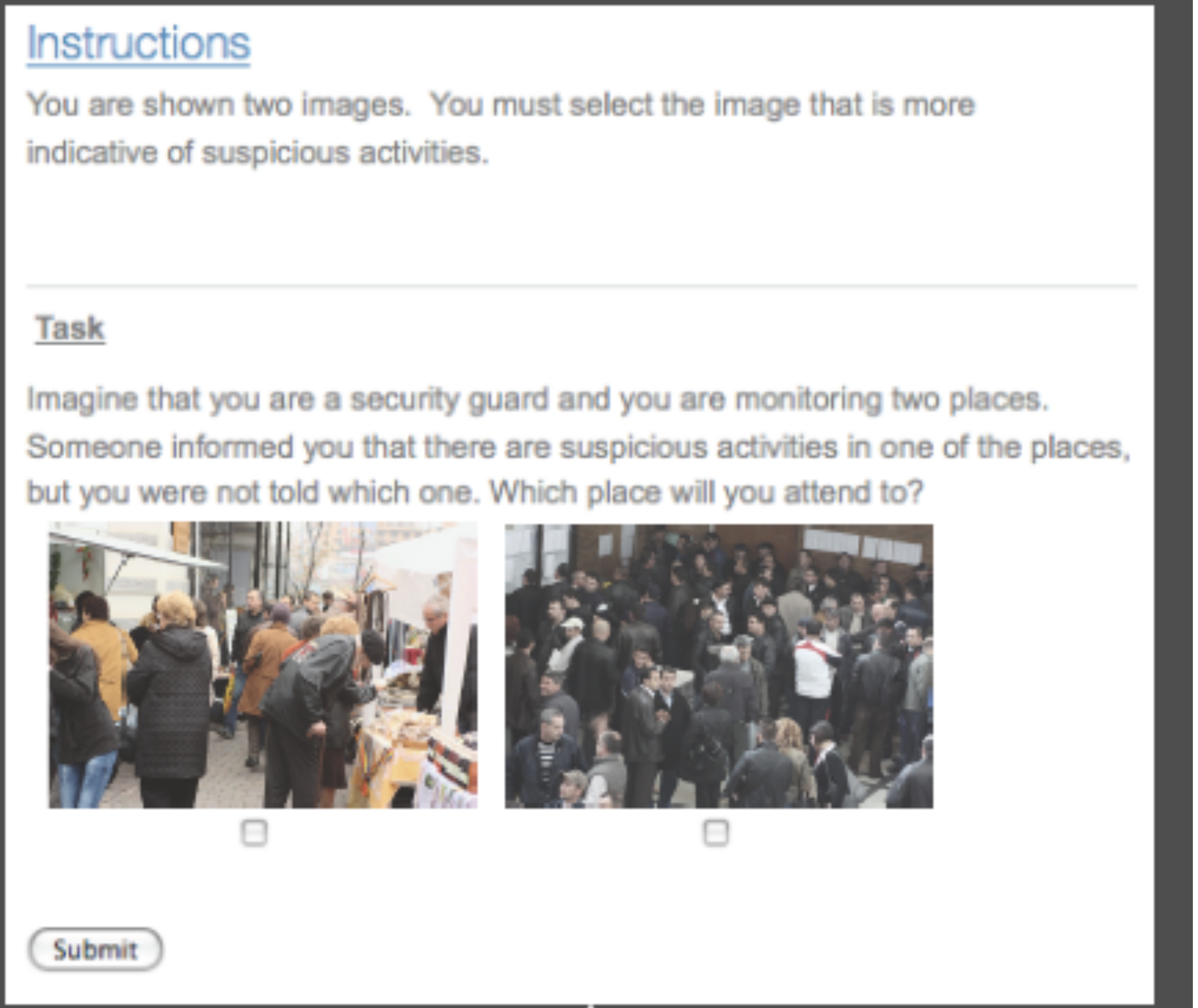
Precisely Defined Steps

```
function quicksort(A)
    initialize empty lists L and G
    if (length(A) ≤ 1)
        return A
    pivot = A.remove(find_pivot(A));
    for x in A
        if compare(x, pivot)
            L.add(x)
        else
            G.add(x)
    return concatenate(quicksort(L), pivot, quicksort(G))

function pivot(A)
    return randomIndex(A);

function compare(x, pivot)
    return (x < pivot)
```

# Human Computation

```
function quicksort(A)
    initialize empty lists L and G
    if (length(A) ≤ 1)
        return A
    pivot = A.remove(find_pivot(A));
    for x in A
        if compare(x, pivot)
            L.add(x)
        else
            G.add(x)
    return concatenate(quicksort(L), pivot, quicksort(G))

function pivot(A)
    return randomIndex(A);

function compare(x, pivot)
    return human_compare(x, pivot)
```

## Mechanical Turk Task



Instructions

You are shown two images. You must select the image that is more indicative of suspicious activities.

Task

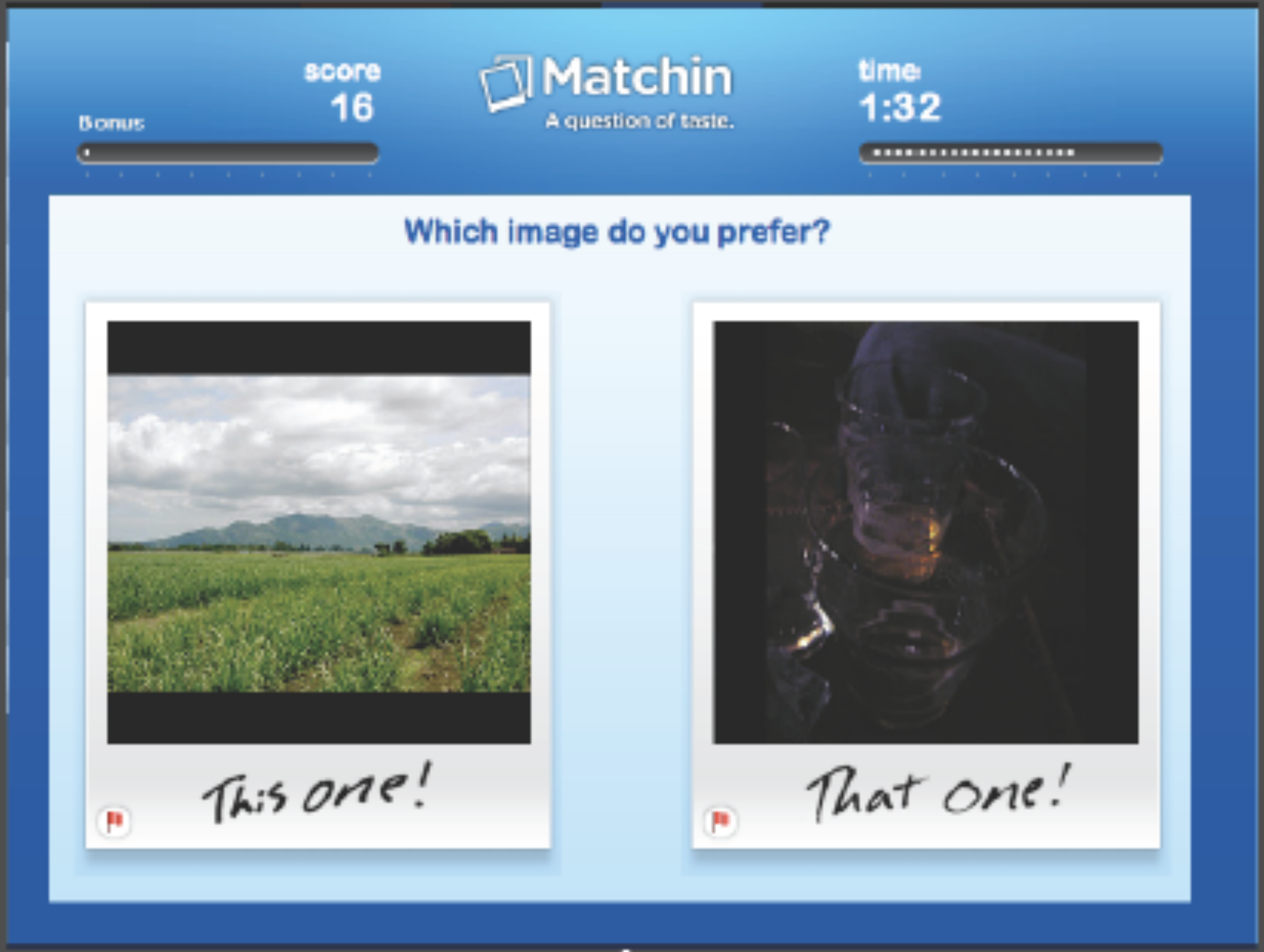
Imagine that you are a security guard and you are monitoring two places. Someone informed you that there are suspicious activities in one of the places, but you were not told which one. Which place will you attend to?

□ □

# Human Computation

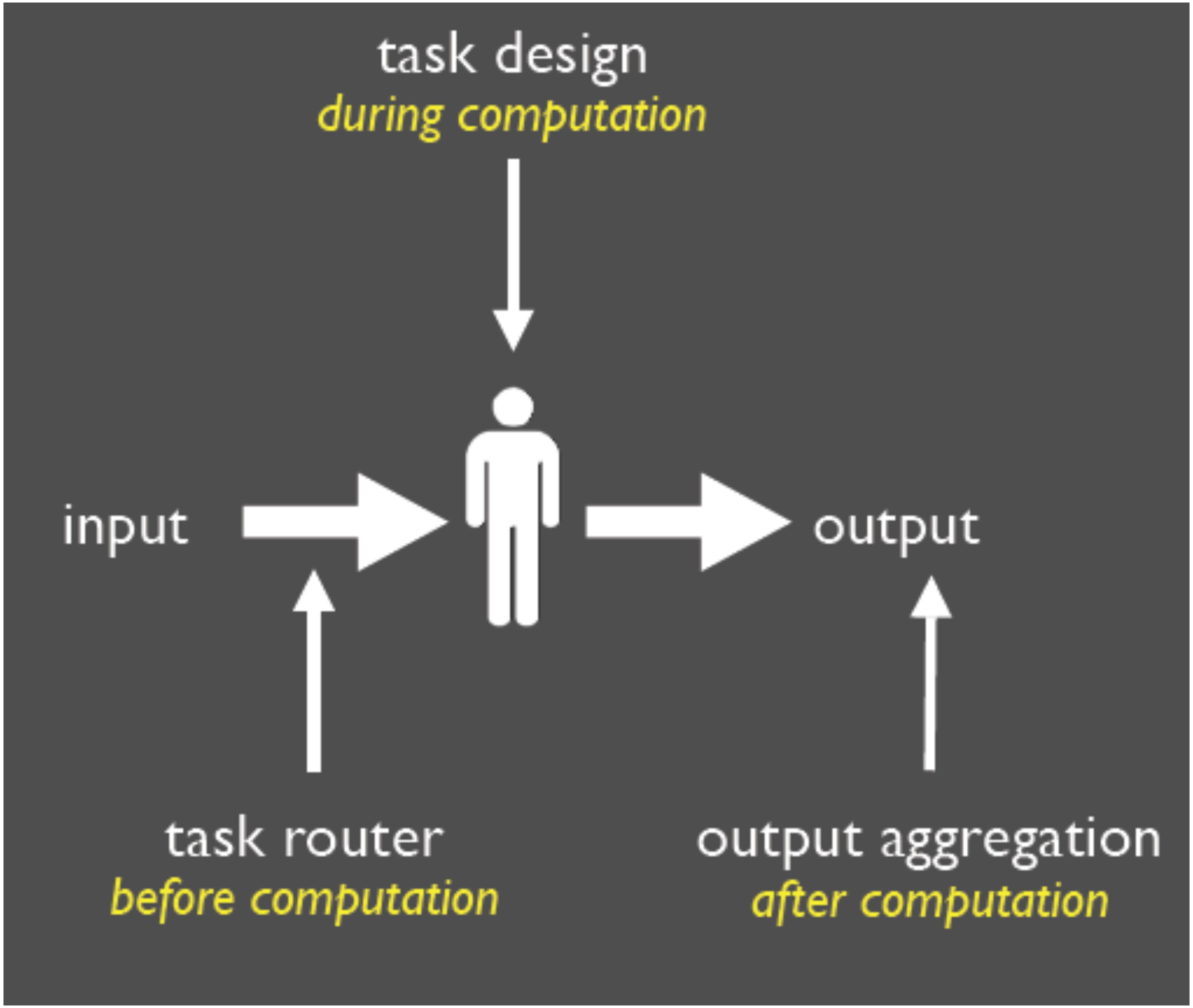
```
function quicksort(A)
    initialize empty lists L and G
    if (length(A) ≤ 1)
        return A
    pivot = A.remove(find_pivot(A));
    for x in A
        if compare(x, pivot)
            L.add(x)
        else
            G.add(x)
    return concatenate(quicksort(L), pivot, quicksort(G))

function pivot(A)
    return randomIndex(A);

function compare(x, pivot)
    return human_compare(x, pivot)
```

## Games with a Purpose



Which image do you prefer?

# 算法正确性



task design

*during computation*

input

output

task router

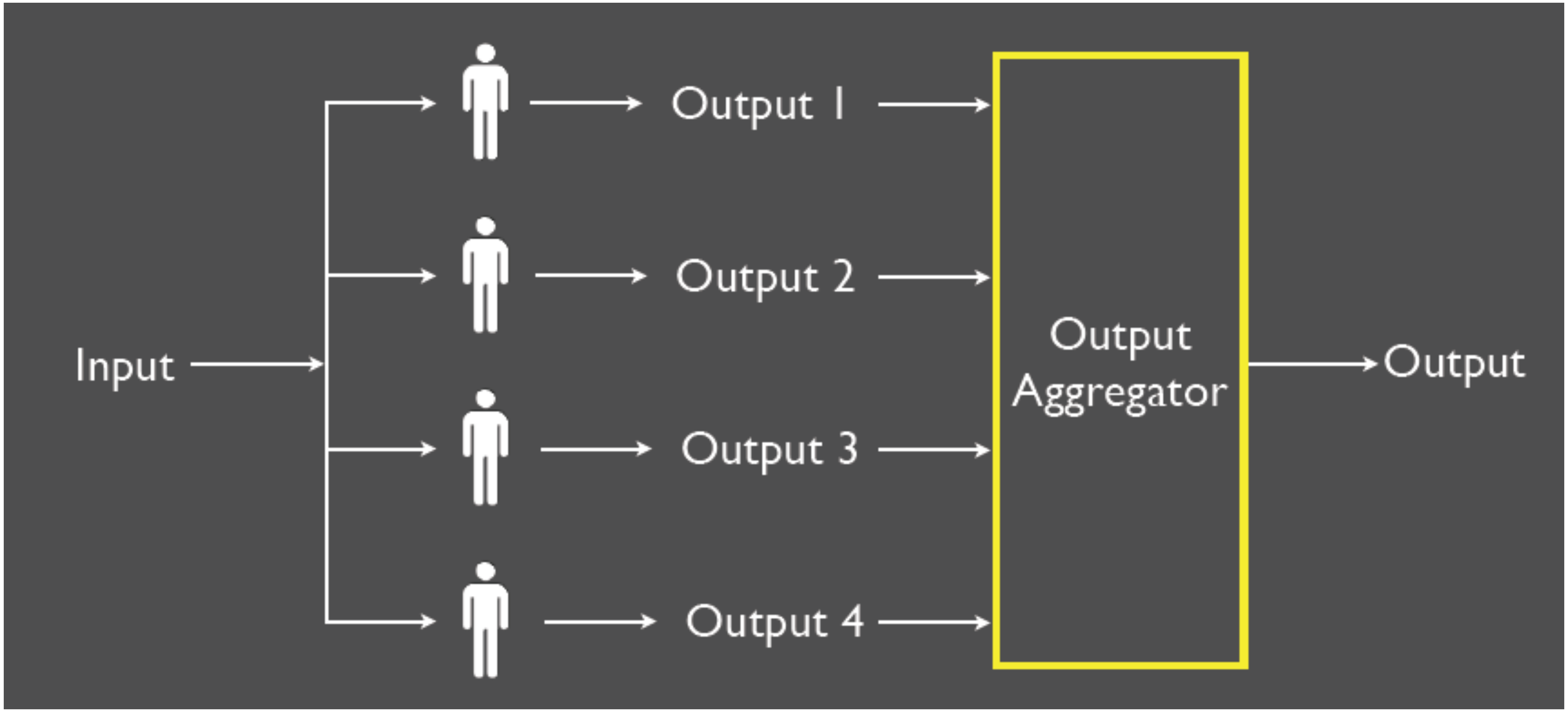
*before computation*

output aggregation

*after computation*

Human Computation

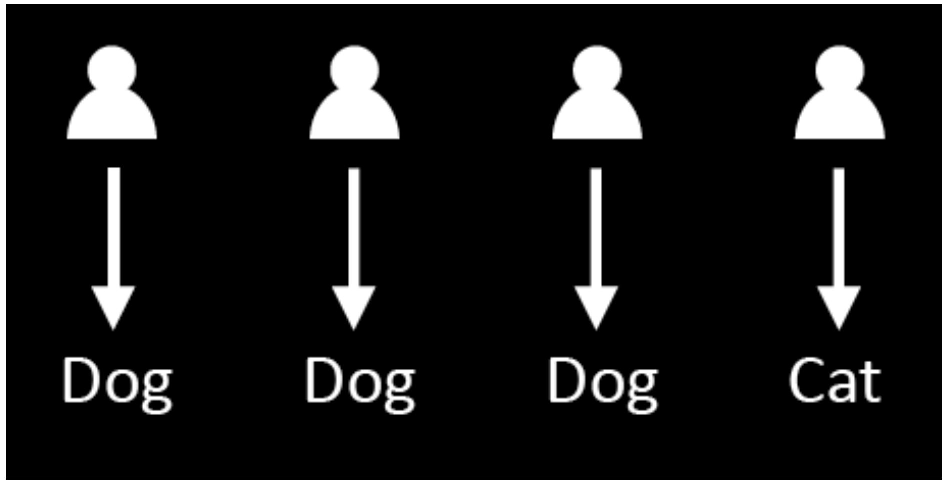
# 结果汇集

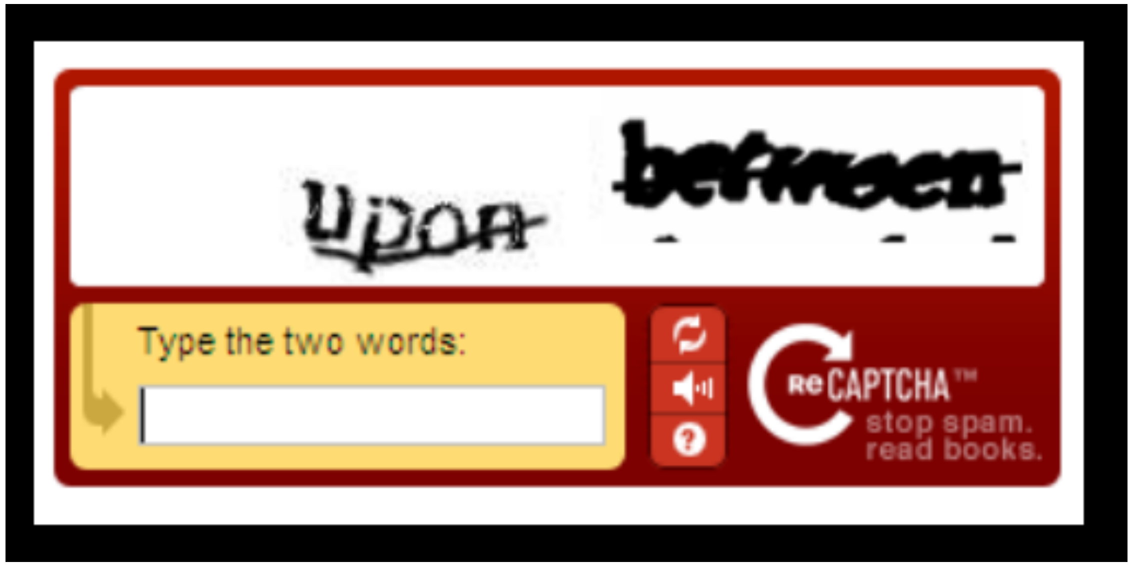


# 参与动机

- Money
- Access
- Game
- Volunteer
- Learning

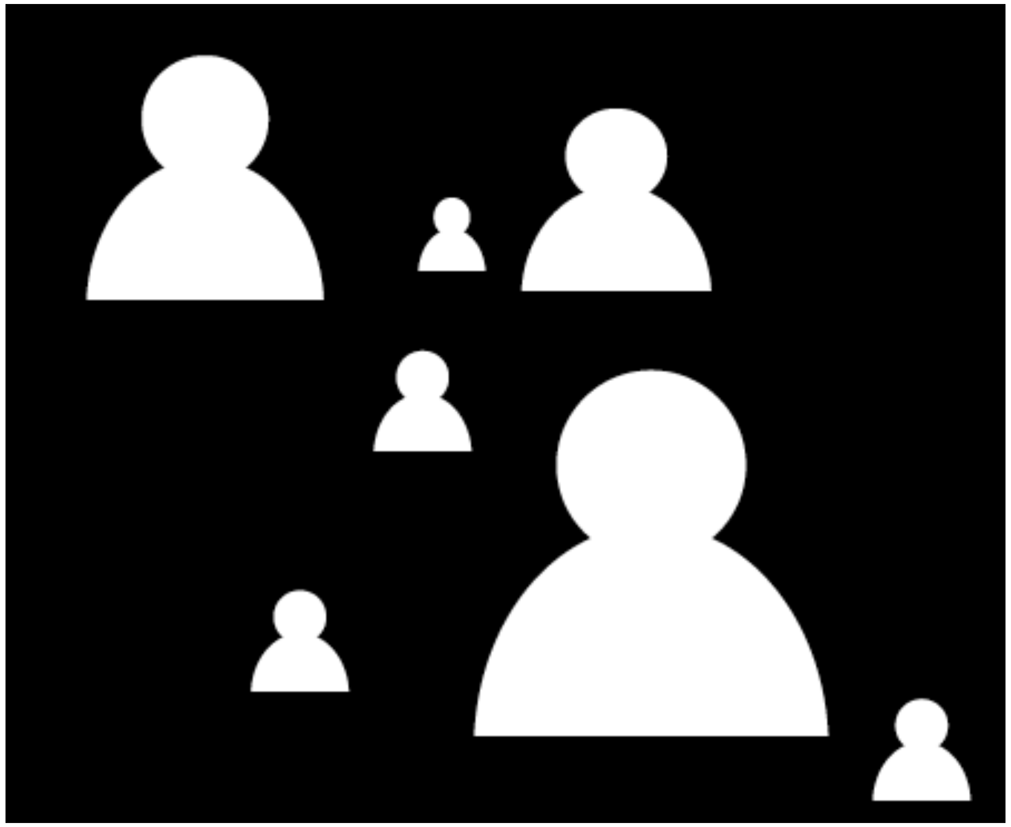
# 正确性

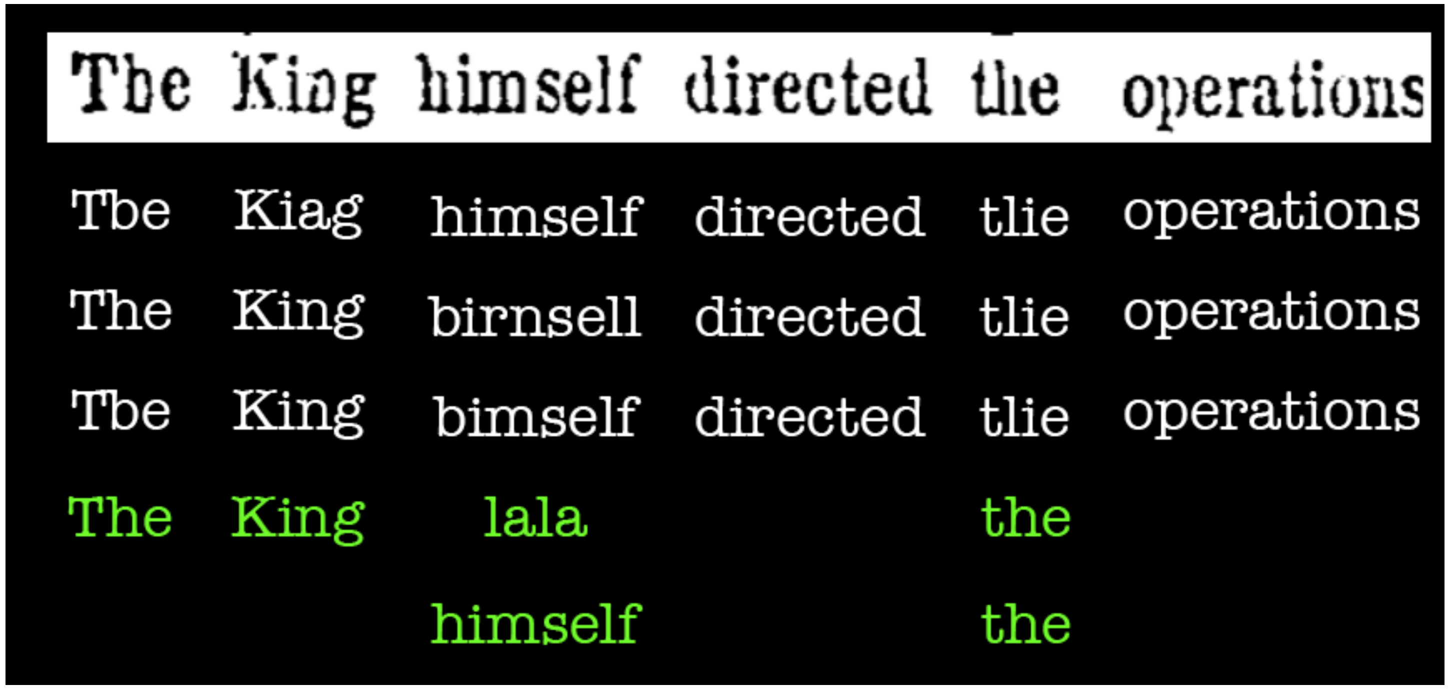



upon between

Type the two words:

reCAPTCHA™ stop spam. read books.





