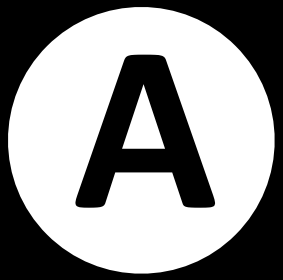
Part II

Luis von Ahn

Carnegie Mellon University



Duolingo

Learning by doing

100 million

people translating the web to
every major language for free

This is question, English is faulty. Thank computer to translate to help. SORRY!!!!!

At often, the goat-time install a error is vomit.

How many times like the wind, a pole, and the dragon?

This insult to father's stones?

Please apologize for your stupidity. There are a many thank you

100 million

people translating the web to
every major language for free

Language Translation Obstacles

1. Lack of bilinguals
2. Motivation

Learning a New Language

1,200,000,000
people around the world

Over 5 million
paid > $500 for software

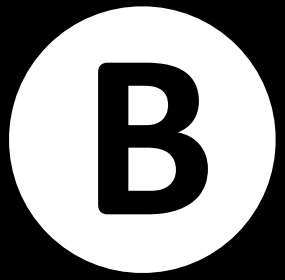
learn a new language
while simultaneously
translating the Web

Input	Falls Pakistans Geschichte ein Indikator ist, so könnte Musharrafs Entscheidung, das Kriegsrecht zu verhängen, jener sprichwörtliche Tropfen sein, der das Fass zum Überlaufen bringt.
Reference (20c/word)	If Pakistan's history is any indicator, Musharraf's decision to impose martial law may prove to be the proverbial straw that breaks the camel's back.
Duolingo	If Pakistan's history is an indicator, Musharraf's decision to impose martial law could be the straw that breaks the camel's back.

Wikipedia to Spanish:

5 weeks with 100,000 users

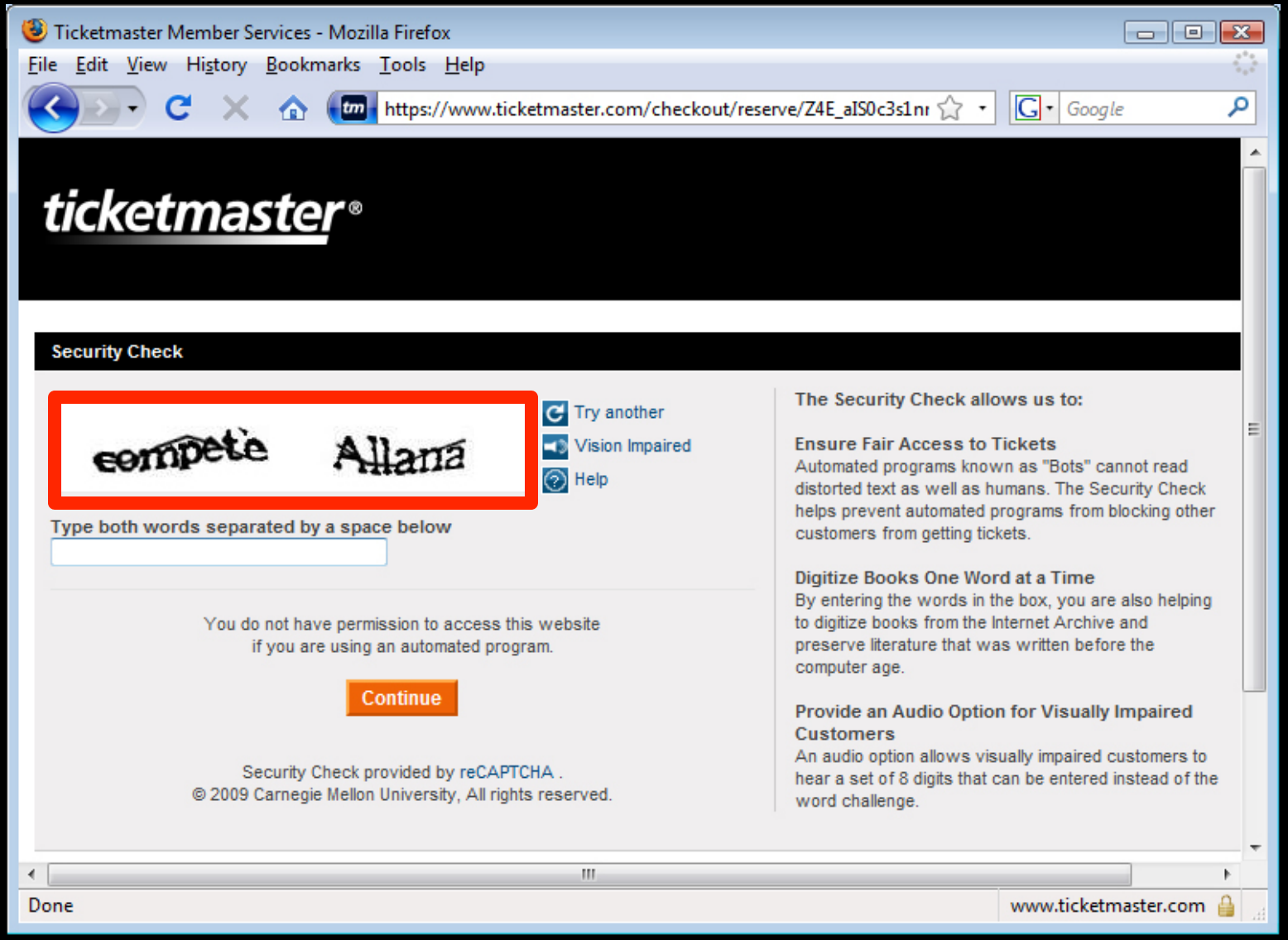
80 hours with 1 million users



Incentives

Motivations for Participation

amazon.com


Ticketmaster Member Services - Mozilla Firefox
File Edit View History Bookmarks Tools Help
https://www.ticketmaster.com/checkout/reserve/Z4E_aIS0c3s1nr
Google
ticketmaster
Security Check
compete
Allana
Try another
Vision Impaired
Help
Type both words separated by a space below
You do not have permission to access this website
if you are using an automated program.
Continue
Security Check provided by reCAPTCHA .
© 2009 Carnegie Mellon University, All rights reserved.
The Security Check allows us to:
Ensure Fair Access to Tickets
Automated programs known as "Bots" cannot read distorted text as well as humans. The Security Check helps prevent automated programs from blocking other customers from getting tickets.
Digitize Books One Word at a Time
By entering the words in the box, you are also helping to digitize books from the Internet Archive and preserve literature that was written before the computer age.
Provide an Audio Option for Visually Impaired Customers
An audio option allows visually impaired customers to hear a set of 8 digits that can be entered instead of the word challenge.
Done
www.ticketmaster.com

The ESP Game - Windows Internet Explorer

http://www.espgame.org/cgi-bin/play_game?id=609648808732358165769236389

1:50
Time Left

The ESP Game

0070
score

Type y

Your partner has entered a guess

Done

biglou@gmail.com | Help | Sign Out

Google Image Labeler BETA

Google Image Labeler

Welcome to **Google Image Labeler**, a new feature of Google Image Search that allows you to label random images to help improve the quality of Google's image search results.

Begin as Playah

Change your nickname

How does it work?

You'll be randomly paired with a partner who's online and using the feature. Over a 90-second period, you and your partner will be shown the same set of images and asked to provide as many labels as possible to describe each image you see. When your label matches your partner's label, you'll earn some points and move on to the next image until time runs out. After time expires, you can explore the images you've seen and the websites where those images were found. And we'll show you the points you've earned throughout the session.

For example, this image can be described by the labels: **bird**, **sky**, **soaring**, or **frigate bird**.

What is required to participate?

Just an interest in helping Google improve the relevance of image search results for users like yourself. Although you do not have to log in to your Google account to help, logging in will allow you to keep track of your points. You can also choose to provide a nickname, or you can remain anonymous.