| The | King | himself | directed | the | operations |
|---|---|---|---|---|---|
| Tbe | Kiag | himself | directed | tlie | operations |
| The | King | birnsell | directed | tlie | operations |
| Tbe | King | bimself | directed | tlie | operations |
| The | King | lala |  | the |  |
|  |  | himself |  | the |  |

# Human Computation
# 例子

# ESP：Web图形识别

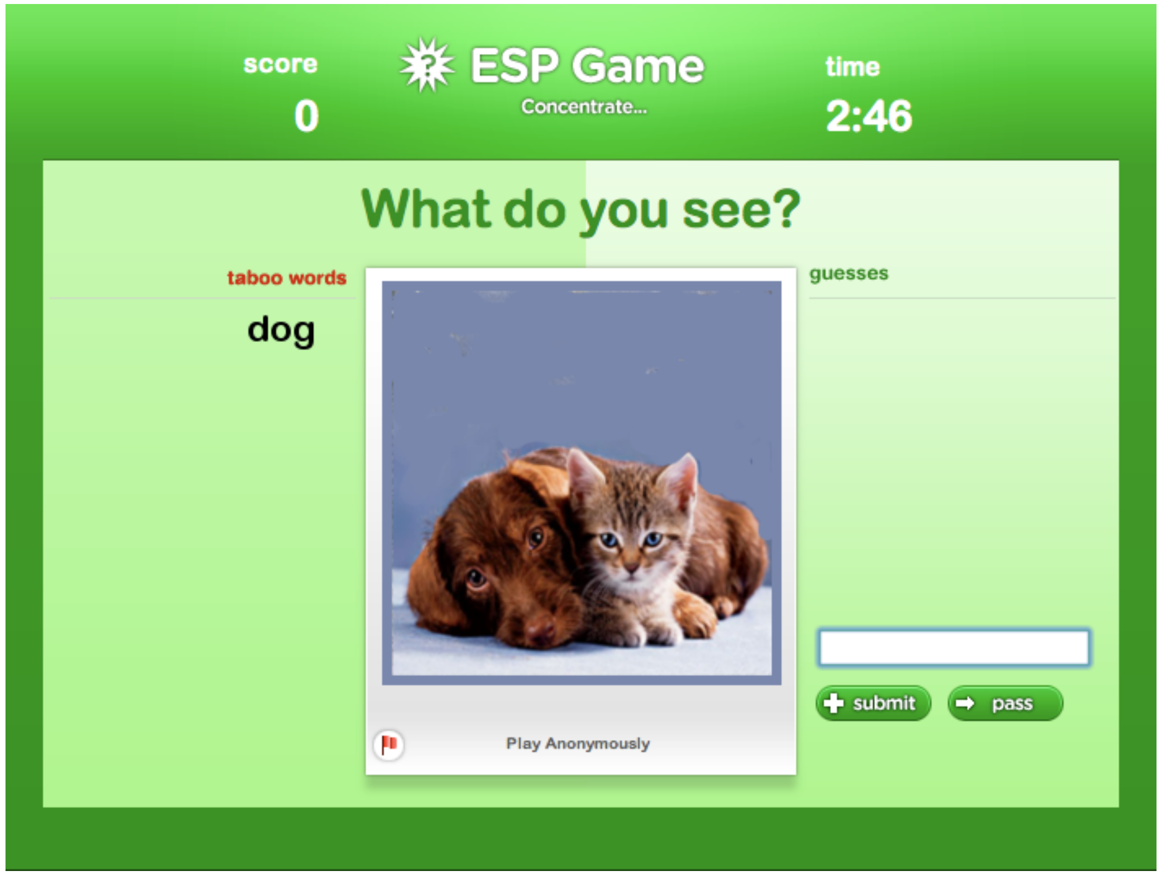
- Web上的图像识别是一个主要的技术挑战
- 大量图片存在，但是文本描述很少，自动识别很不准确
- 人来做标记是一个无奈的选择

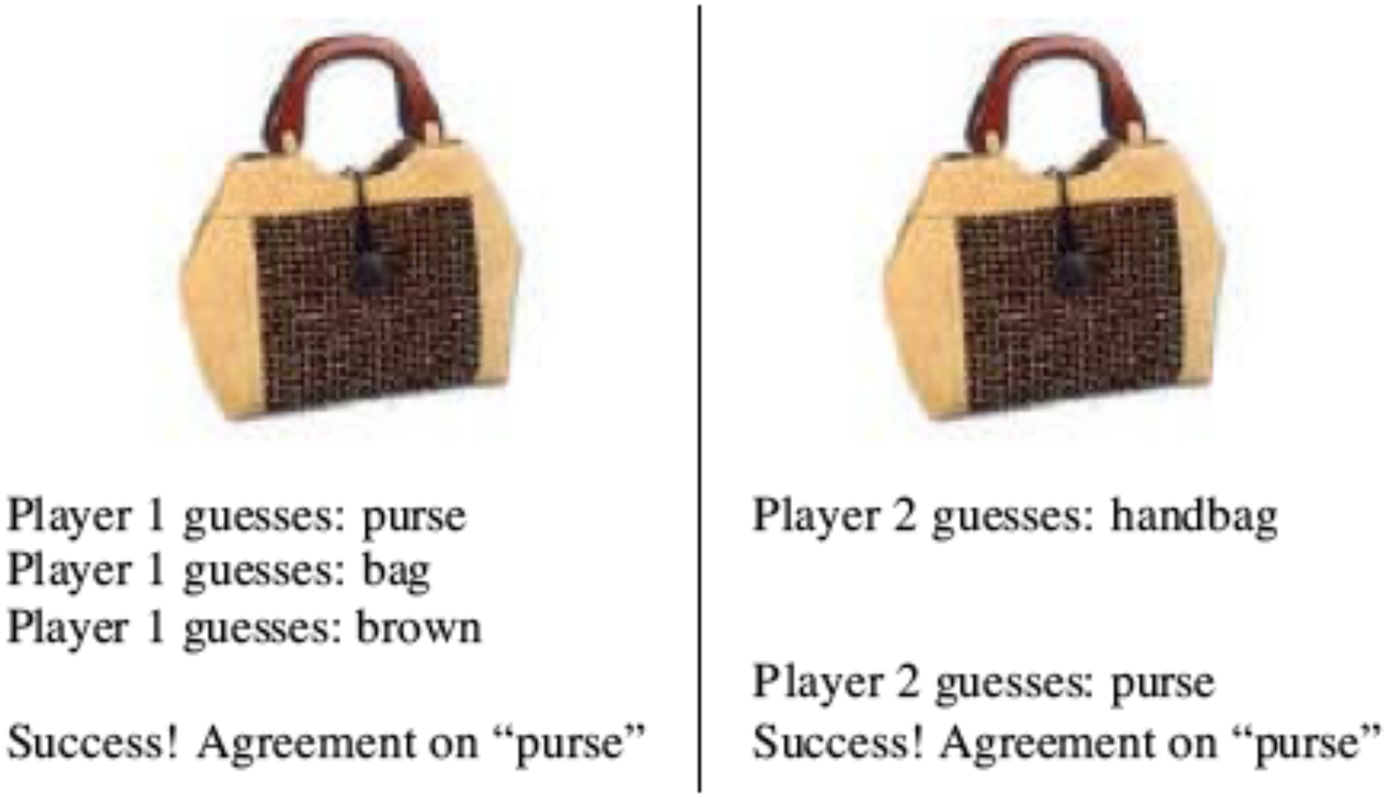
# 游戏

- 每周现在有20亿用户玩在线游戏
- 21岁美国人万游戏时间，平均一生5年

# ESP游戏

- 两个用户同时独立的标记一个图片
- 如果标记一致会得到奖励





Player 1 guesses: purse
Player 1 guesses: bag
Player 1 guesses: brown

Success! Agreement on "purse"

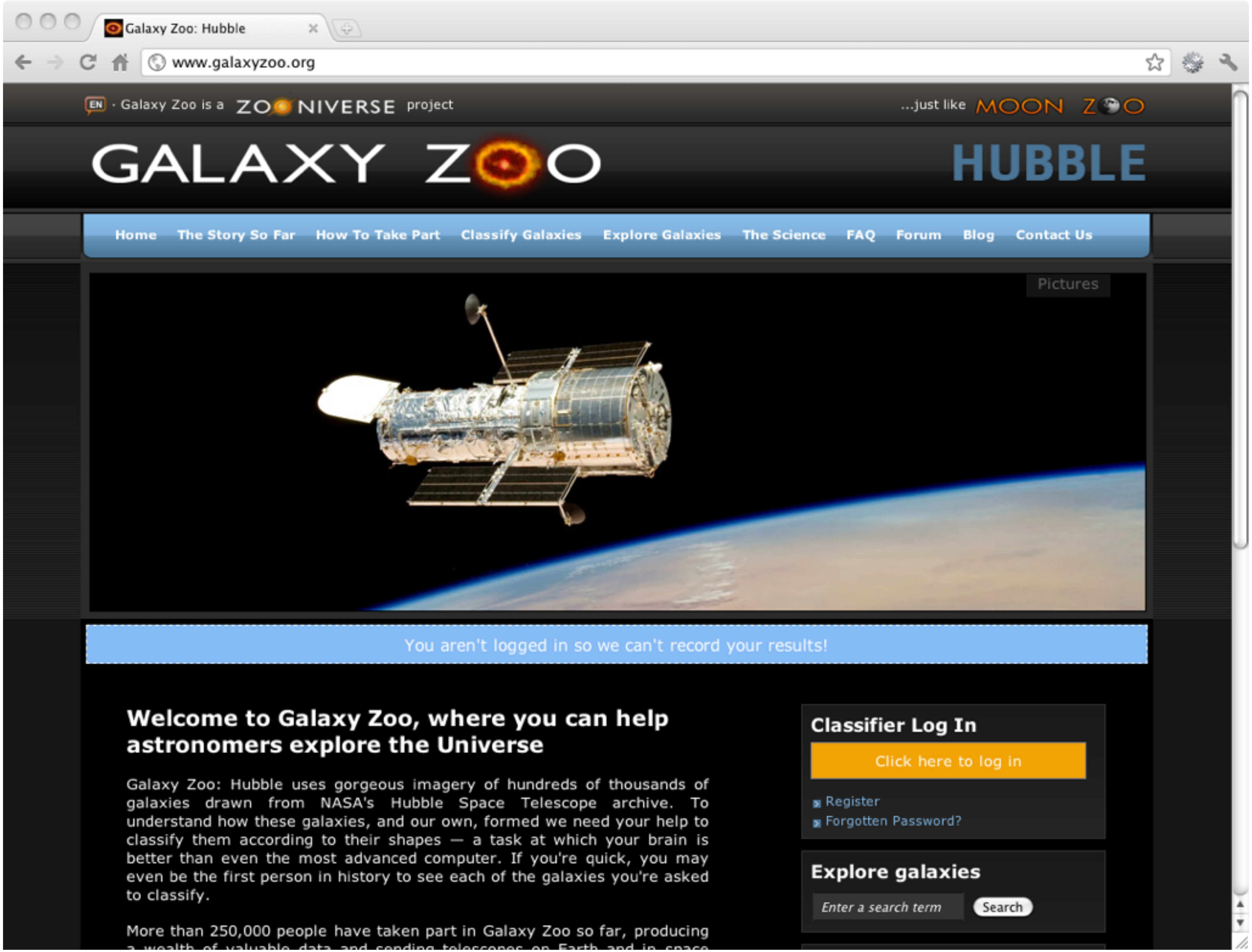
Player 2 guesses: handbag

Player 2 guesses: purse
Success! Agreement on "purse"

# Citizen Science

- 科学是数据密集型的
  - 气候
  - 物种分布
  - 星体轨迹
- 科学家数量少
- 非科学家来收集和解释数据

# Galaxy Zoo



You aren't logged in so we can't record your results!

## Welcome to Galaxy Zoo, where you can help astronomers explore the Universe

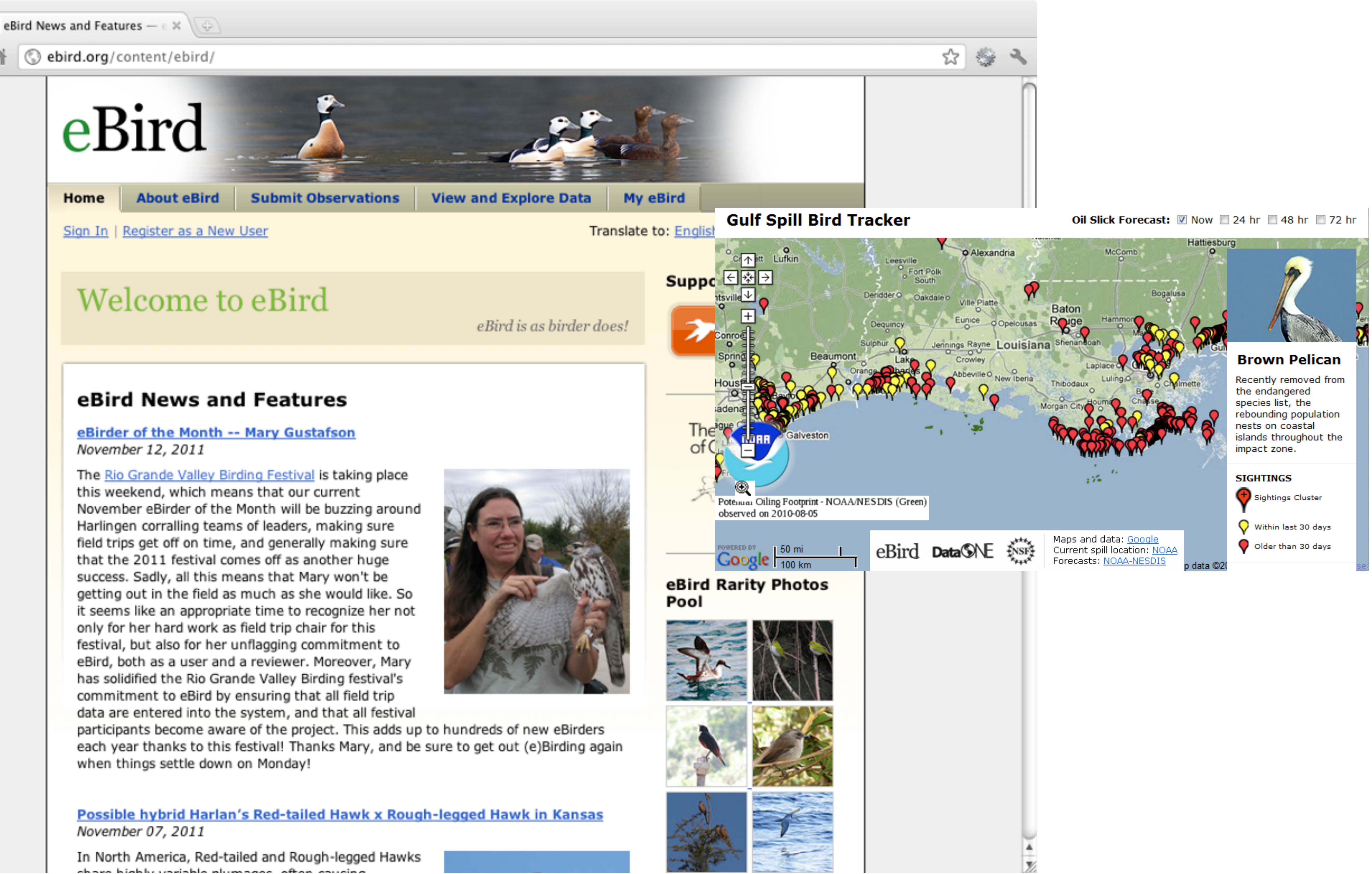
Galaxy Zoo: Hubble uses gorgeous imagery of hundreds of thousands of galaxies drawn from NASA's Hubble Space Telescope archive. To understand how these galaxies, and our own, formed we need your help to classify them according to their shapes — a task at which your brain is better than even the most advanced computer. If you're quick, you may even be the first person in history to see each of the galaxies you're asked to classify.

More than 250,000 people have taken part in Galaxy Zoo so far, producing a wealth of valuable data and sending telescopes on Earth and in space

### Classifier Log In

### Explore galaxies

# eBird



eBird News and Features

ebird.org/content/ebird/

eBird

Home | About eBird | Submit Observations | View and Explore Data | My eBird

Sign In | Register as a New User

Translate to: English

Welcome to eBird

*eBird is as birder does!*

## eBird News and Features

**eBirder of the Month -- Mary Gustafson**

*November 12, 2011*

The Rio Grande Valley Birding Festival is taking place this weekend, which means that our current November eBirder of the Month will be buzzing around Harlingen corralling teams of leaders, making sure field trips get off on time, and generally making sure that the 2011 festival comes off as another huge success. Sadly, all this means that Mary won't be getting out in the field as much as she would like. So it seems like an appropriate time to recognize her not only for her hard work as field trip chair for this festival, but also for her unflagging commitment to eBird, both as a user and a reviewer. Moreover, Mary has solidified the Rio Grande Valley Birding festival's commitment to eBird by ensuring that all field trip data are entered into the system, and that all festival participants become aware of the project. This adds up to hundreds of new eBirders each year thanks to this festival! Thanks Mary, and be sure to get out (e)Birding again when things settle down on Monday!

**Possible hybrid Harlan's Red-tailed Hawk x Rough-legged Hawk in Kansas**

*November 07, 2011*

In North America, Red-tailed and Rough-legged Hawks share highly variable plumages, often causing

**eBird Rarity Photos Pool**

**Gulf Spill Bird Tracker**

Oil Slick Forecast: ☑ Now □ 24 hr □ 48 hr □ 72 hr

Potential Oiling Footprint - NOAA/NESDIS (Green) observed on 2010-08-05

**Brown Pelican**

Recently removed from the endangered species list, the rebounding population nests on coastal islands throughout the impact zone.

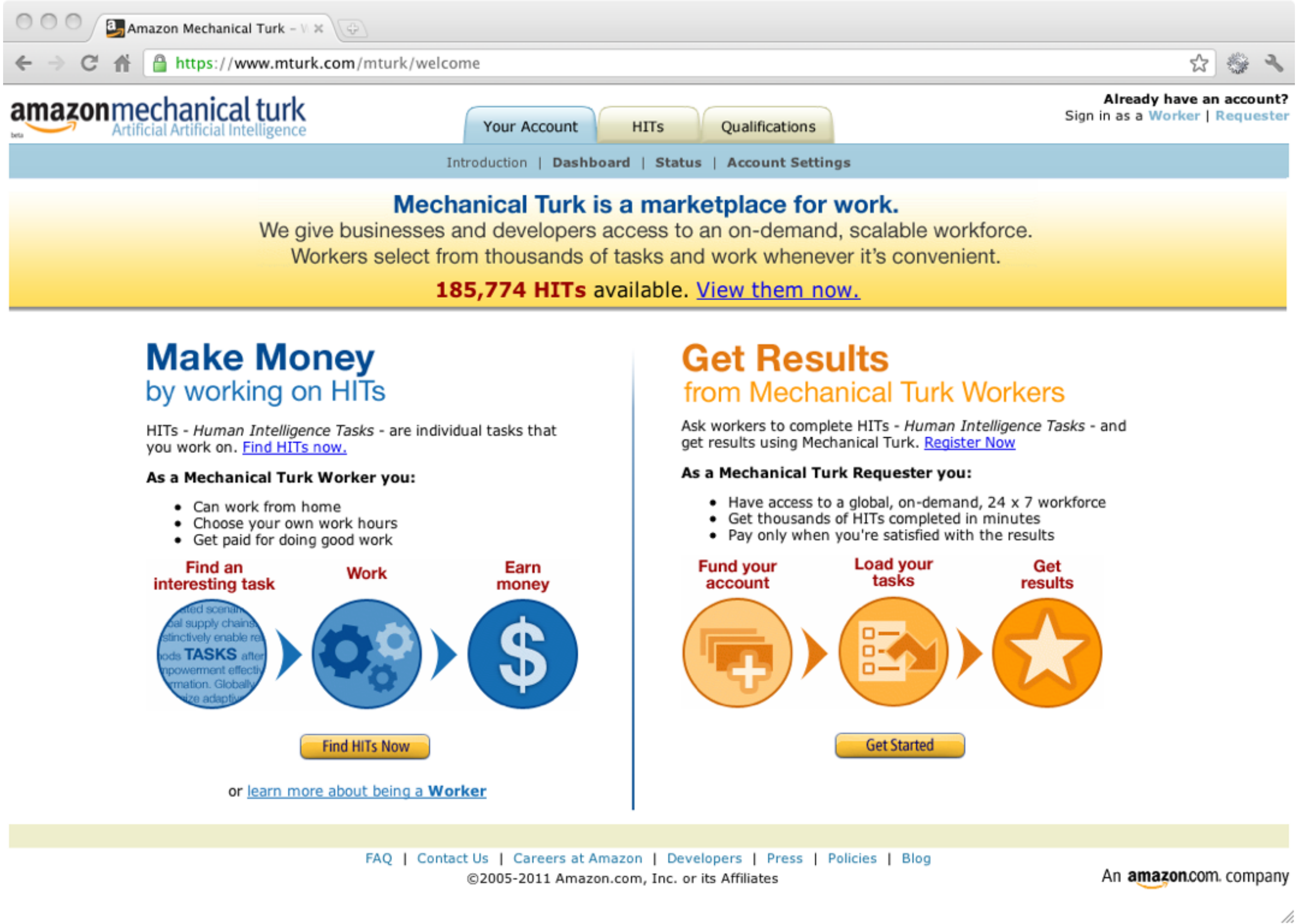
**SIGHTINGS**

| | |
|---|---|
| 📍 | Sightings Cluster |
| 📍 | Within last 30 days |
| 📍 | Older than 30 days |

eBird DataONE NSF

Maps and data: Google
Current spill location: NOAA
Forecasts: NOAA-NESDIS

# Amazon Mechanical Turk



Already have an account?
Sign in as a Worker | Requester

**Mechanical Turk is a marketplace for work.**
We give businesses and developers access to an on-demand, scalable workforce.
Workers select from thousands of tasks and work whenever it's convenient.