Today's Top Pairs

1.	Knaz - guest	2200
2.	guest - guest	1900
3.	asgerix - Yucker	1800
4.	guest - fiftysix	1700
5.	Karate Monkey - eGrunt	1700

All-time Top Contributors

1.	ChemaZ	2204200
2.	khi	1676100
3.	JoeBob	1444600
4.	eGrunt	1340400
5.	mdda123	1339600

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GALAXY ZOO

duolingo

Learn a language while translating the Web

1 Money

Easy to do

Can manipulate reward structure

Expensive for large scale tasks

Can lead to lame research

Self-interest can lead to bad results

2 Access

- Huge scale
- Task doesn’t have to be engaging
- Hard to get adoption
- Only works for short tasks
- Human success rate must be > 90%

3 Games

Free

Large scale

Hard to make

Hard to keep people’s attention

4 Volunteers

Easy to do

Not many volunteers

Needs a good cause

5 Learning

Users get a true reward

Huge scale

Hard to make

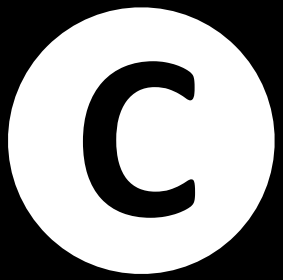
May not work for all tasks

Education: ?

Access: 300M hours

Games: 5M hours

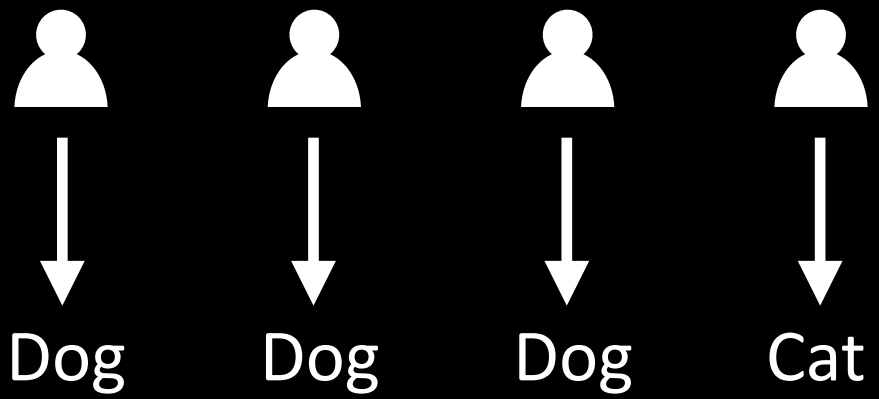
Volunteer: 50K hours



Correctness

Guaranteeing the output

1 Consensus

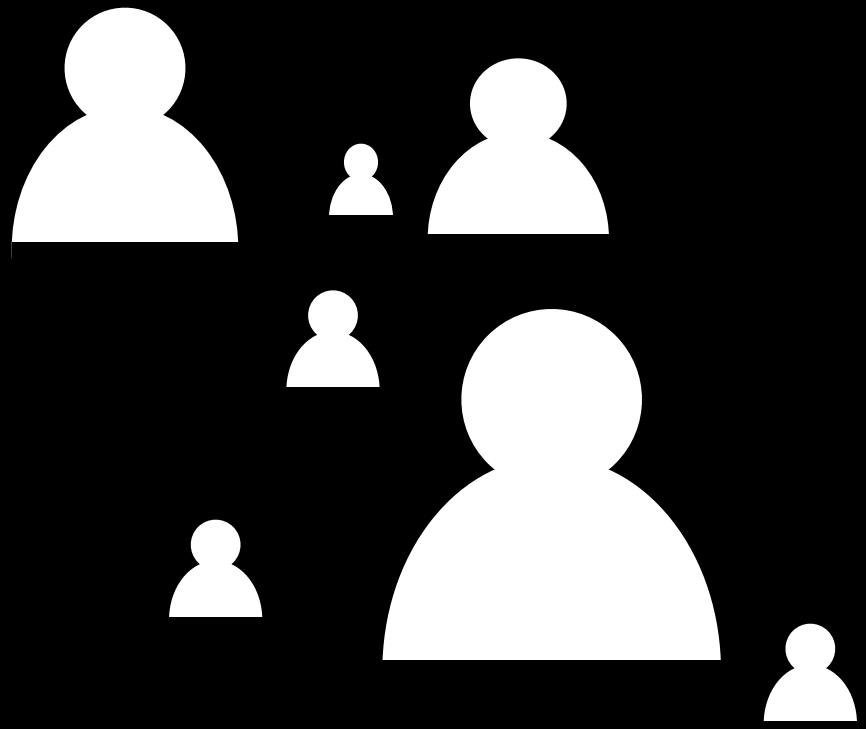


There is a fundamental tradeoff between correctness and efficiency

2 Testing

upon
between
Type the two words:
reCAPTCHA™
stop spam.
read books.