**185,774 HITs** available. View them now.

## 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

or learn more about being a **Worker**

## 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:**

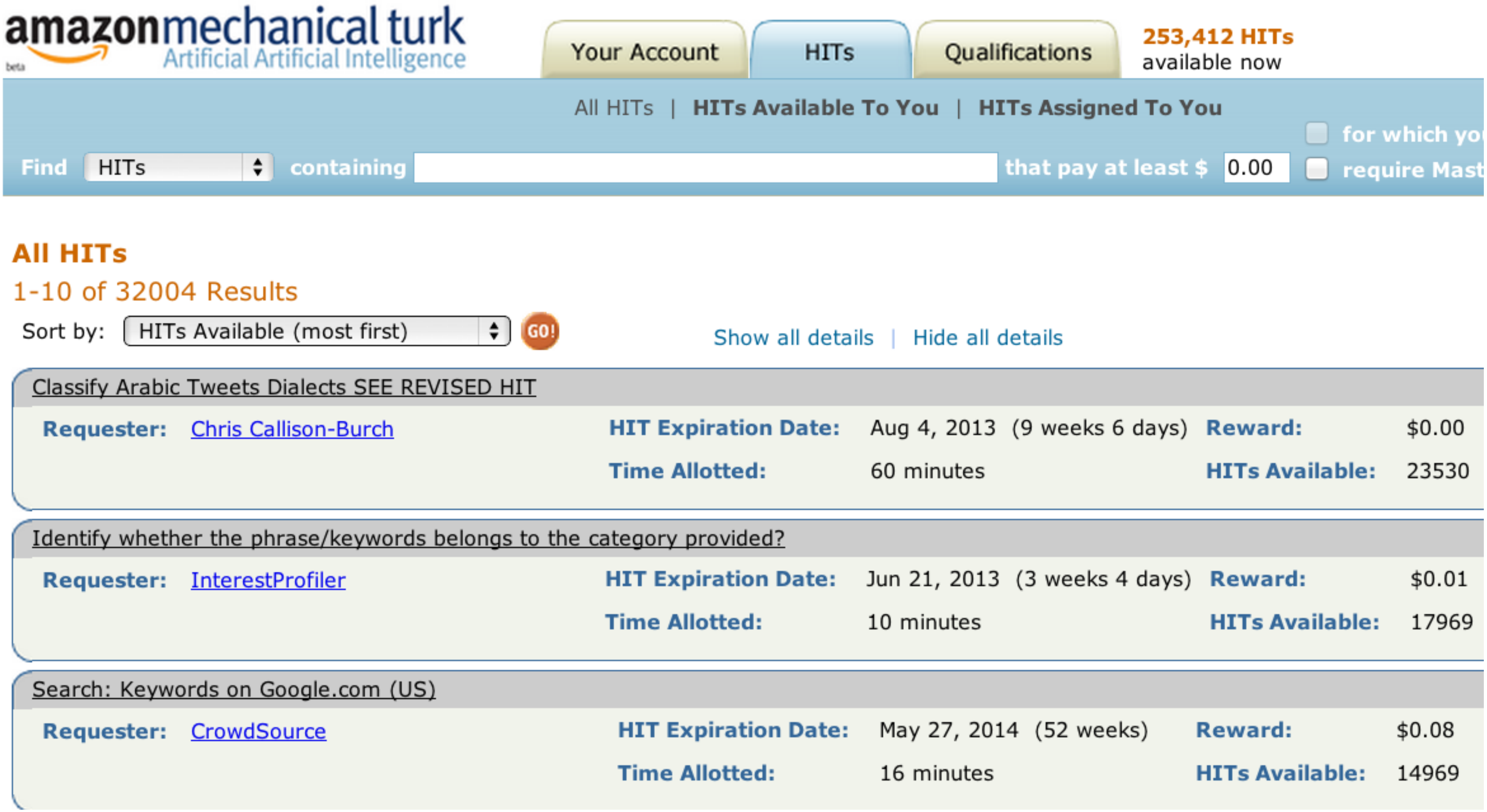
- Have access to a global, on-demand, 24 x 7 workforce
- Get thousands of HITs completed in minutes
- Pay only when you're satisfied with the results

FAQ | Contact Us | Careers at Amazon | Developers | Press | Policies | Blog

©2005-2011 Amazon.com, Inc. or its Affiliates

An amazon.com. company

# Amazon Mechanical Turk


amazonmechanical turk
beta
Artificial Artificial Intelligence
Your Account
HITs
Qualifications
All HITs | HITs Available To You | HITs Assigned To You
Find
HITs
containing
that pay at least $
□ for which yo
□ require Mast
Show all details | Hide all details
GO!

253,412 HITs available now

Find: HITs

that pay at least $: 0.00

## All HITs

1-10 of 32004 Results

Sort by: HITs Available (most first)

**Classify Arabic Tweets Dialects SEE REVISED HIT**

|  |  |  |  |  |  |
|---|---|---|---|---|---|
| **Requester:** | Chris Callison-Burch | **HIT Expiration Date:** | Aug 4, 2013 (9 weeks 6 days) | **Reward:** | $0.00 |
|  |  | **Time Allotted:** | 60 minutes | **HITs Available:** | 23530 |

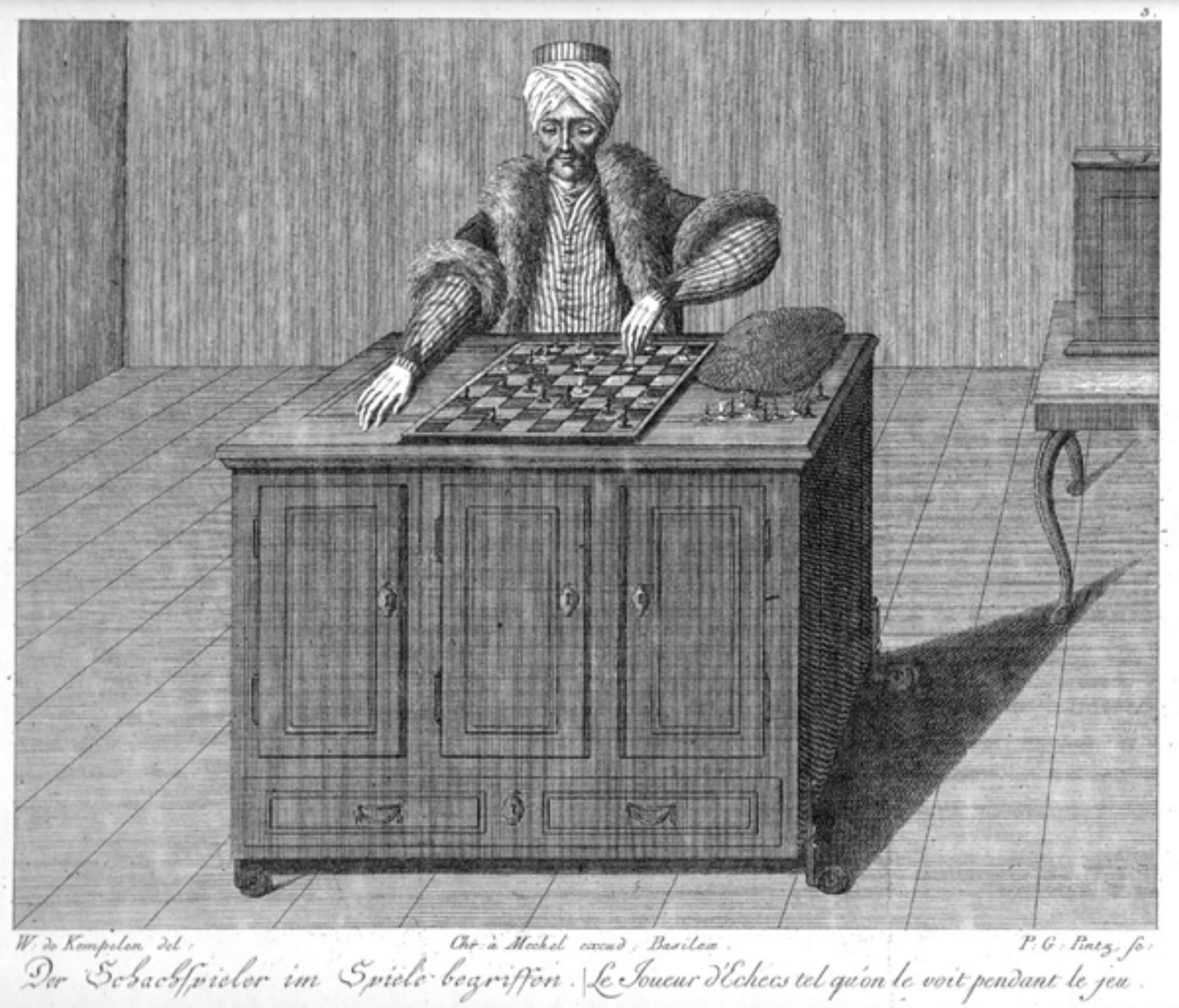
**Identify whether the phrase/keywords belongs to the category provided?**

|  |  |  |  |  |  |
|---|---|---|---|---|---|
| **Requester:** | InterestProfiler | **HIT Expiration Date:** | Jun 21, 2013 (3 weeks 4 days) | **Reward:** | $0.01 |
|  |  | **Time Allotted:** | 10 minutes | **HITs Available:** | 17969 |

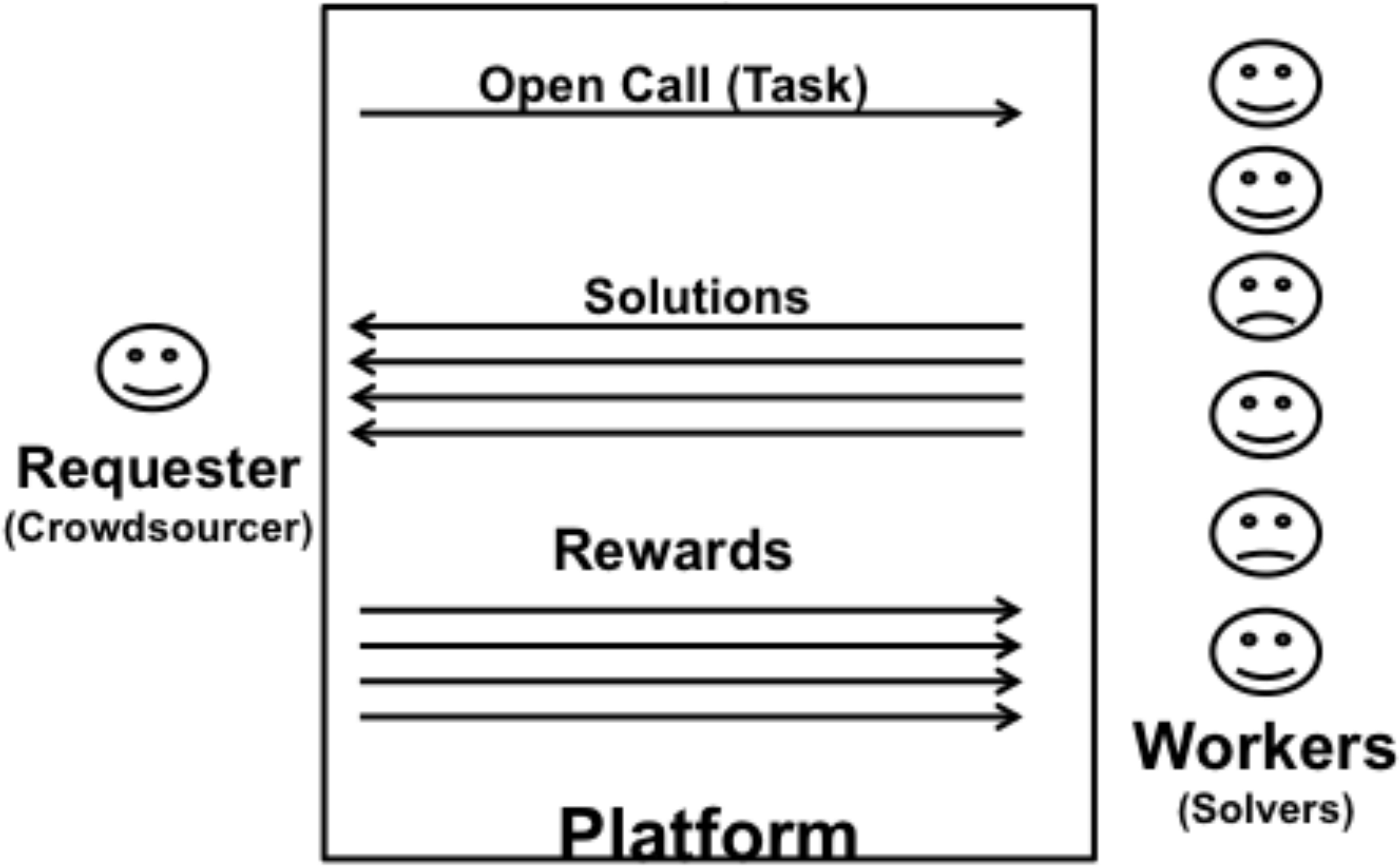
**Search: Keywords on Google.com (US)**

|  |  |  |  |  |  |
|---|---|---|---|---|---|
| **Requester:** | CrowdSource | **HIT Expiration Date:** | May 27, 2014 (52 weeks) | **Reward:** | $0.08 |
|  |  | **Time Allotted:** | 16 minutes | **HITs Available:** | 14969 |

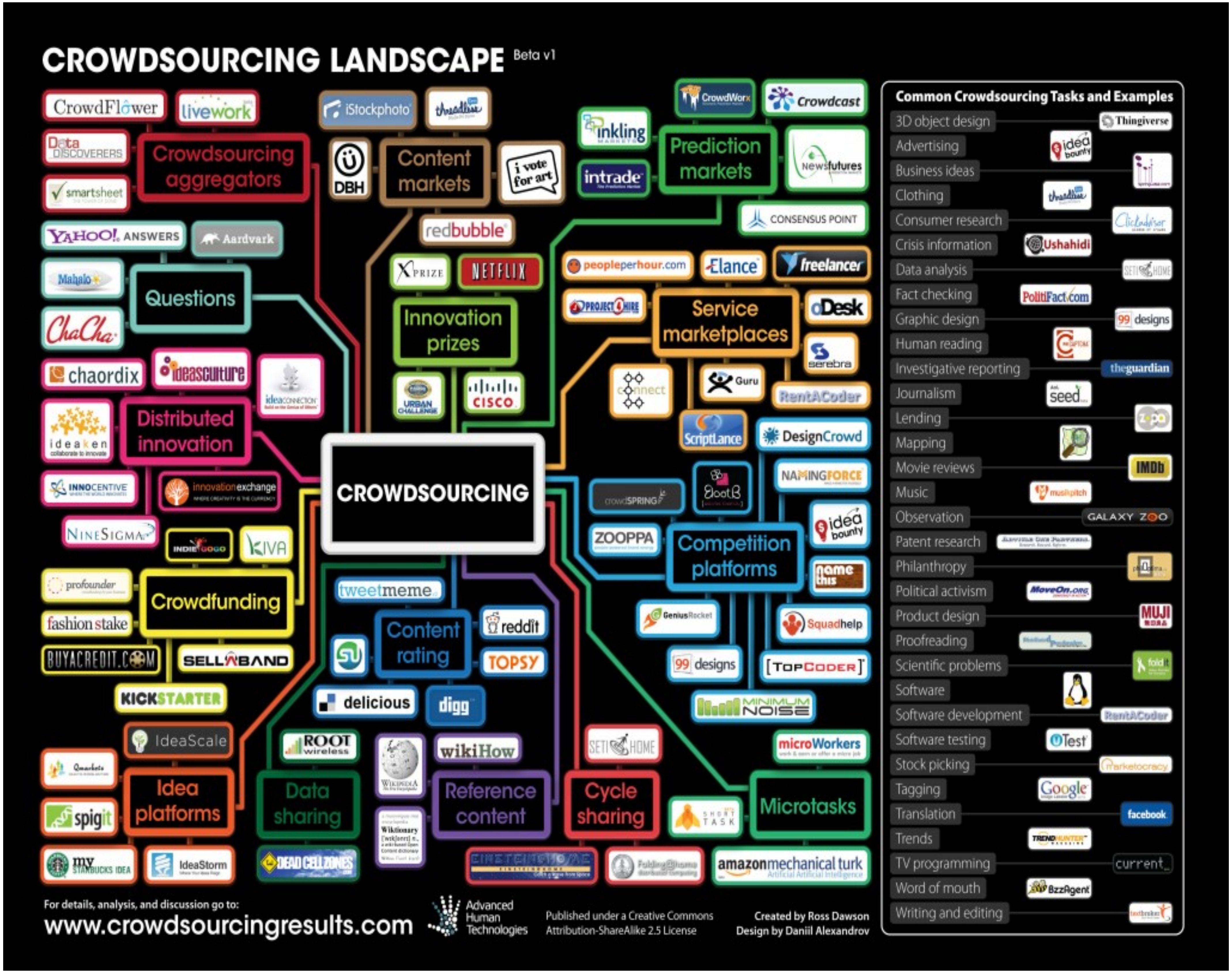
# Mechanical Turk


W. de Kempelen del:
Chr. à Mechel excud. Basileæ.
P. G. Pintz sc.
Der Schachſpieler im Spiele begriffen. | Le Joueur d'Echecs tel qu'on le voit pendant le jeu.

# 众包


Open Call (Task)
Solutions
Rewards
Platform
Requester
(Crowdsourcer)
Workers
(Solvers)

# 众包



## CROWDSOURCING LANDSCAPE Beta v1

**Common Crowdsourcing Tasks and Examples**

| | |
|---|---|
| 3D object design | Thingiverse |
| Advertising | idea bounty |
| Business ideas | |
| Clothing | threadless |
| Consumer research | Clickadvisor |
| Crisis information | Ushahidi |
| Data analysis | SETI@home |
| Fact checking | PolitiFact.com |
| Graphic design | 99designs |
| Human reading | |
| Investigative reporting | theguardian |
| Journalism | seed |
| Lending | zopa |
| Mapping | |
| Movie reviews | IMDb |
| Music | musicpitch |
| Observation | Galaxy Zoo |
| Patent research | |
| Philanthropy | |
| Political activism | MoveOn.org |
| Product design | MUJI |
| Proofreading | |
| Scientific problems | foldit |
| Software | |
| Software development | RentACoder |
| Software testing | uTest |
| Stock picking | marketocracy |
| Tagging | Google |
| Translation | facebook |
| Trends | Trendhunter |
| TV programming | current |
| Word of mouth | BzzAgent |
| Writing and editing | textbroker |

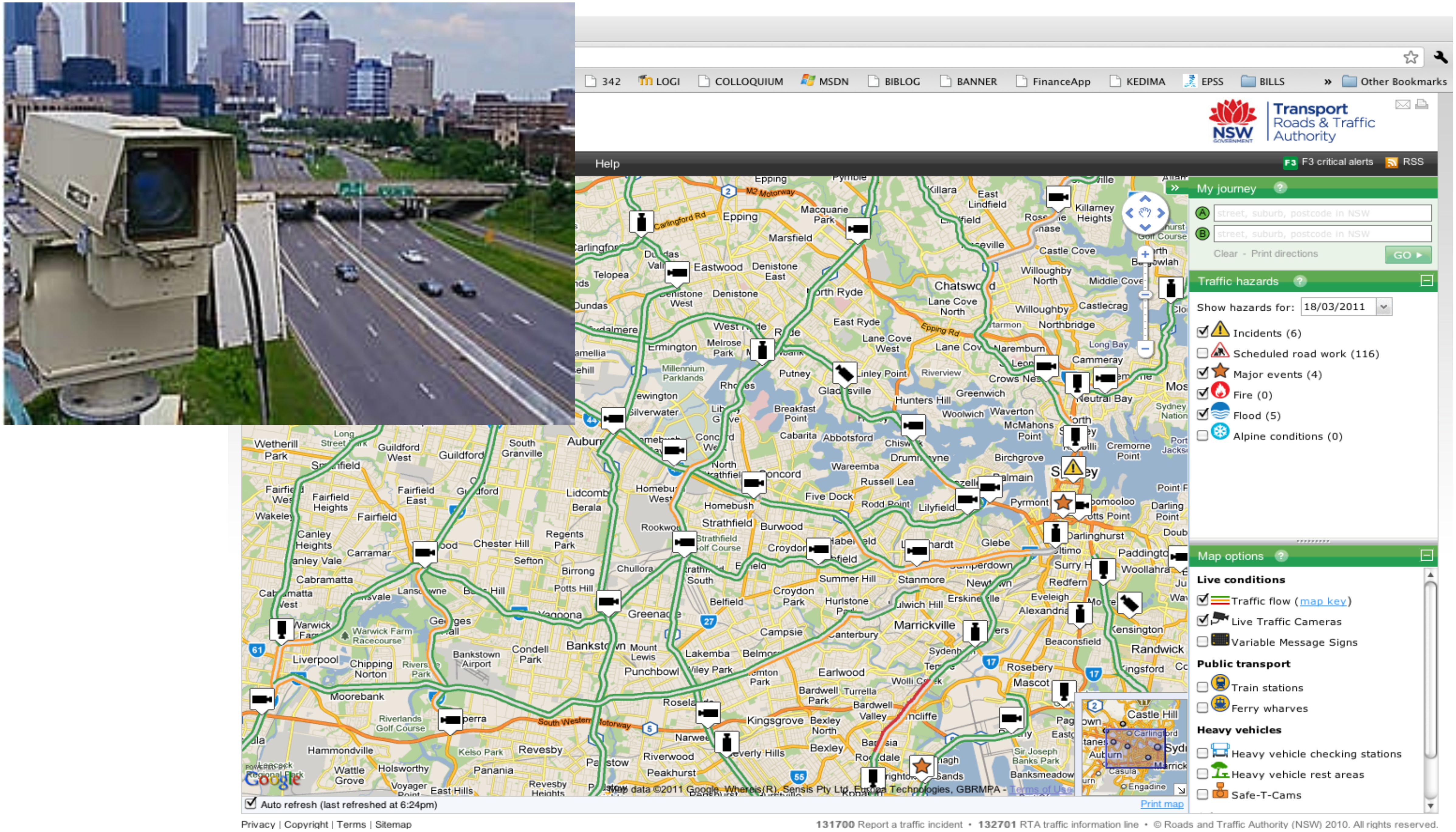
For details, analysis, and discussion go to:
www.crowdsourcingresults.com

Advanced Human Technologies

Published under a Creative Commons Attribution-ShareAlike 2.5 License

Created by Ross Dawson
Design by Daniil Alexandrov

# 道路监控



My journey

Ⓐ street, suburb, postcode in NSW

Ⓑ street, suburb, postcode in NSW

Clear - Print directions GO ▸

Traffic hazards

Show hazards for: 18/03/2011

☑ Incidents (6)

☐ Scheduled road work (116)

☑ Major events (4)

☑ Fire (0)

☑ Flood (5)

☐ Alpine conditions (0)

Map options

**Live conditions**

☑ Traffic flow (map key)

☑ Live Traffic Cameras

☐ Variable Message Signs

**Public transport**

☐ Train stations

☐ Ferry wharves

**Heavy vehicles**

☐ Heavy vehicle checking stations

☐ Heavy vehicle rest areas

☐ Safe-T-Cams

☑ Auto refresh (last refreshed at 6:24pm)

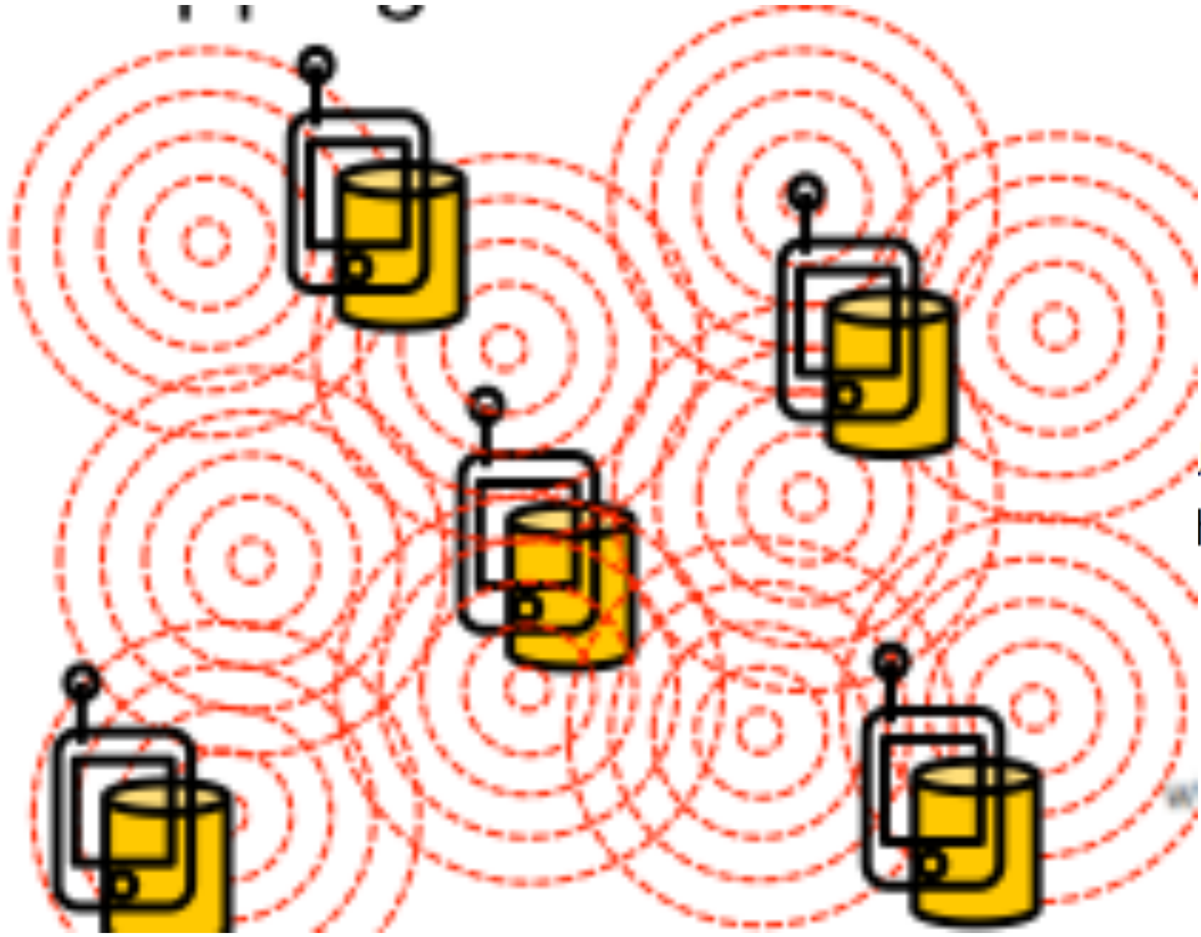
Map data ©2011 Google, Whereis(R), Sensis Pty Ltd, Europa Technologies, GBRMPA - Terms of Use

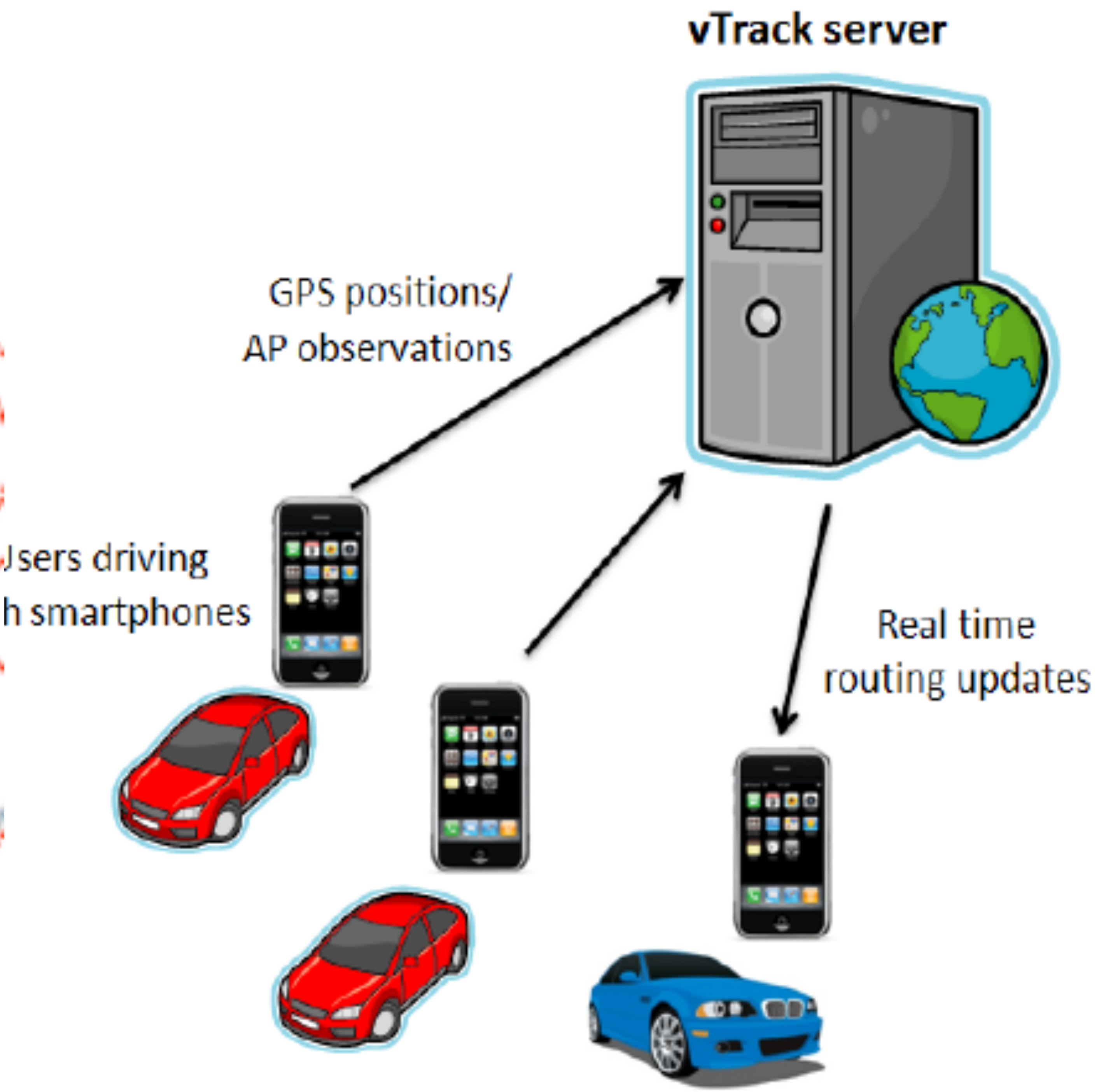
Print map

Privacy | Copyright | Terms | Sitemap

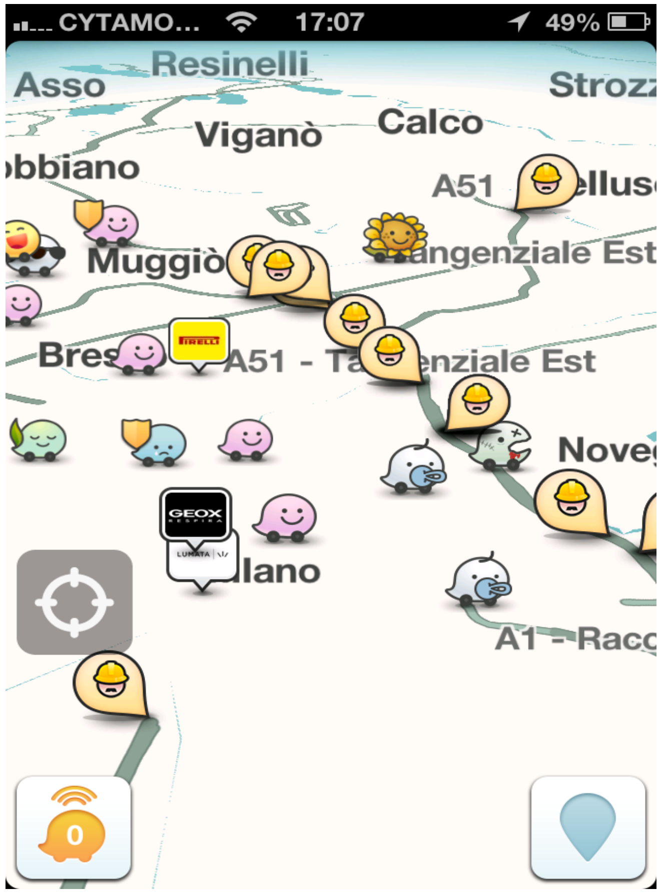
131700 Report a traffic incident • 132701 RTA traffic information line • © Roads and Traffic Authority (NSW) 2010. All rights reserved.

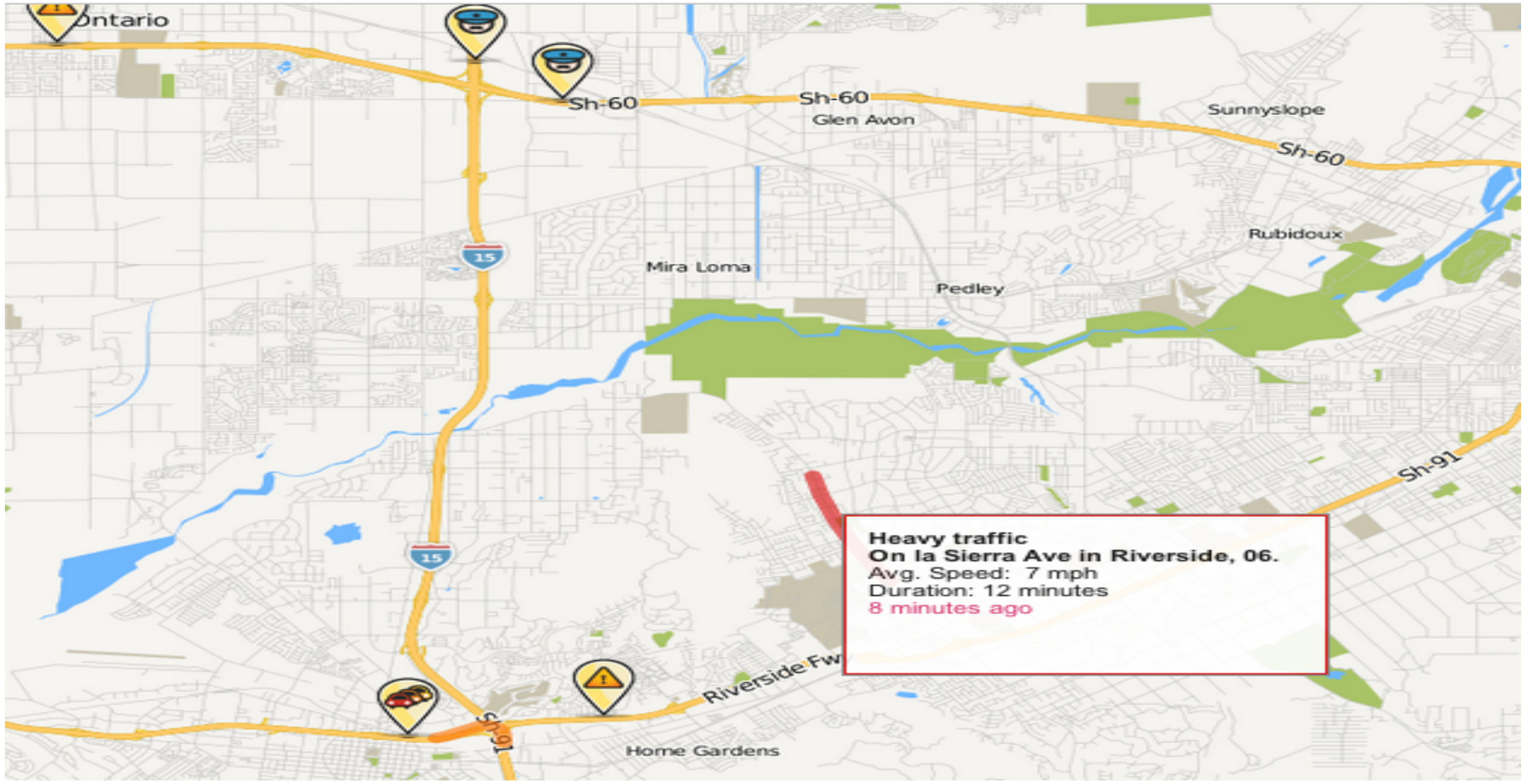
# 道路监控




vTrack server
GPS positions/
AP observations
Jsers driving
h smartphones
Real time
routing updates

# 道路监控





Heavy traffic
On la Sierra Ave in Riverside, 06.
Avg. Speed: 7 mph
Duration: 12 minutes
8 minutes ago

# CAPTCHA

# CAPTCHA定义

- CAPTCHA

  Completely

  Automated

  Public

  Turning test to tell

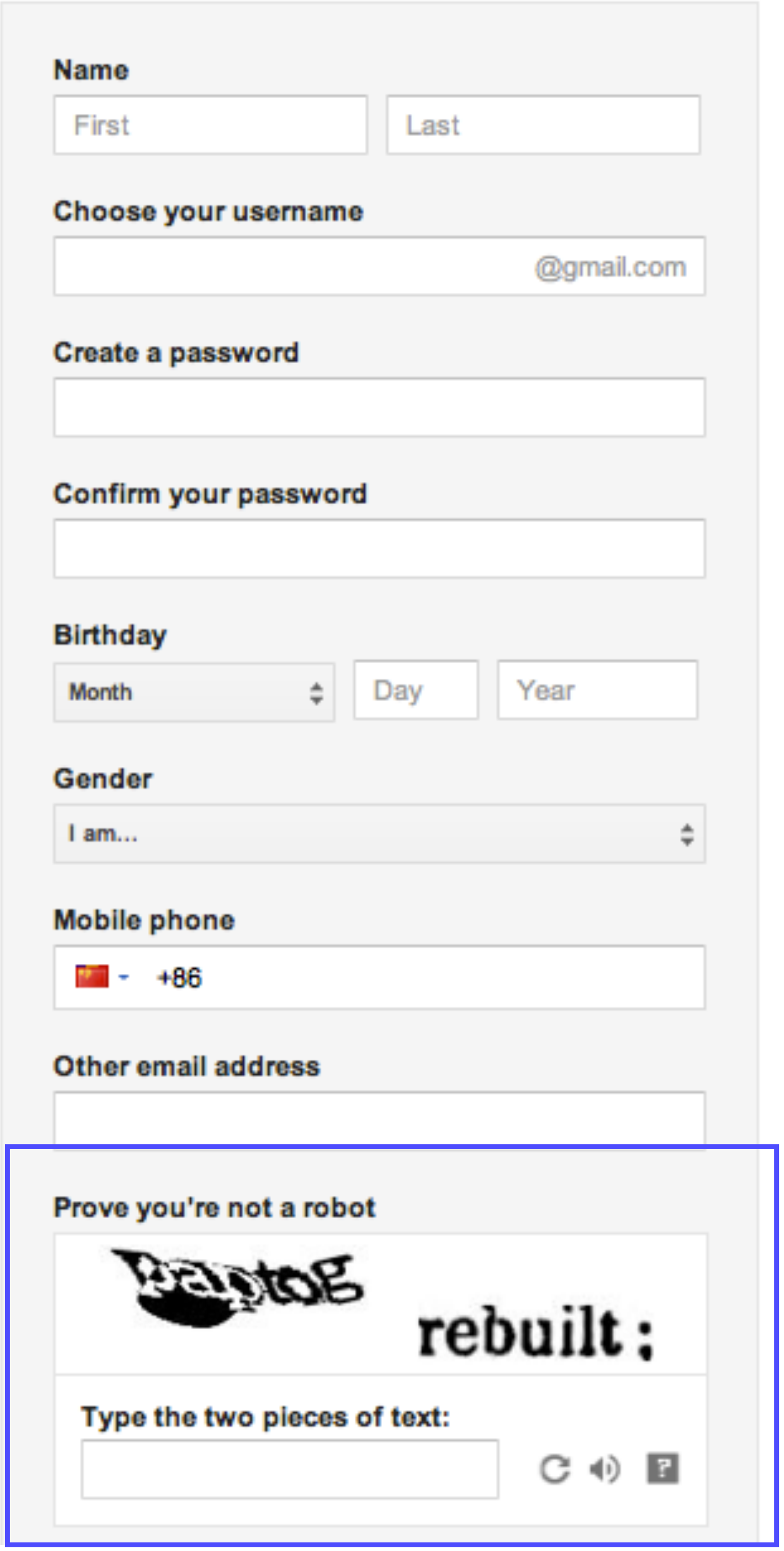
  Computers and

  Humans

  Apart

http://www.captcha.net/

http://en.wikipedia.org/wiki/CAPTCHA



Name

First | Last

Choose your username

@gmail.com

Create a password

Confirm your password

Birthday

Month | Day | Year

Gender

I am...

Mobile phone

+86

Other email address

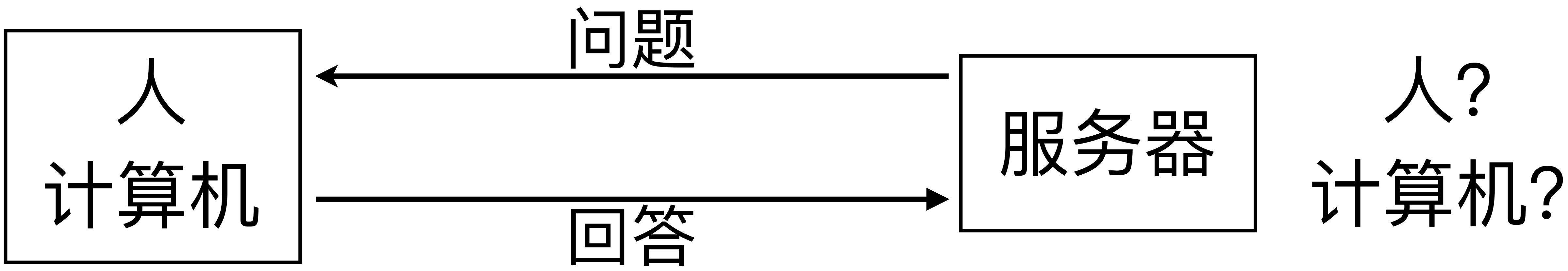
Prove you're not a robot

rebuilt ;

Type the two pieces of text:

# CAPTCHA定义

- A program that generates and grades tests that are human solvable but beyond the capabilities of current computer programs
- 全自动区分计算机和人类的图灵测试
- 验证码，一种区分用户是计算机和人的公共全自动程序



人
计算机

问题

回答

服务器

人?
计算机?

# CAPTCHA历史

- 1996，Moni Naor
- 1997年, AltaVista
- Yahoo邮件是第一个大规模采用CAPTCHA的网站
- 2000年，von Ahn和Blum设计出第一个抵御OCR的CAPTCHA
- 2007年，reCAPTCHA
- 2007年，NoCAPTCHA
- … …

HIPs:
Human Interactive Proof

OCR:
Opitcal Character Recognition

# CAPTCHA应用

- 判断人还是机器

✳保护网站用户注册，提供免费服务给用户而不是bots

✳保护搜索引擎，防止评论spam

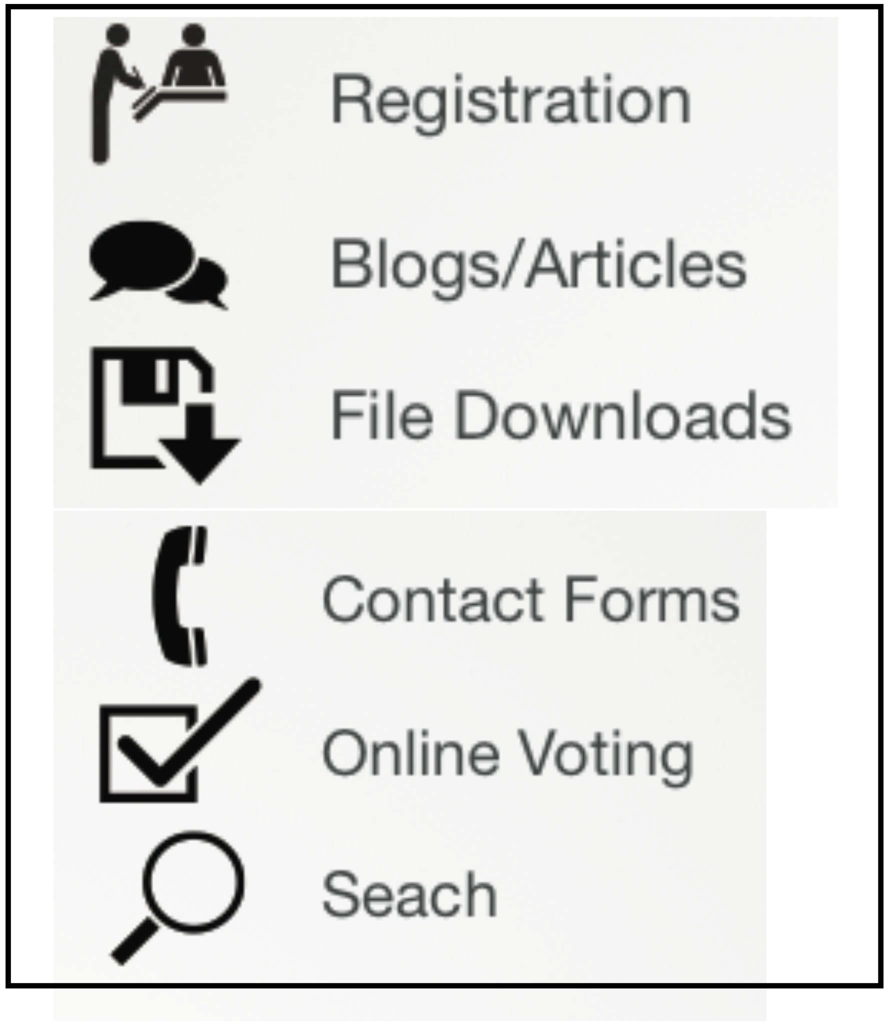
✳确保在线调查更可信，防止虚假投票

✳防止spam制作者很容易的获得email地址

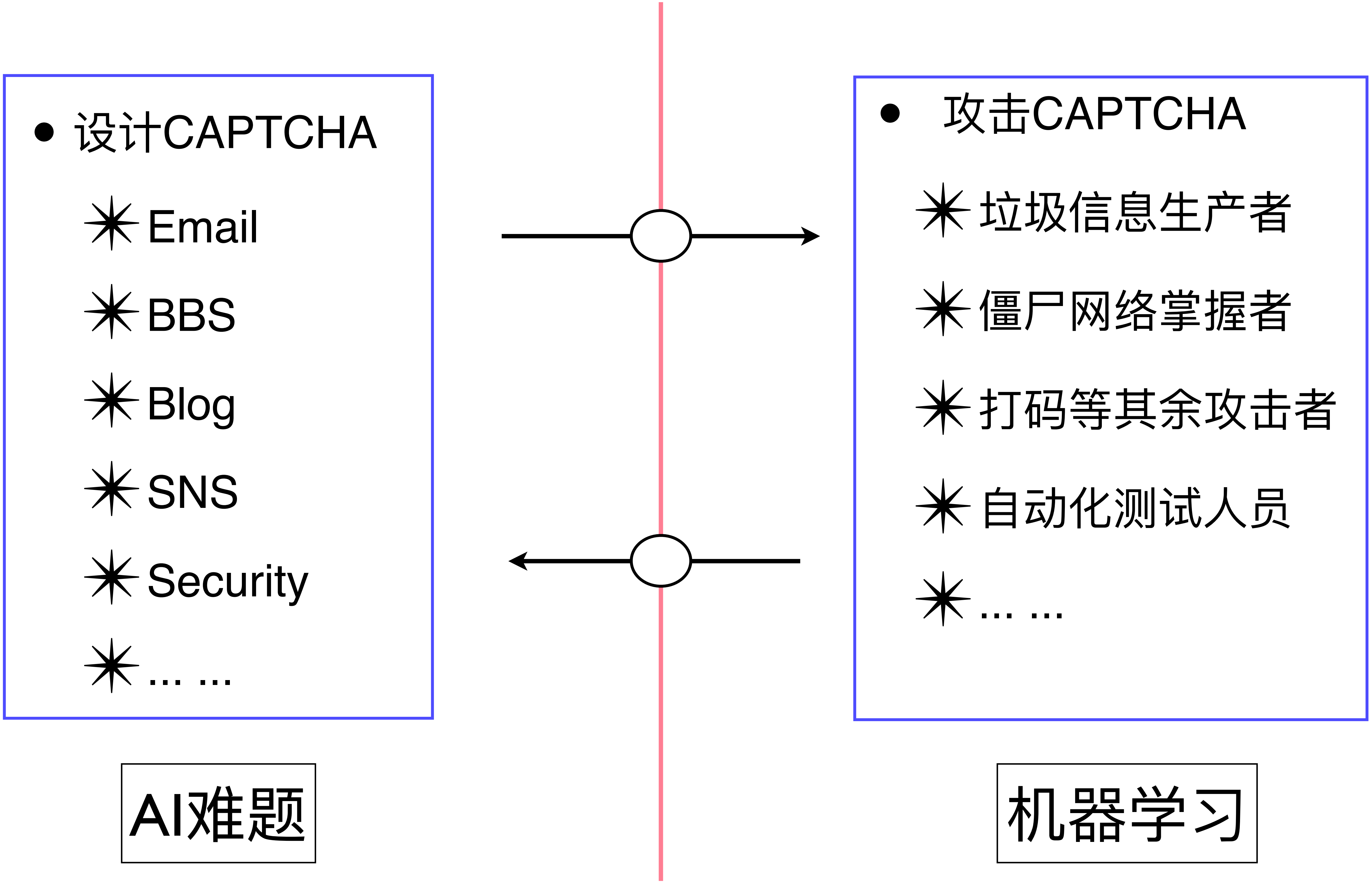
✳防止针对口令系统的字典攻击

✳抵御bots

SPAM



# CAPTCHA vs AI



- 设计CAPTCHA
  - ✶ Email
  - ✶ BBS
  - ✶ Blog
  - ✶ SNS
  - ✶ Security
  - ✶ … …

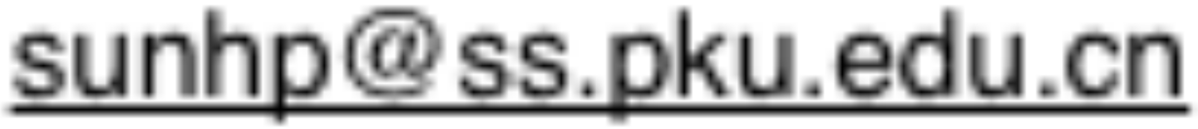
AI难题

- 攻击CAPTCHA
  - ✶ 垃圾信息生产者
  - ✶ 僵尸网络掌握者
  - ✶ 打码等其余攻击者
  - ✶ 自动化测试人员
  - ✶ … …

机器学习

# 文本 vs 图片

- 请进入如下图片的文字



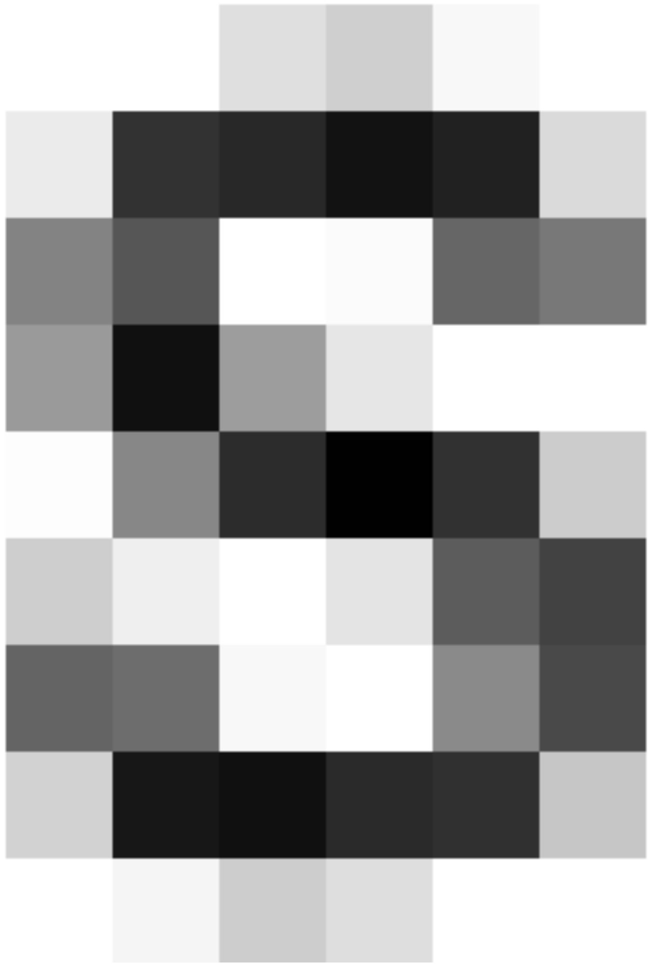
sunhp@ss.pku.edu.cn

- <u>文字如下：</u>

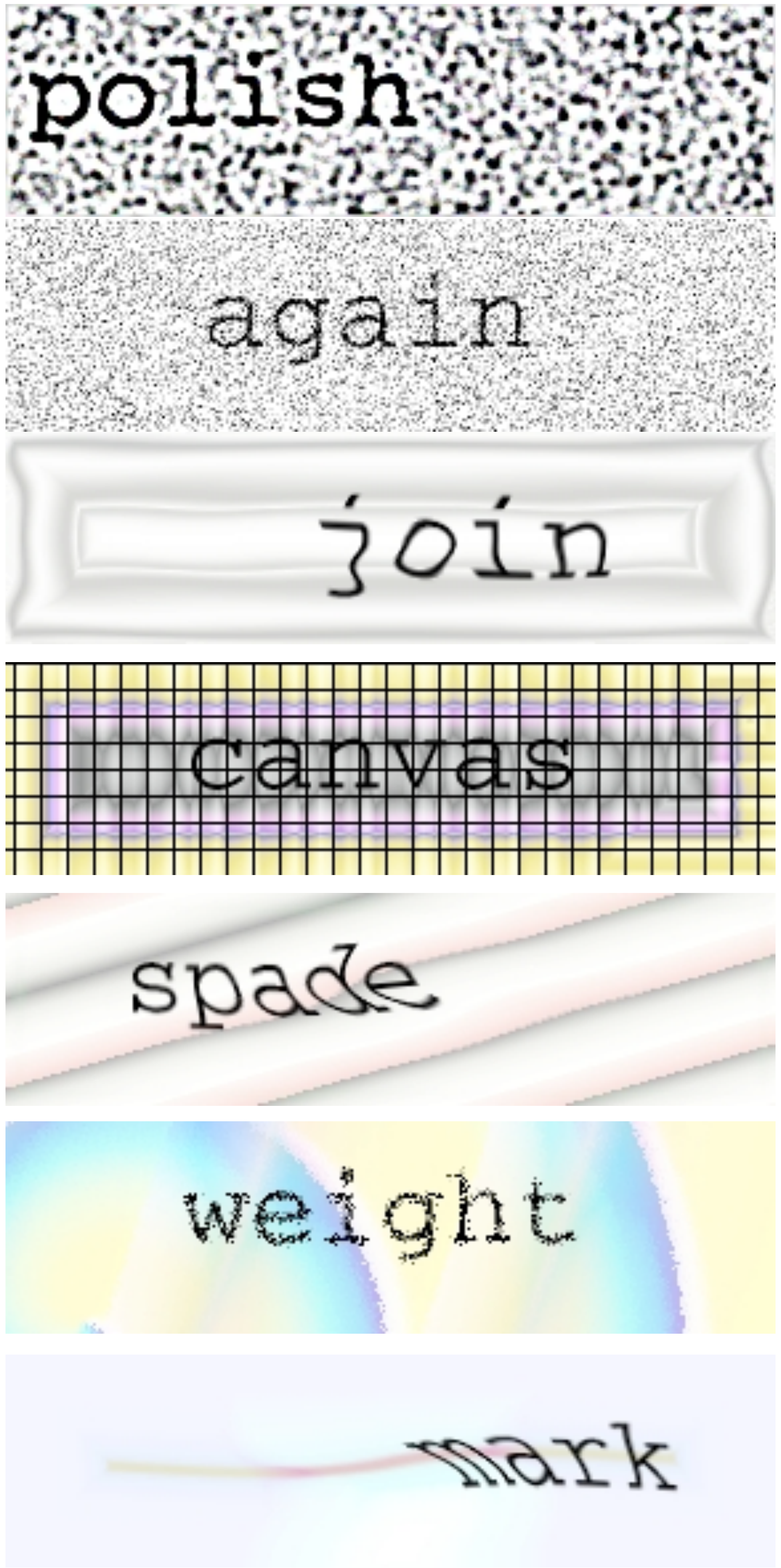
<u>sunhp@ss.pku.edu.cn</u>

- 像素点
- 图片：二维的像素点
- 计算机不能识别图片中包括什么文本
- 计算机能识别图片中哪些像素相同不相同

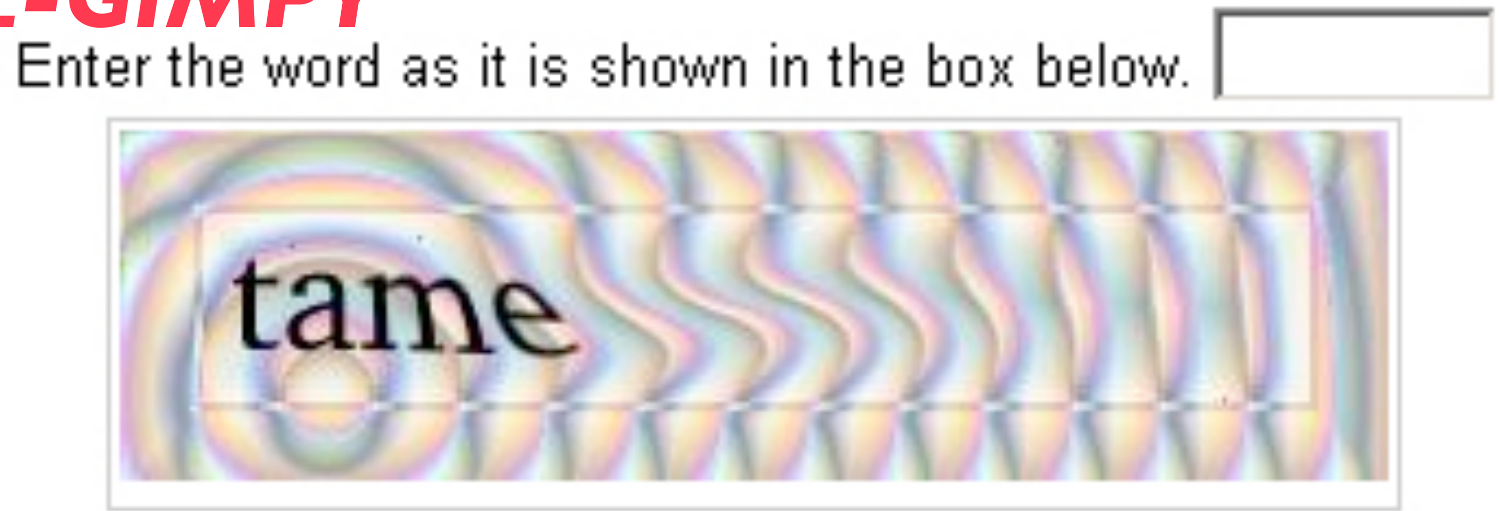
模式匹配



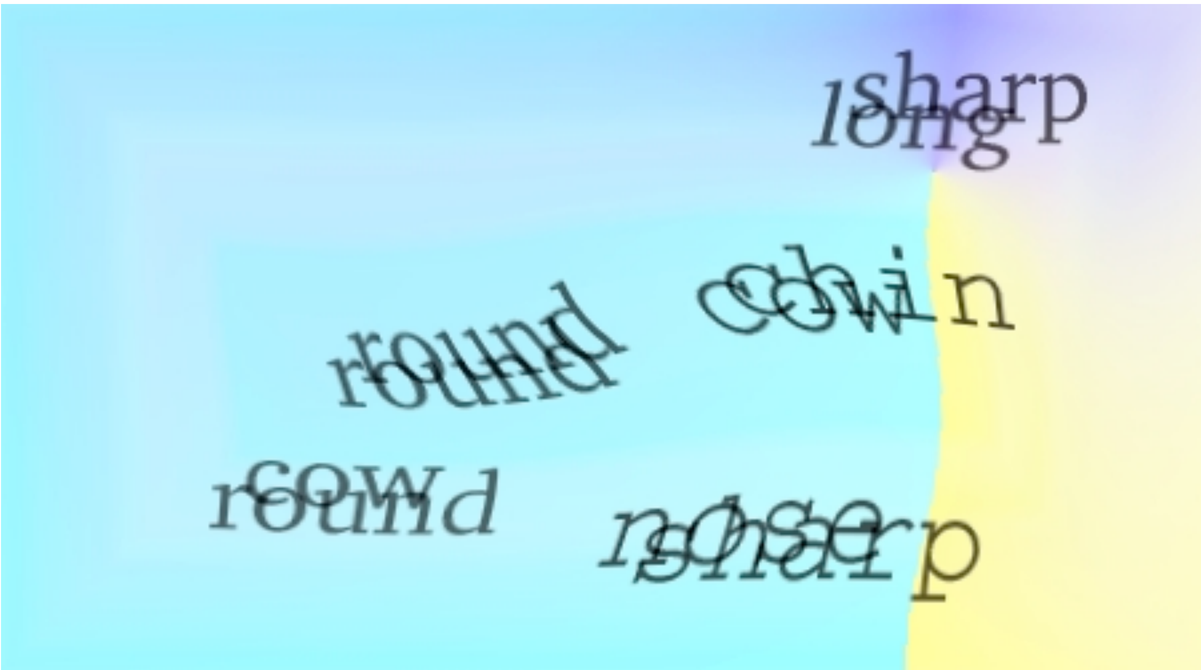
# GIMPY / EZ-GIMPY



## EZ-GIMPY


Enter the word as it is shown in the box below.

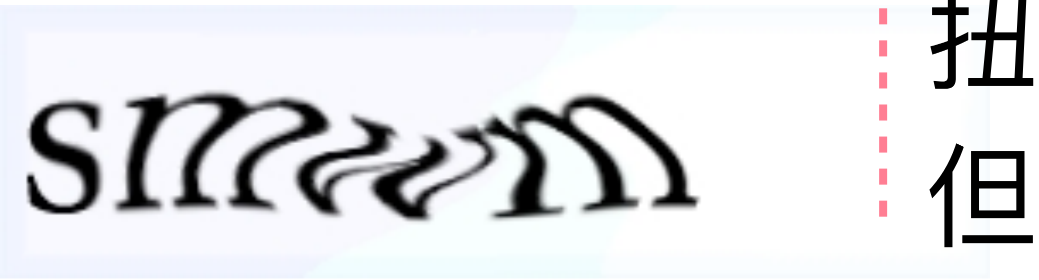
## GIMPY



http://www.cs.sfu.ca/~mori/research/gimpy/

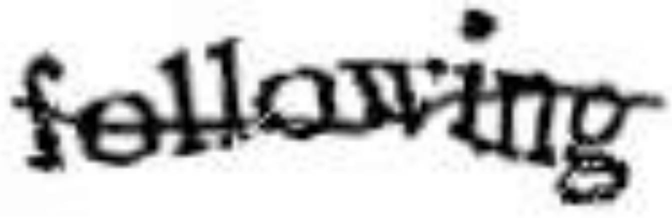
# 文本CAPTCHA原理

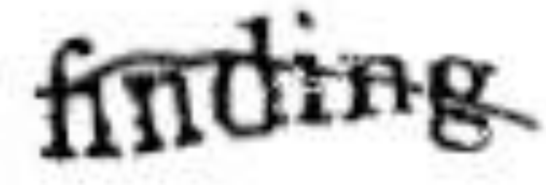
Yahoo’s EZ-Gimpy



假设：人能读扭曲的文本，但计算机不能

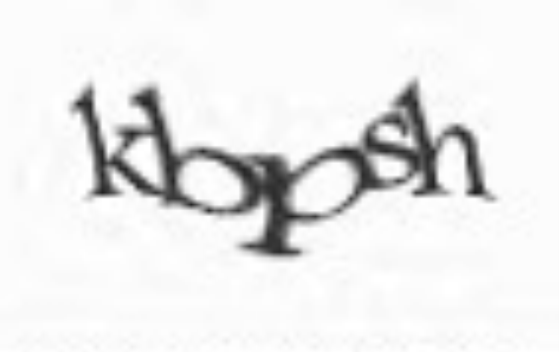
一般情况下要求用户输入扭曲图像中的文字

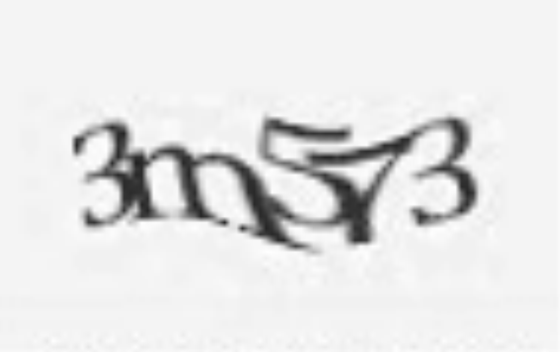




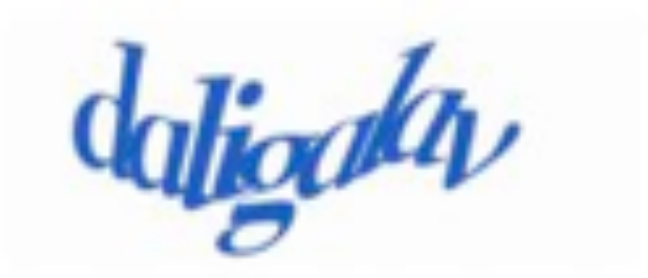
增加一条曲线使得图像分割更困难

将符号彼此拥挤在一起，但是人也比较难于识别

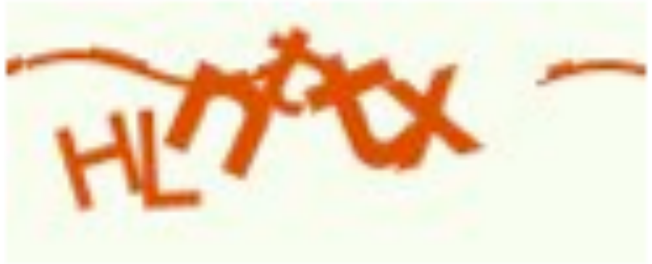




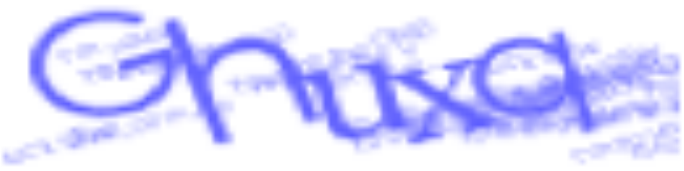
# 常见文本CAPTCHA



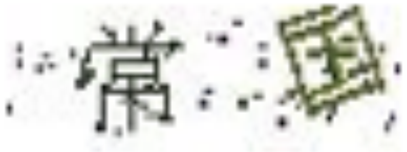
谷歌的验证码



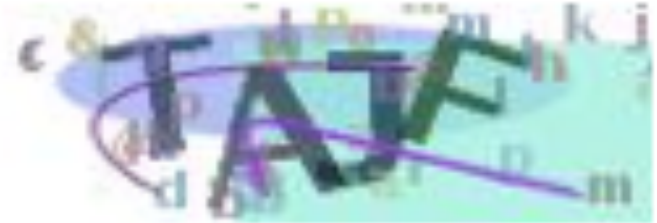
QQ的验证码



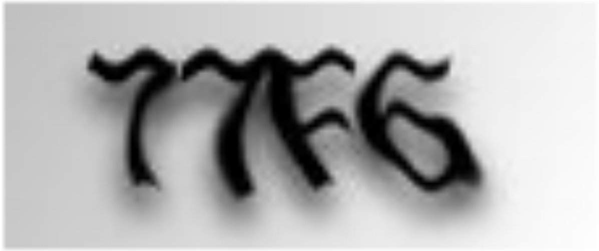
新浪的验证码



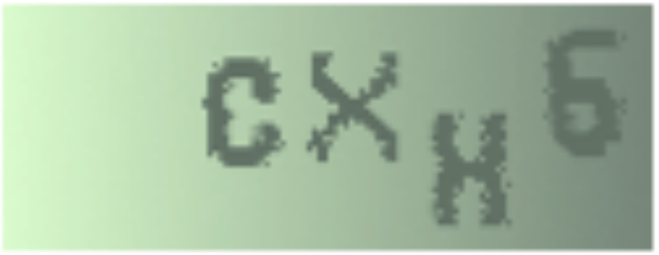
网易的验证码



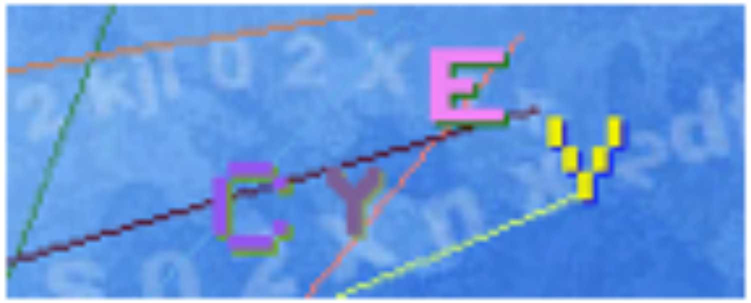
人人网的验证码



天涯的验证码

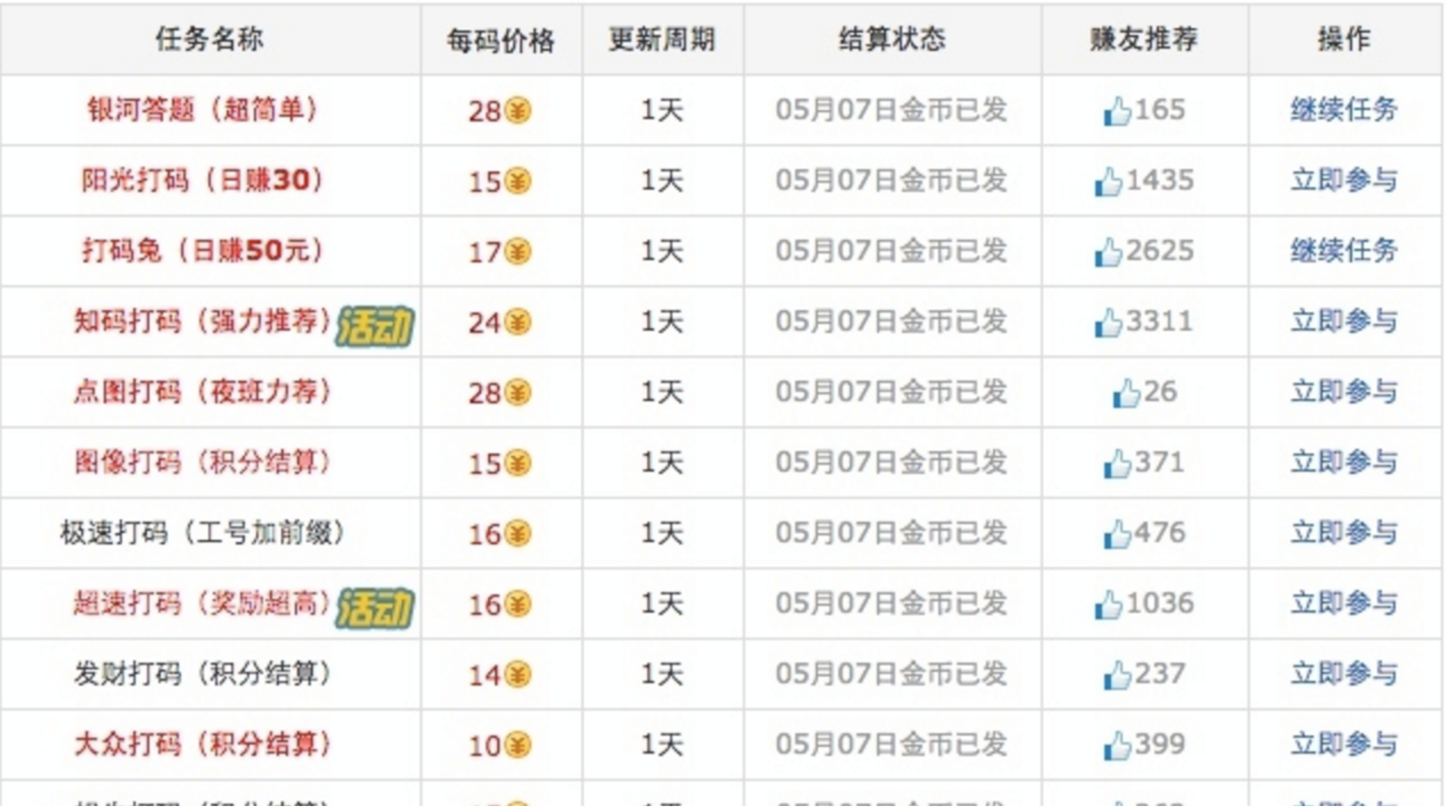


Discuz的验证码



北大软微论坛

# 人为攻击CAPTCHA



| 任务名称 | 每码价格 | 更新周期 | 结算状态 | 赚友推荐 | 操作 |
|---|---|---|---|---|---|
| 银河答题（超简单） | 28 | 1天 | 05月07日金币已发 | 165 | 继续任务 |
| 阳光打码（日赚30） | 15 | 1天 | 05月07日金币已发 | 1435 | 立即参与 |
| 打码兔（日赚50元） | 17 | 1天 | 05月07日金币已发 | 2625 | 继续任务 |
| 知码打码（强力推荐）活动 | 24 | 1天 | 05月07日金币已发 | 3311 | 立即参与 |
| 点图打码（夜班力荐） | 28 | 1天 | 05月07日金币已发 | 26 | 立即参与 |
| 图像打码（积分结算） | 15 | 1天 | 05月07日金币已发 | 371 | 立即参与 |
| 极速打码（工号加前缀） | 16 | 1天 | 05月07日金币已发 | 476 | 立即参与 |
| 超速打码（奖励超高）活动 | 16 | 1天 | 05月07日金币已发 | 1036 | 立即参与 |
| 发财打码（积分结算） | 14 | 1天 | 05月07日金币已发 | 237 | 立即参与 |
| 大众打码（积分结算） | 10 | 1天 | 05月07日金币已发 | 399 | 立即参与 |

云打码 Yündama 神码都是浮云

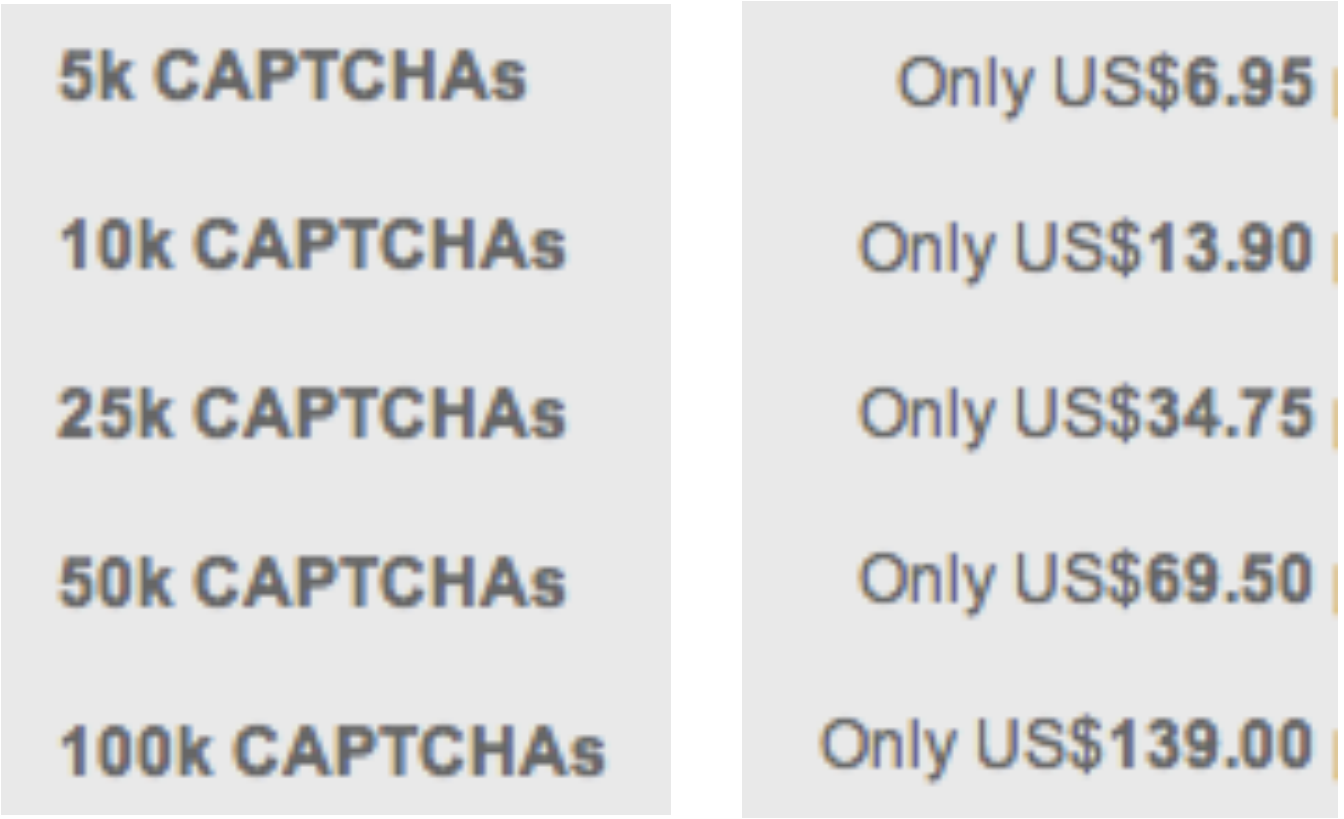
DEATH BY CAPTCHA

FASTEST DISCOUNT CAPTCHA SOLVERS

•DECAPTCHER.COM

DeCaptcher

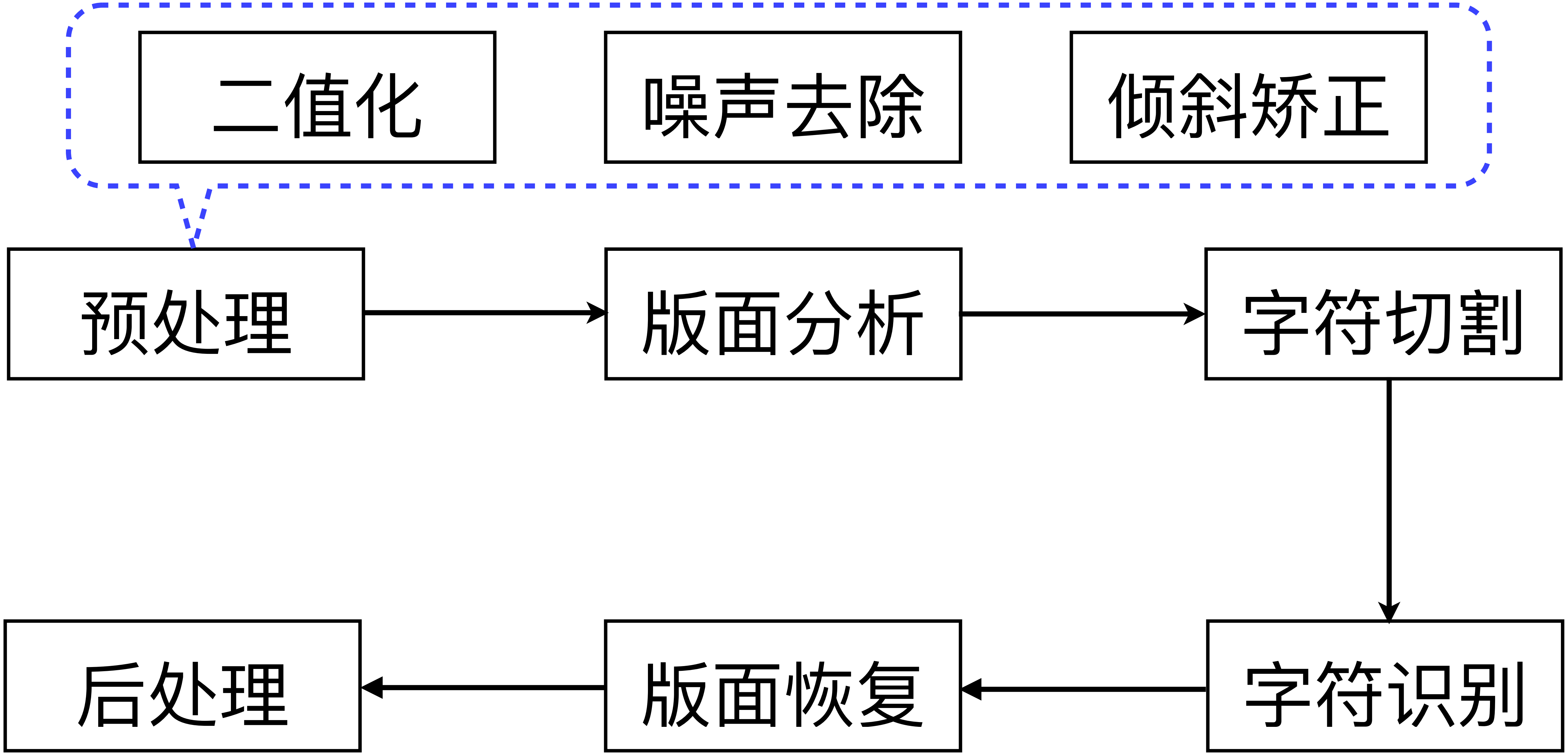
Bypass CAPTCHA



| | |
|---|---|
| 5k CAPTCHAs | Only US$6.95 |
| 10k CAPTCHAs | Only US$13.90 |
| 25k CAPTCHAs | Only US$34.75 |
| 50k CAPTCHAs | Only US$69.50 |
| 100k CAPTCHAs | Only US$139.00 |

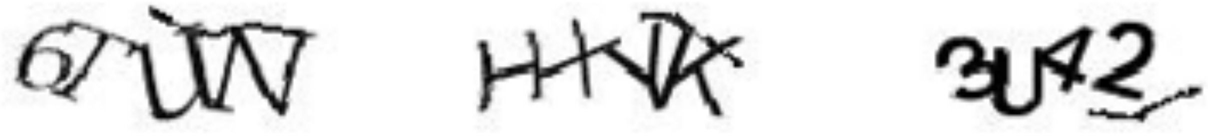
# OCR

- OCR：Optical Character Recognition，光学字符识别

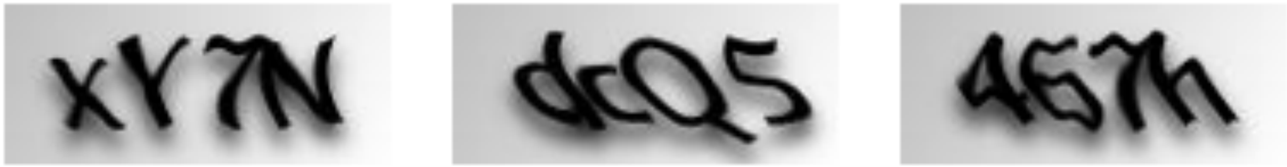


http://en.wikipedia.org/wiki/Optical_character_recognition

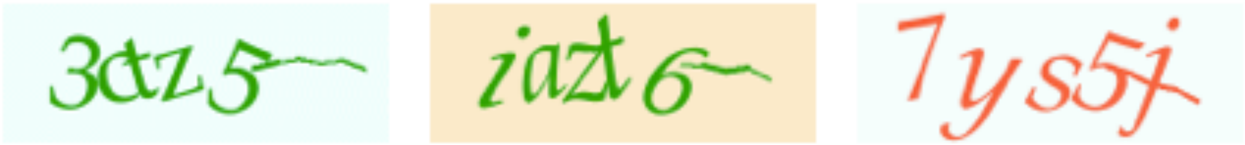
# 常用技术



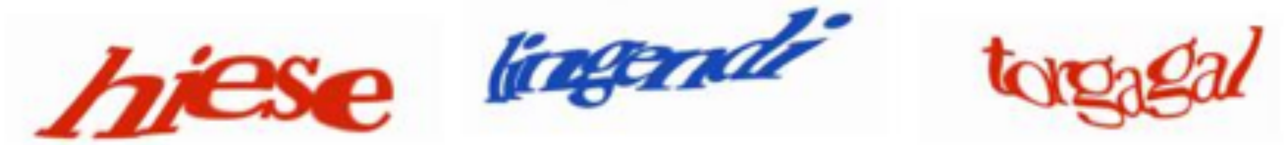
a．百度使用的验证码



b．天涯论坛使用的验证码



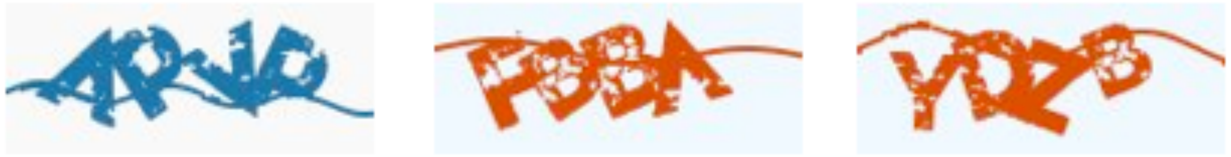
a．开心网使用的验证码



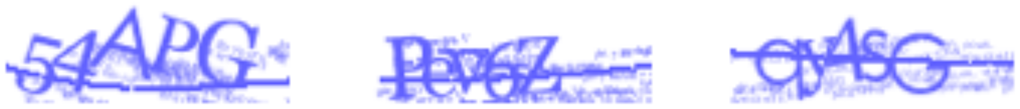
b．谷歌使用的验证码

粘连　扭曲

干扰线　其余



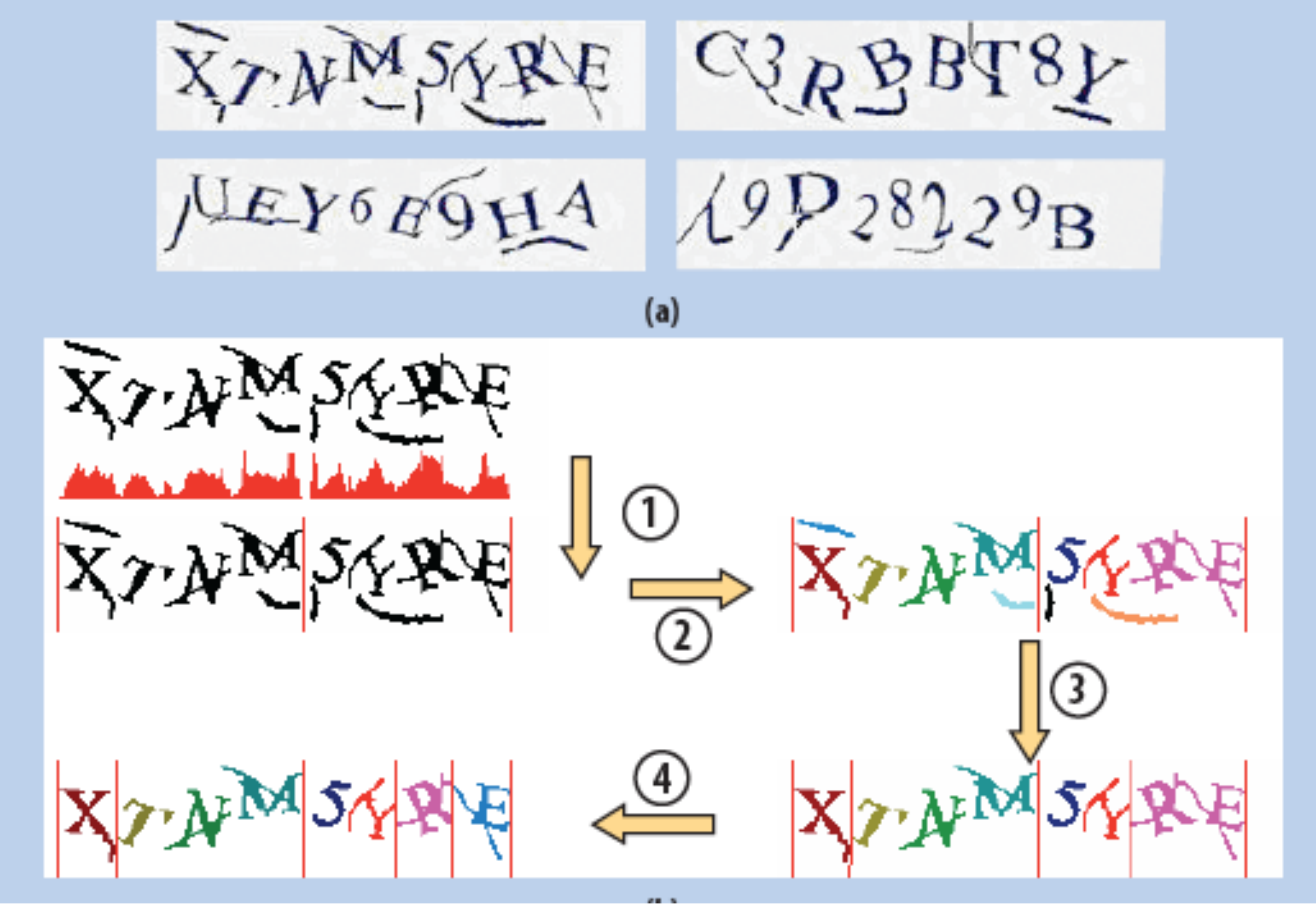
a．QQ使用的验证码



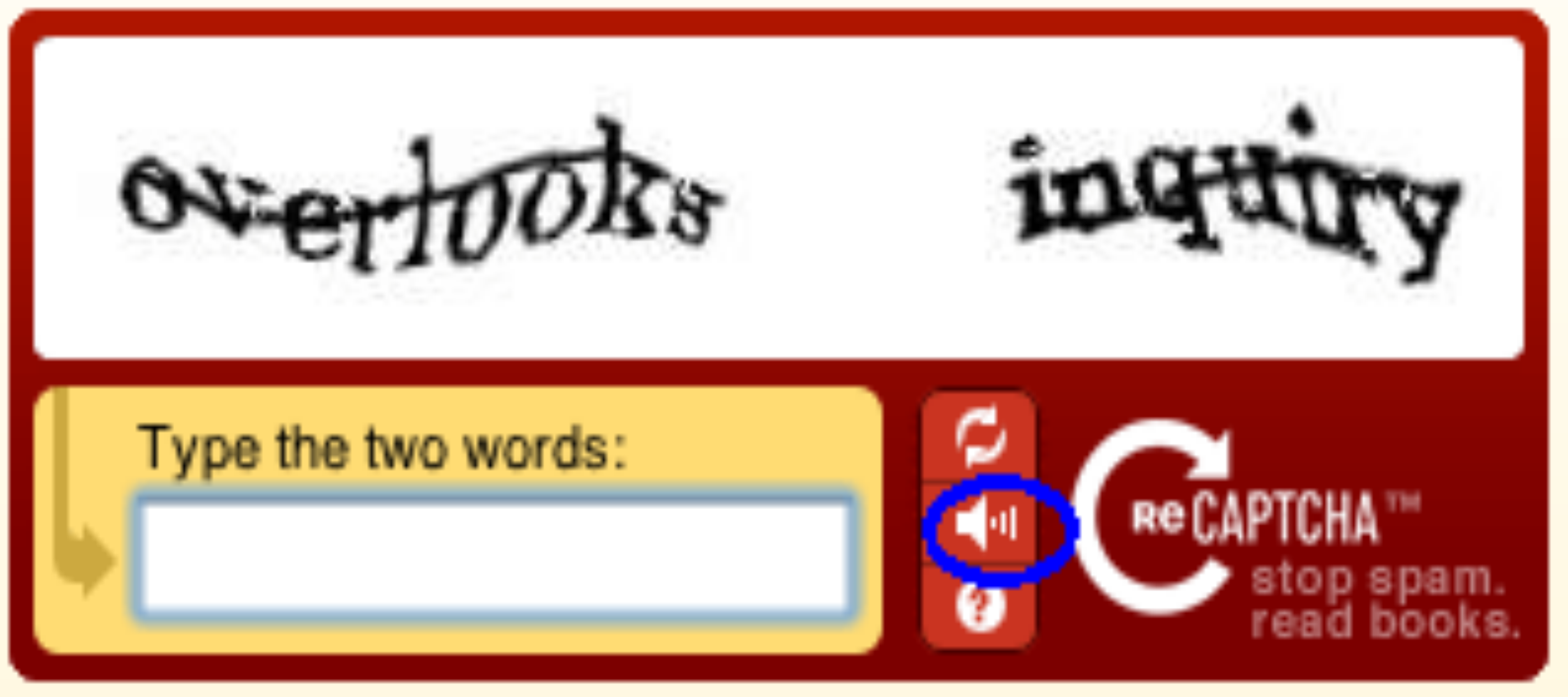
b．新浪网使用的验证码

- 不定字符
- 不定字体和大小
- 背景干扰

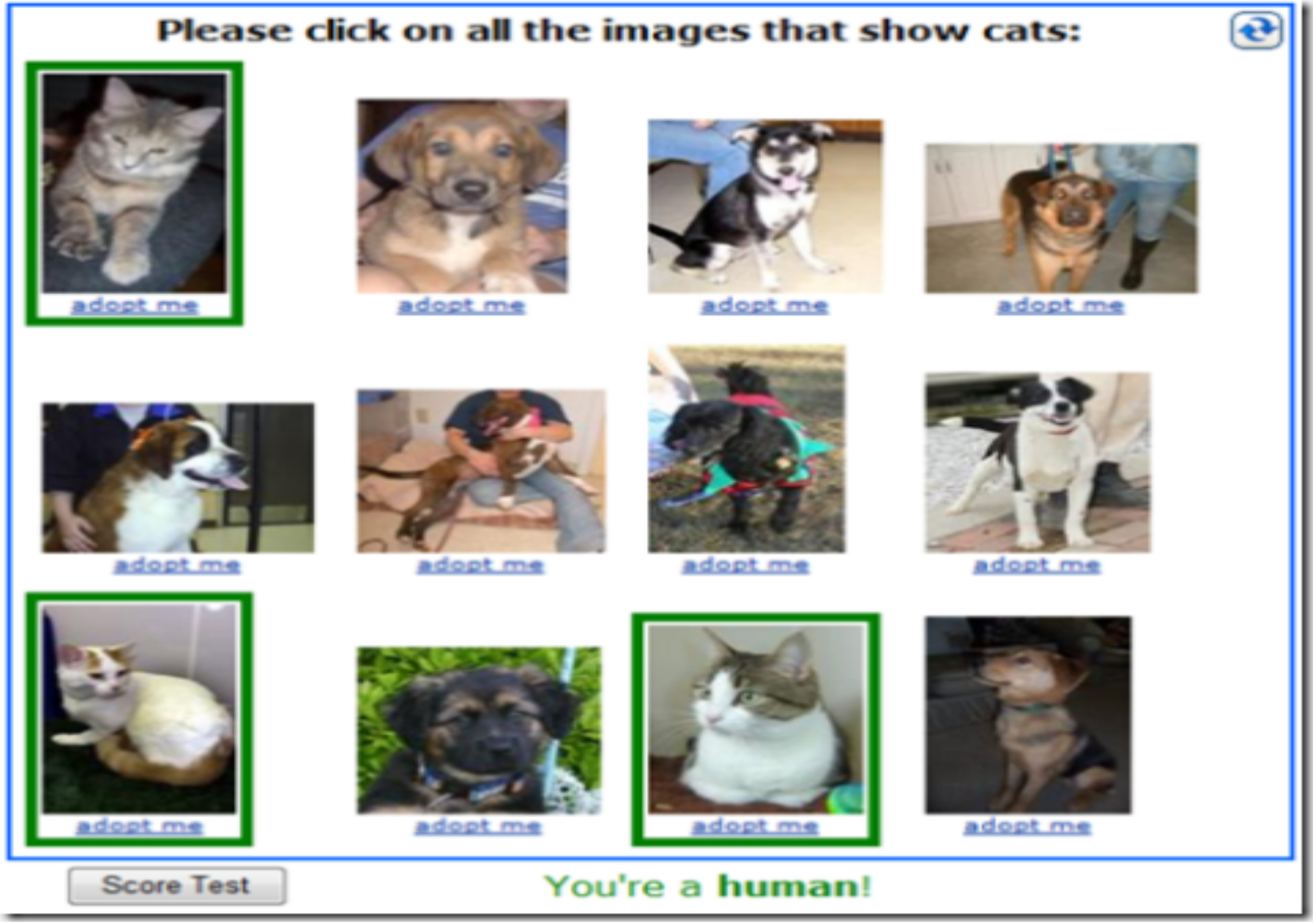
# 攻击例子


(a)

# 声音CAPTCHA


overlooks
inquiry
Type the two words:
reCAPTCHA™
stop spam.
read books.

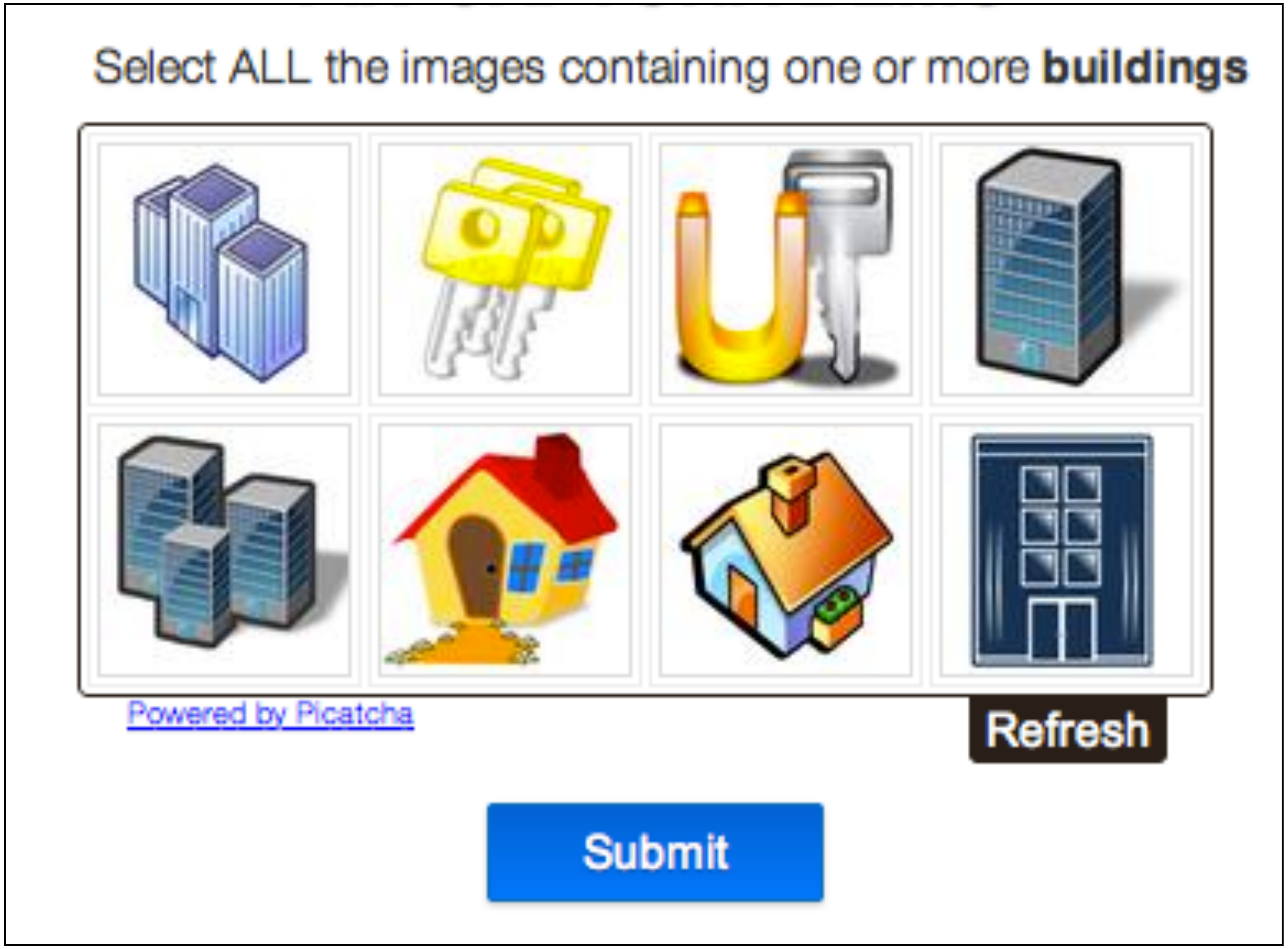
# 分类CAPTCHA



Please click on all the images that show cats:

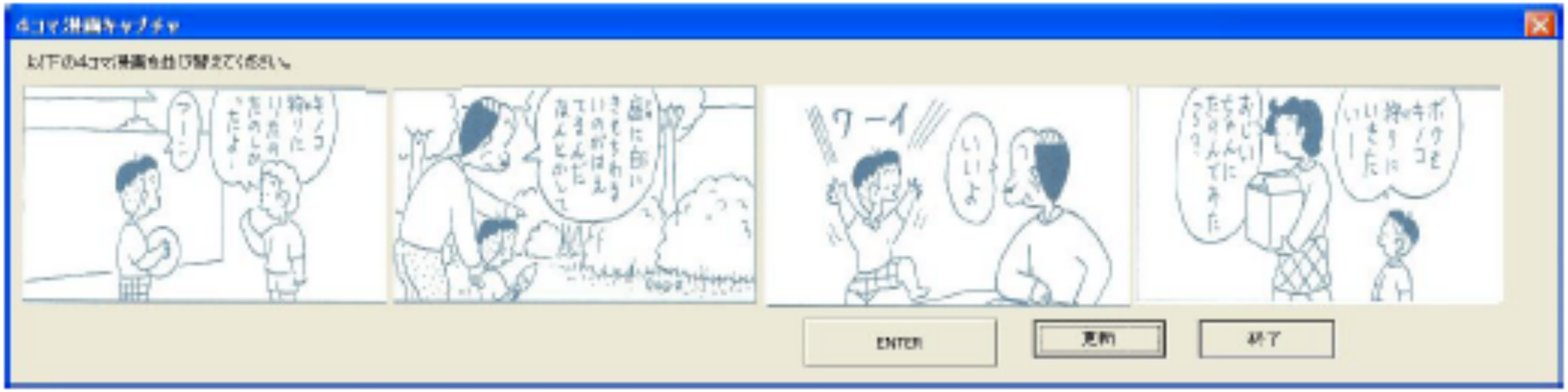
You're a human!

# 分类CAPTCHA



Select ALL the images containing one or more **buildings**

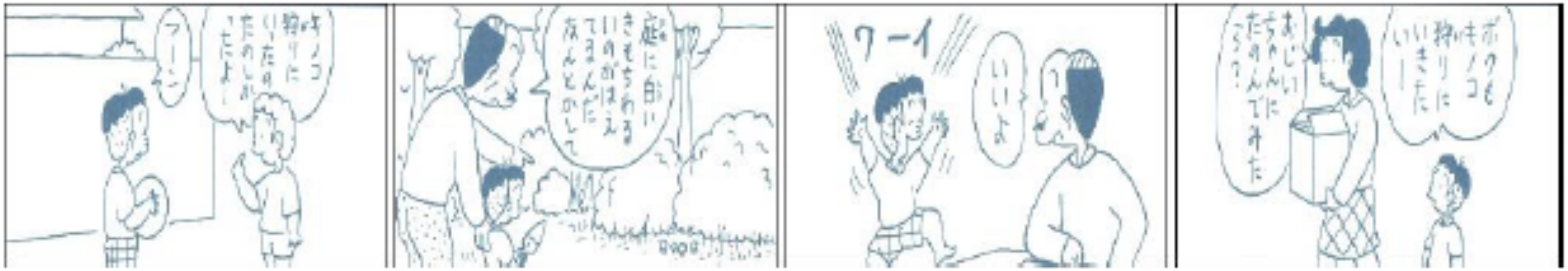
# 逻辑CAPTCHA



4コマ漫画キャプチャ

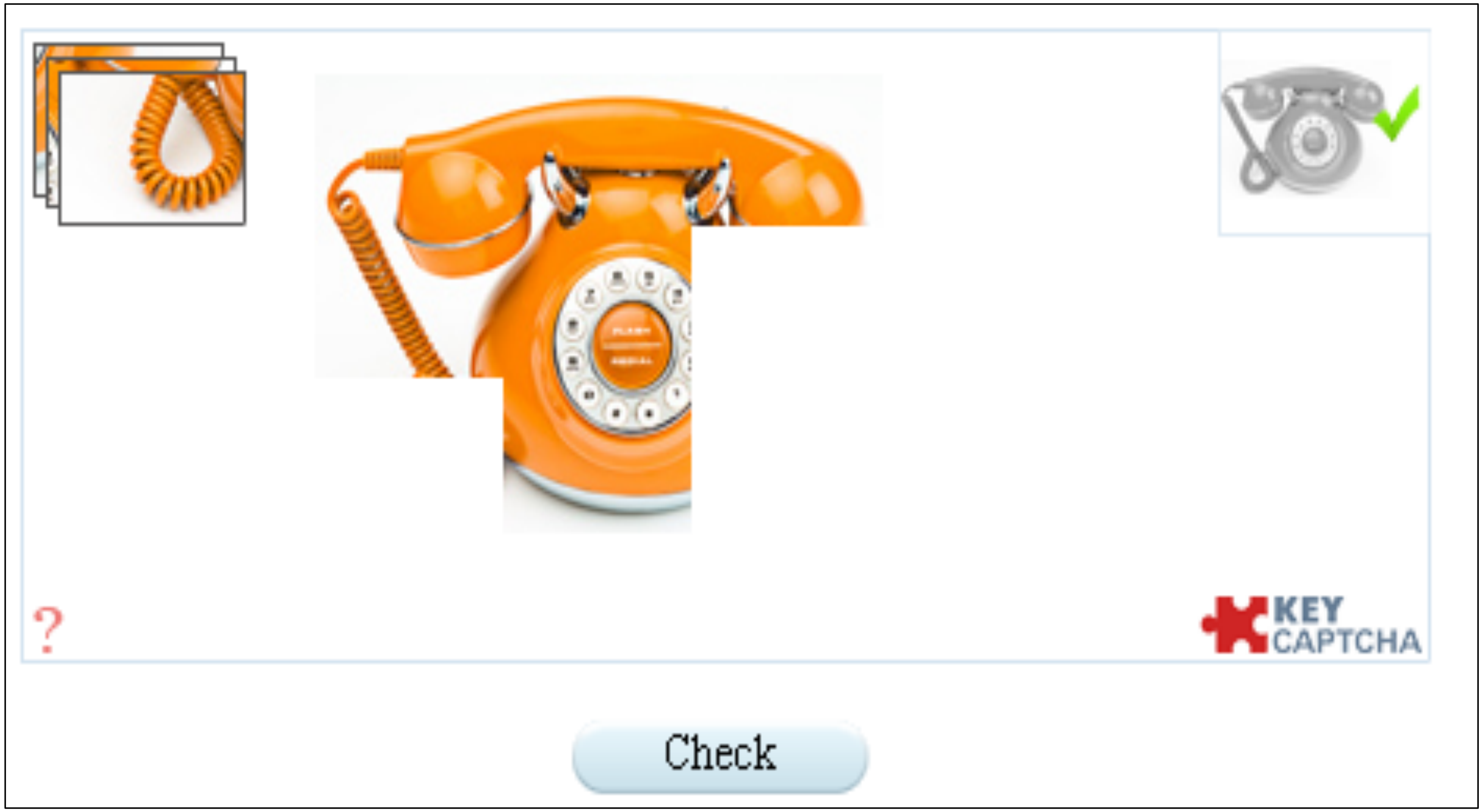
以下の4コマ漫画を並び替えてください。

キノコ狩りたのしかったよー
フーン
庭に白いきもちわるいのがはえてきたんだなんとかして
ワーイ
いいよ
ボクもキノコ狩りにいきたいー
おじいちゃんにたのんでみたら？
ENTER
更新
終了



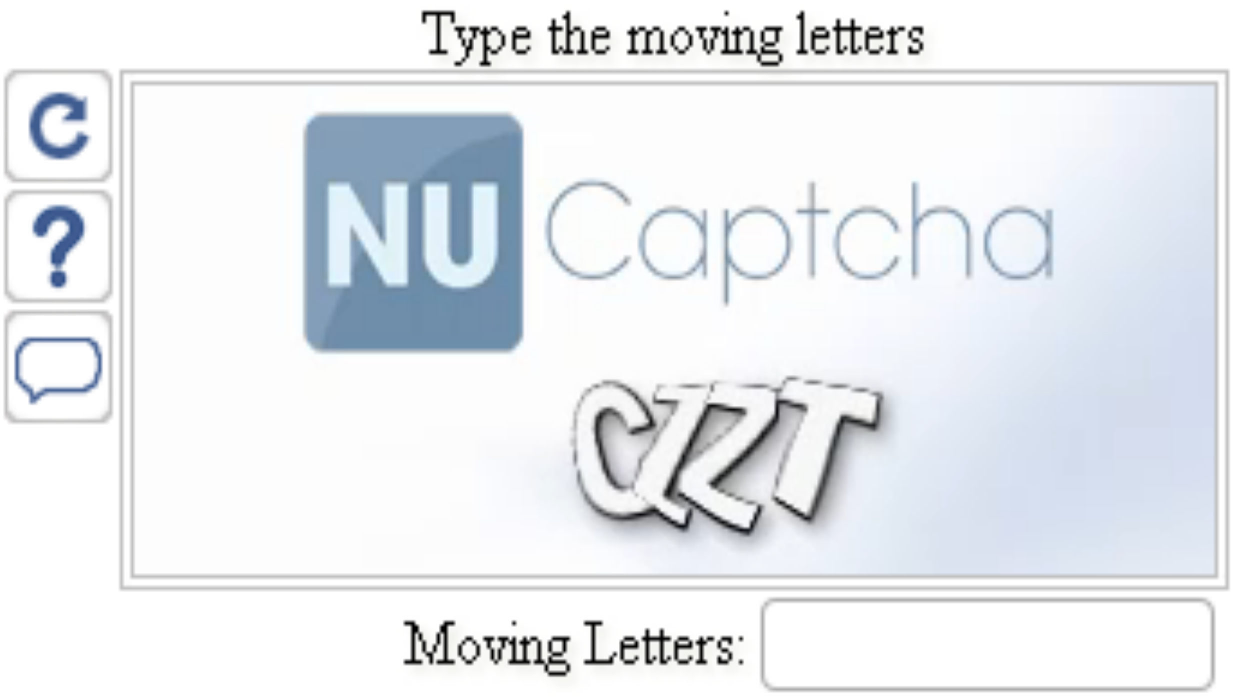
キノコ狩りたのしかったよー
フーン
庭に白いきもちわるいのがはえてきたんだなんとかして
ワーイ
いいよ
ボクもキノコ狩りにいきたいー
おじいちゃんにたのんでみたら？

# 拼图CAPTCHA



基于拼图

# NuCAPCTHA



Type the moving letters

Moving Letters:

NU Captcha

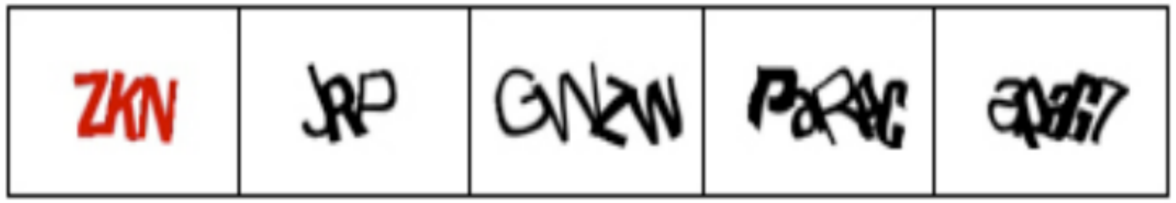
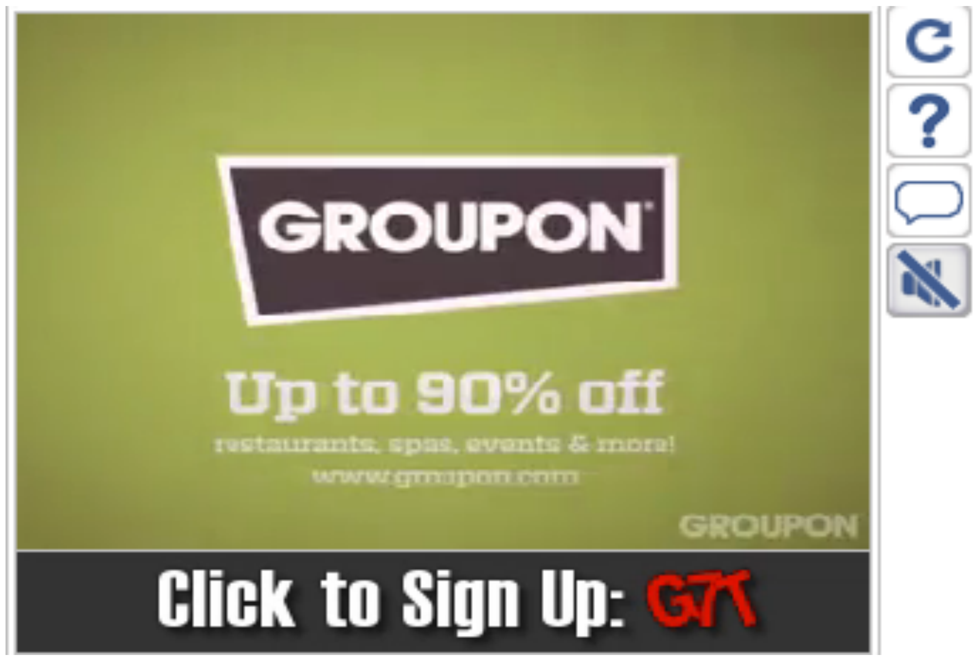
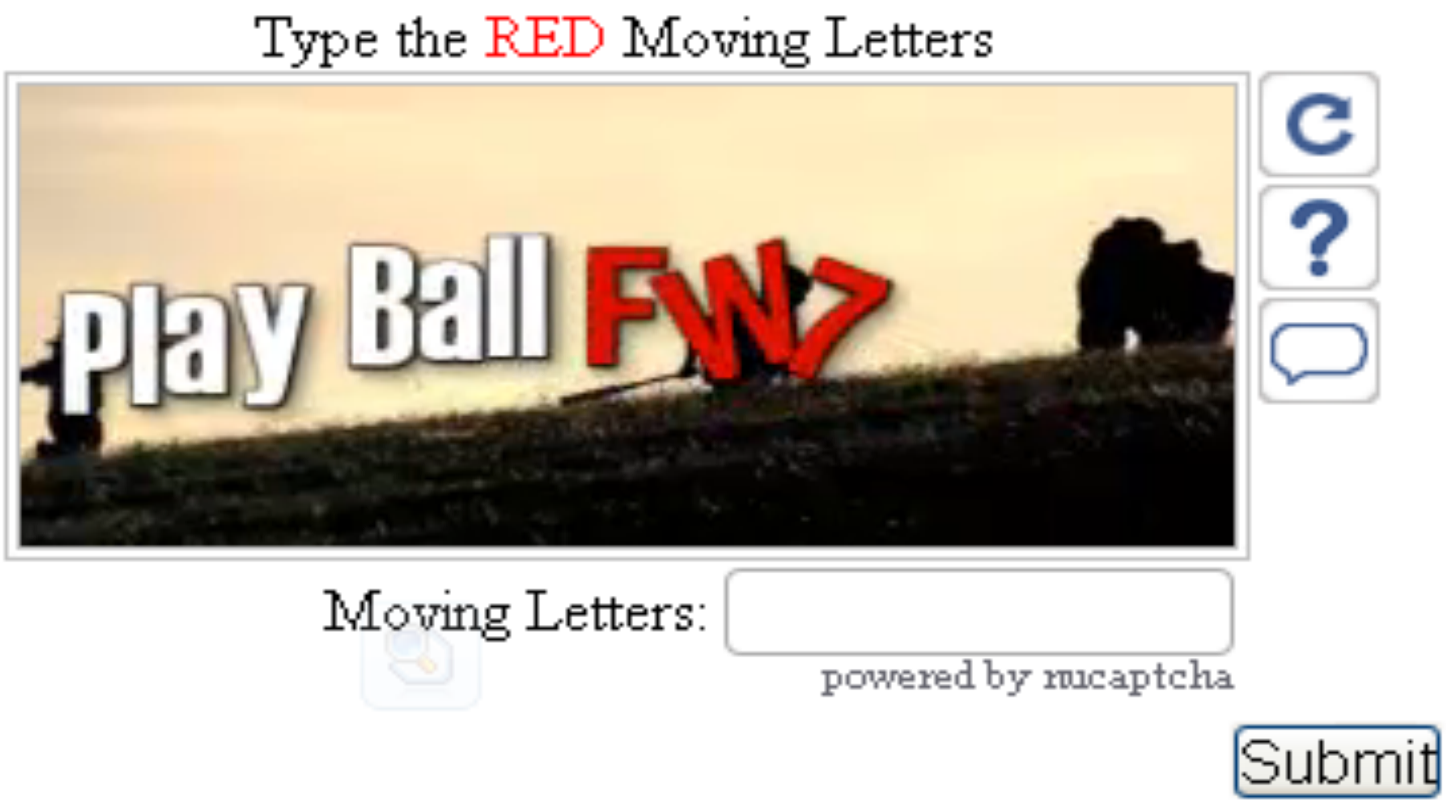


Figure 1: Sample screenshot non animated security settings for NuCaptcha

用户行为分析系统



Click to Sign Up: G7T



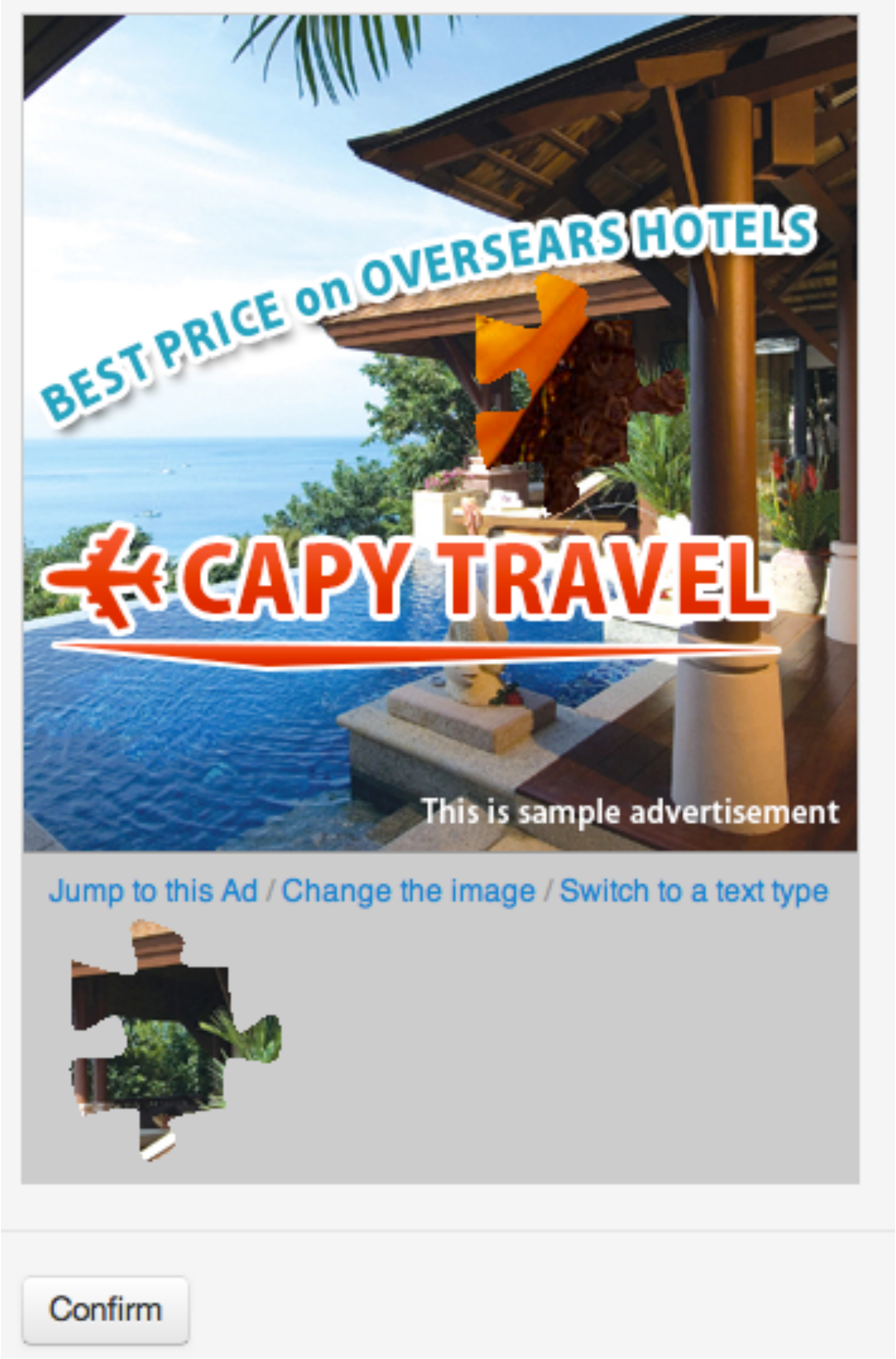
Type the RED Moving Letters

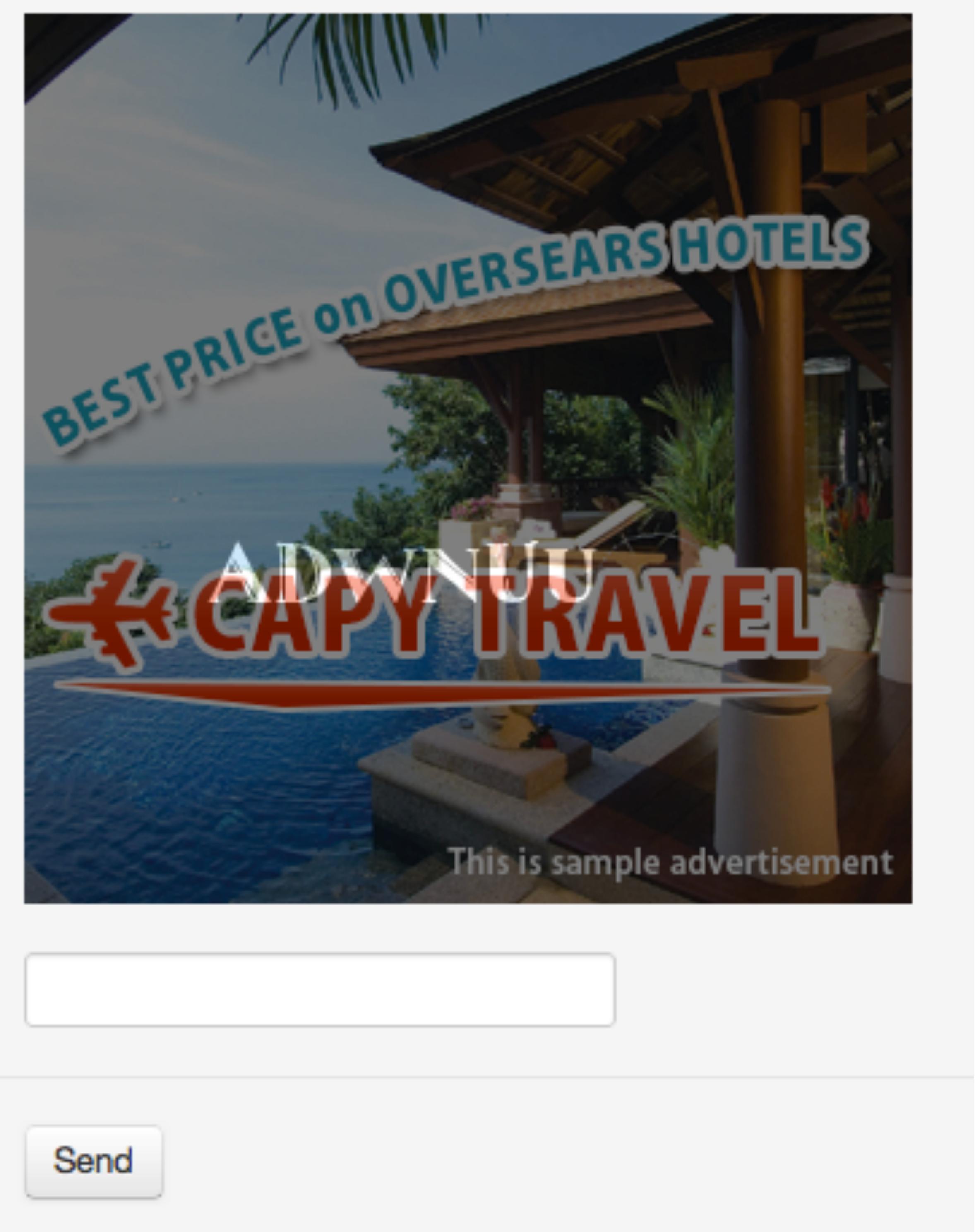
Moving Letters:

powered by nucaptcha

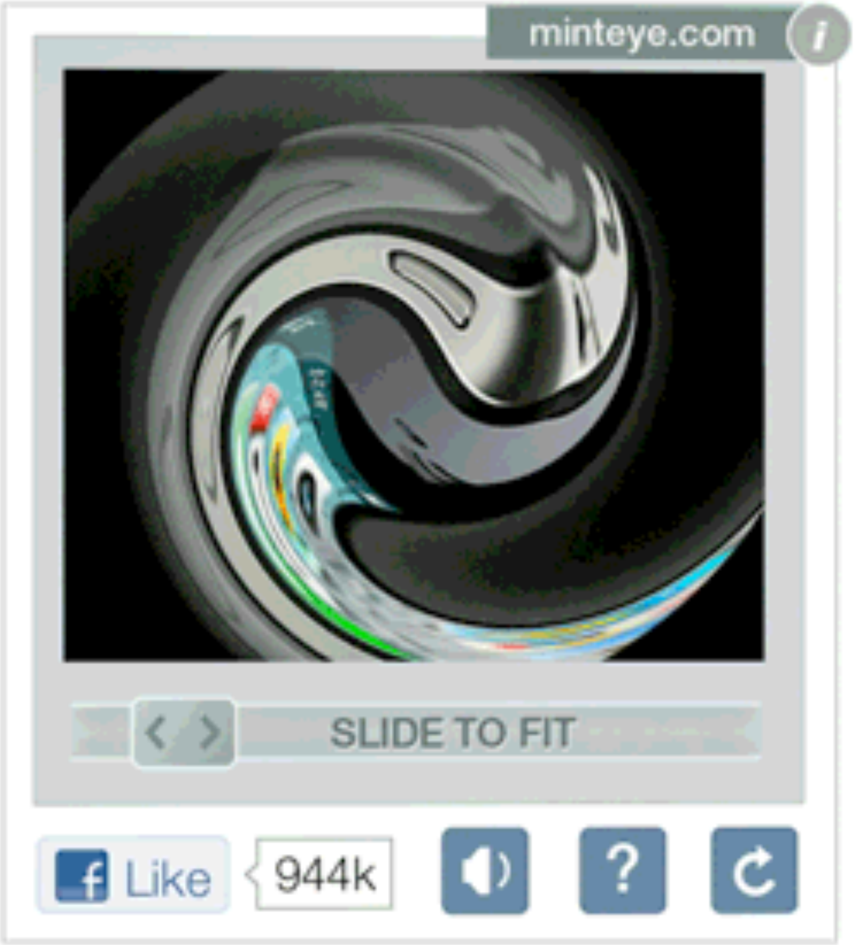
Submit

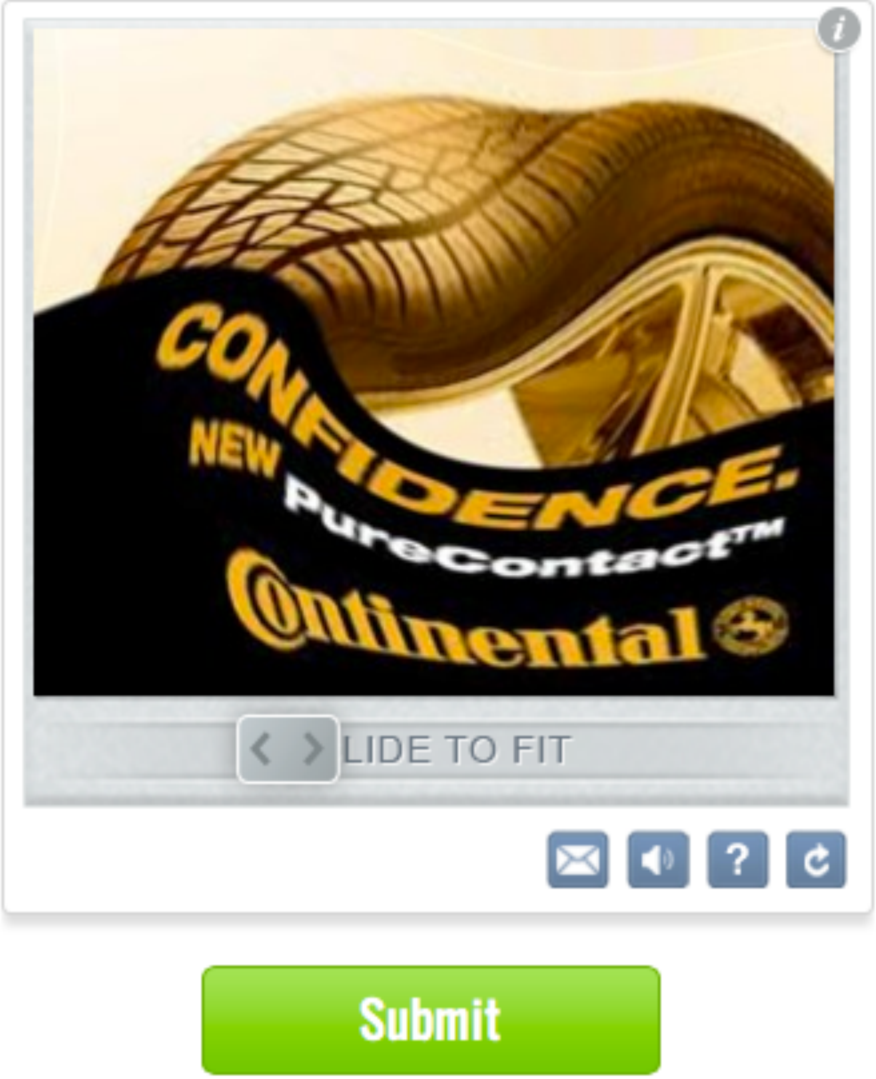
# CAPY


BEST PRICE on OVERSEARS HOTELS
CAPY TRAVEL
This is sample advertisement
Jump to this Ad / Change the image / Switch to a text type
Confirm

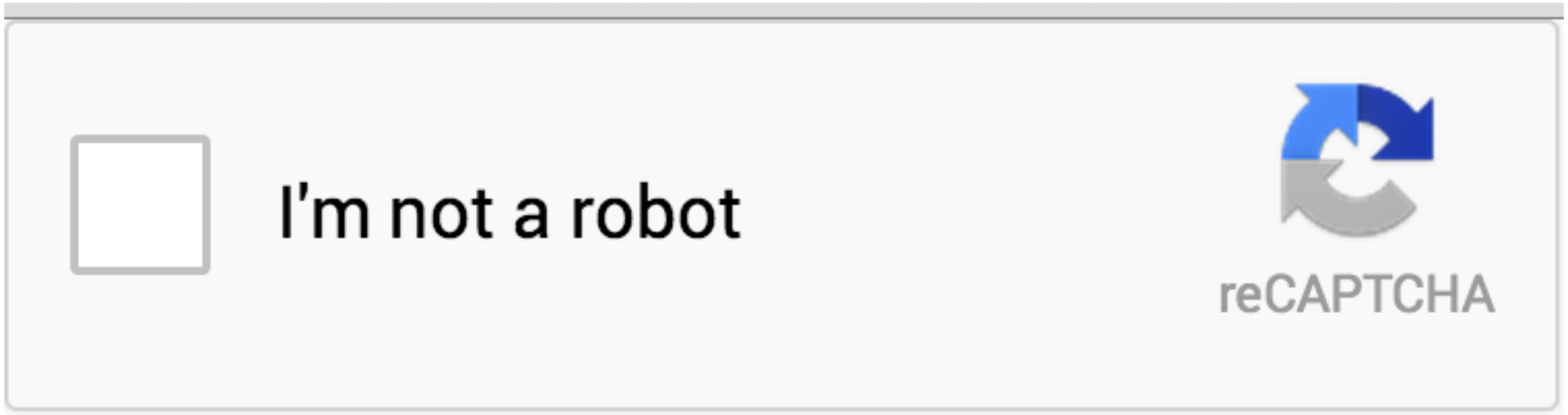

BEST PRICE on OVERSEARS HOTELS
ADWNUU
CAPY TRAVEL
This is sample advertisement
Send

# Mineye

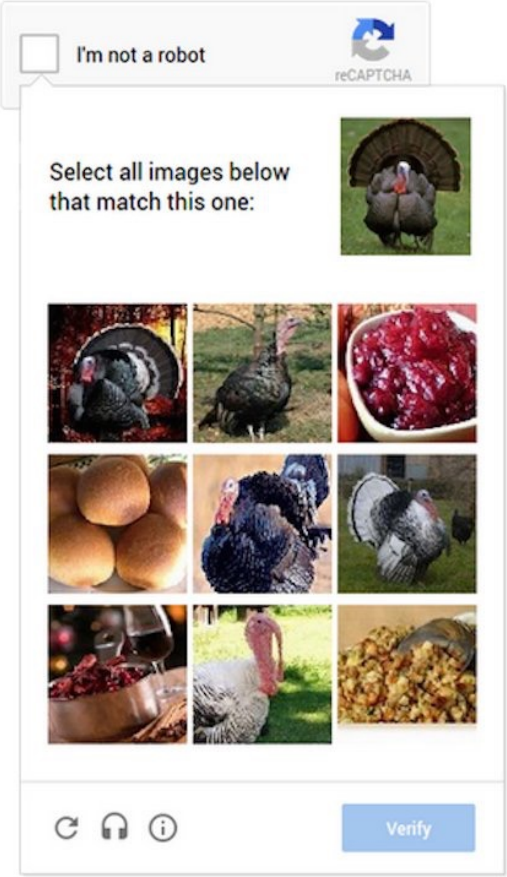

minteye.com
SLIDE TO FIT
Like
944k


CONFIDENCE.
NEW PureContact™
Continental
LIDE TO FIT
Submit

# NoCAPTCHA

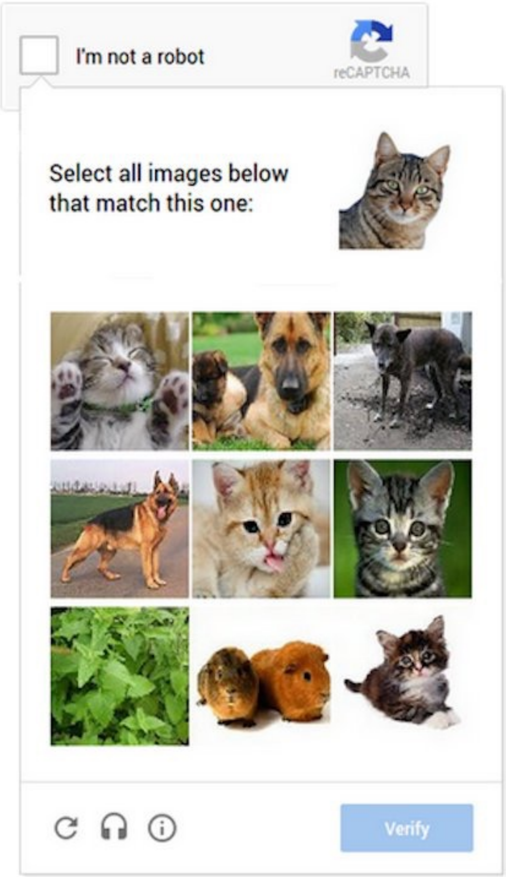


□ I'm not a robot



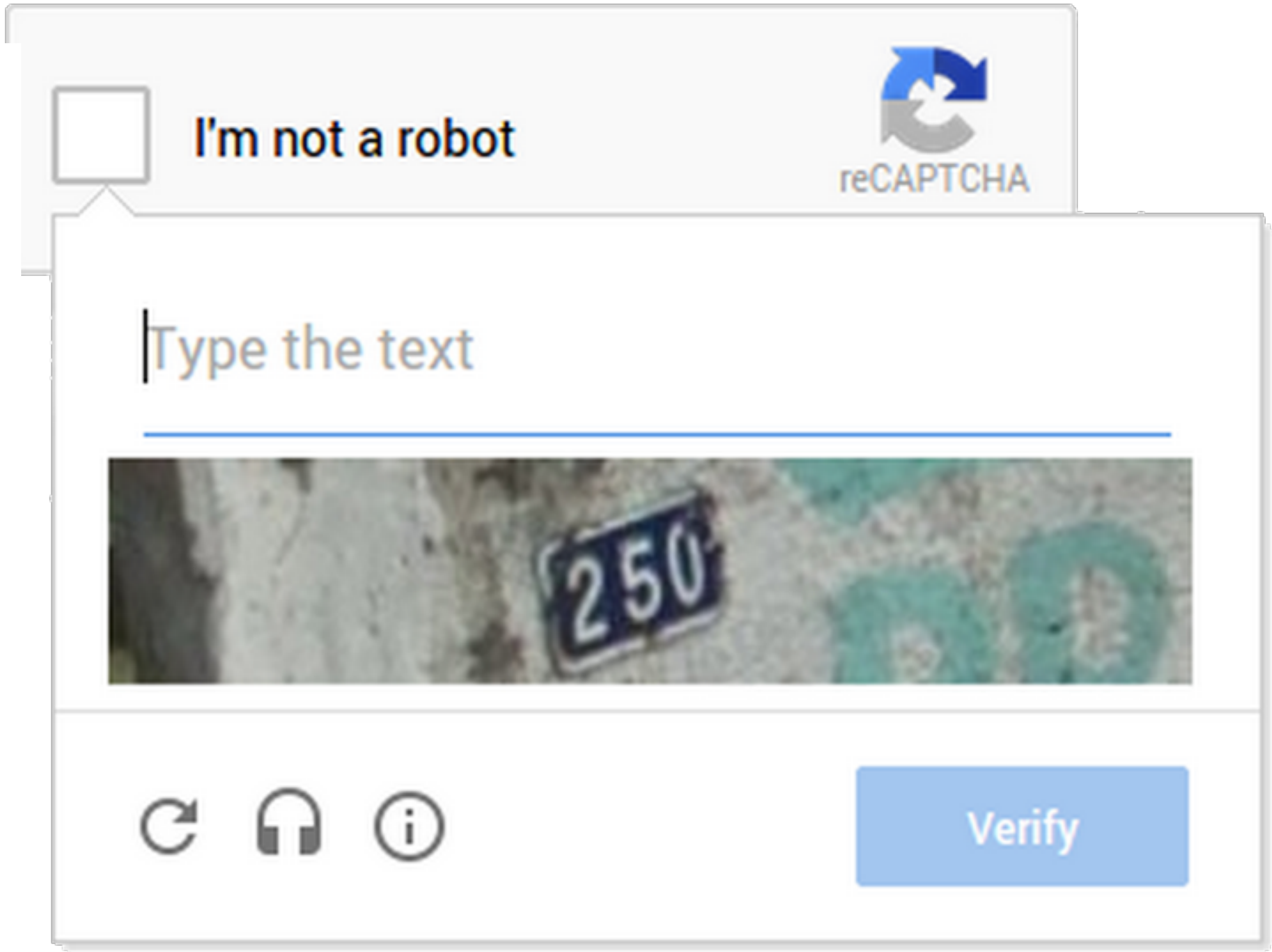
□ I'm not a robot

Select all images below that match this one:



□ I'm not a robot

Select all images below that match this one:

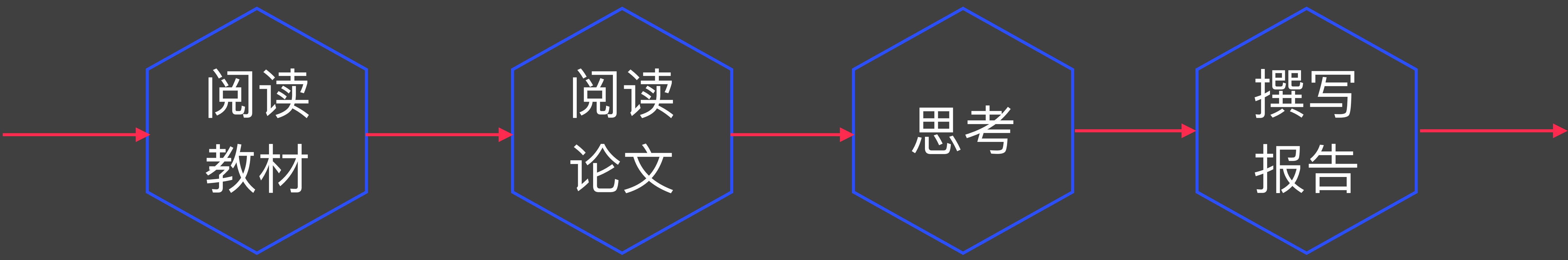


□ I'm not a robot

Type the text

# 提问时间！

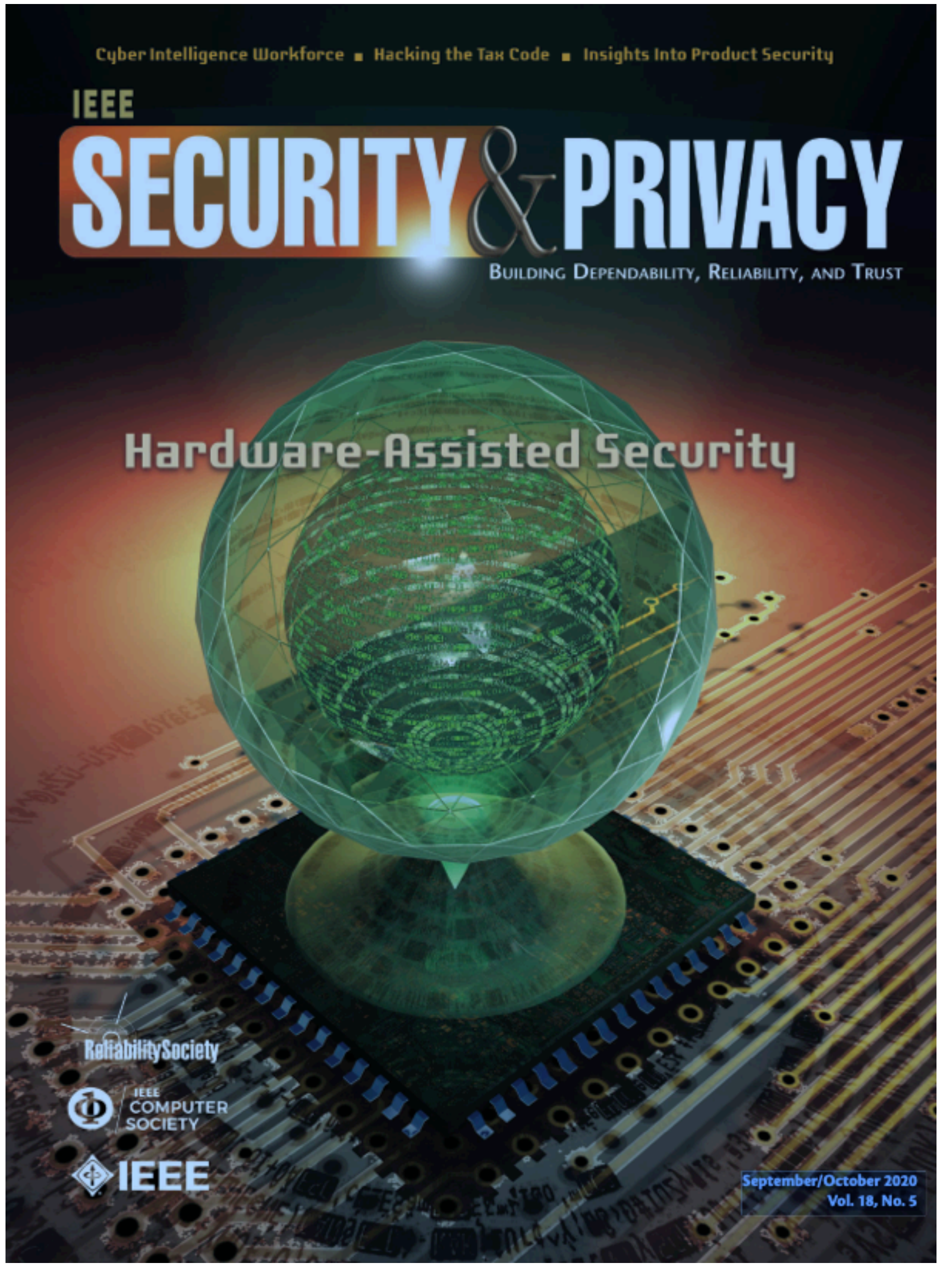
# 课后作业



Homework

# 课后作业

要求自己检索一篇论文并阅读，写论文阅读报告


Cyber Intelligence Workforce ■ Hacking the Tax Code ■ Insights Into Product Security
IEEE
SECURITY & PRIVACY
Building Dependability, Reliability, and Trust
Hardware-Assisted Security
Reliability Society
IEEE COMPUTER SOCIETY
IEEE
September/October 2020
Vol. 18, No. 5

***IEEE Security & Privacy Magazine***

**7页以上**

后续安排
课上讲解

1、文章概述

2、主要收获

3、存在疑问

4、所思所感

5、一篇论文

引用该论文的

周日晚上12点
前提交

*https://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=8013*

# 谢谢！

Huiping Sun

sunhp@ss.pku.edu.cn

https://huipingsun.github.io