3 Reputation



4 Humans + AI

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

5 Aligning Incentives

Locating Objects in Images

ESP

GAME

sky
man
woman
water
plant

Locating Objects in Images

sky
man
woman
water
plant

Such information is useful for
computer vision research

Peekaboom

butterfly

HINTS

NOUN

NOUN RELATED

TEXT

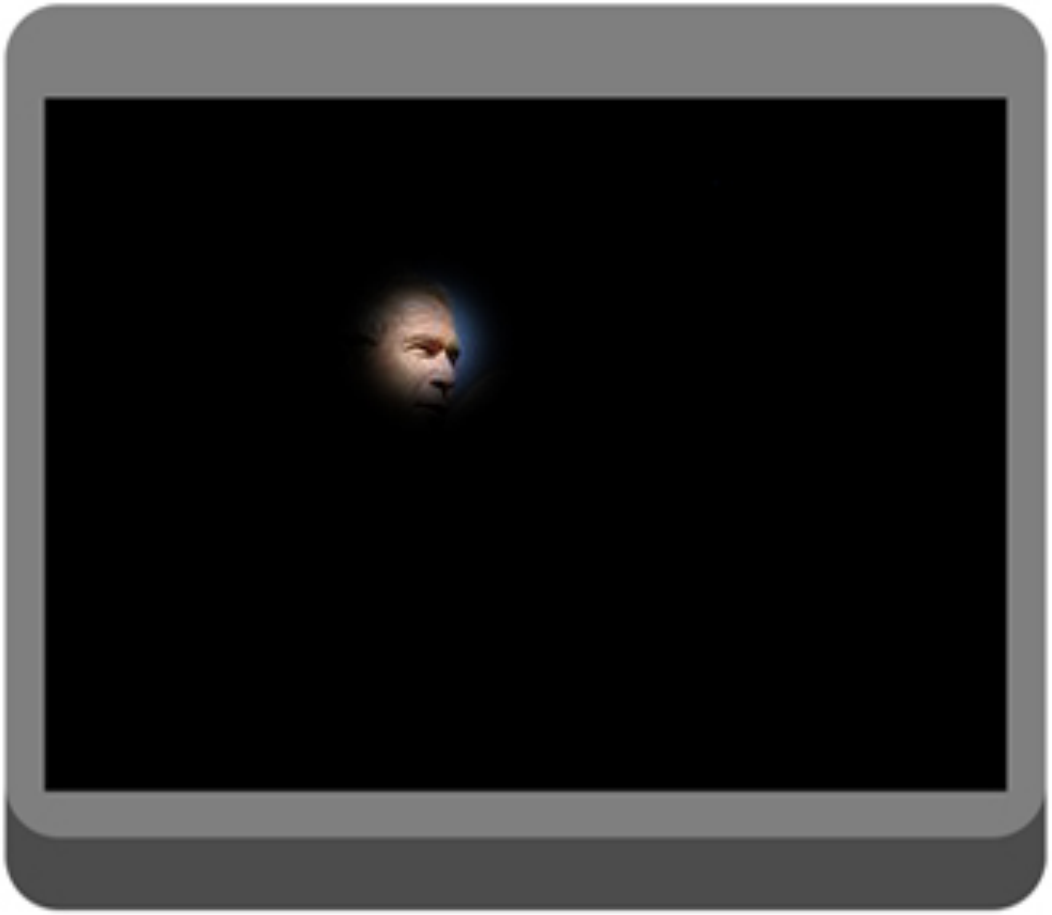
VERB

Peekaboom

Peekaboom

HINT

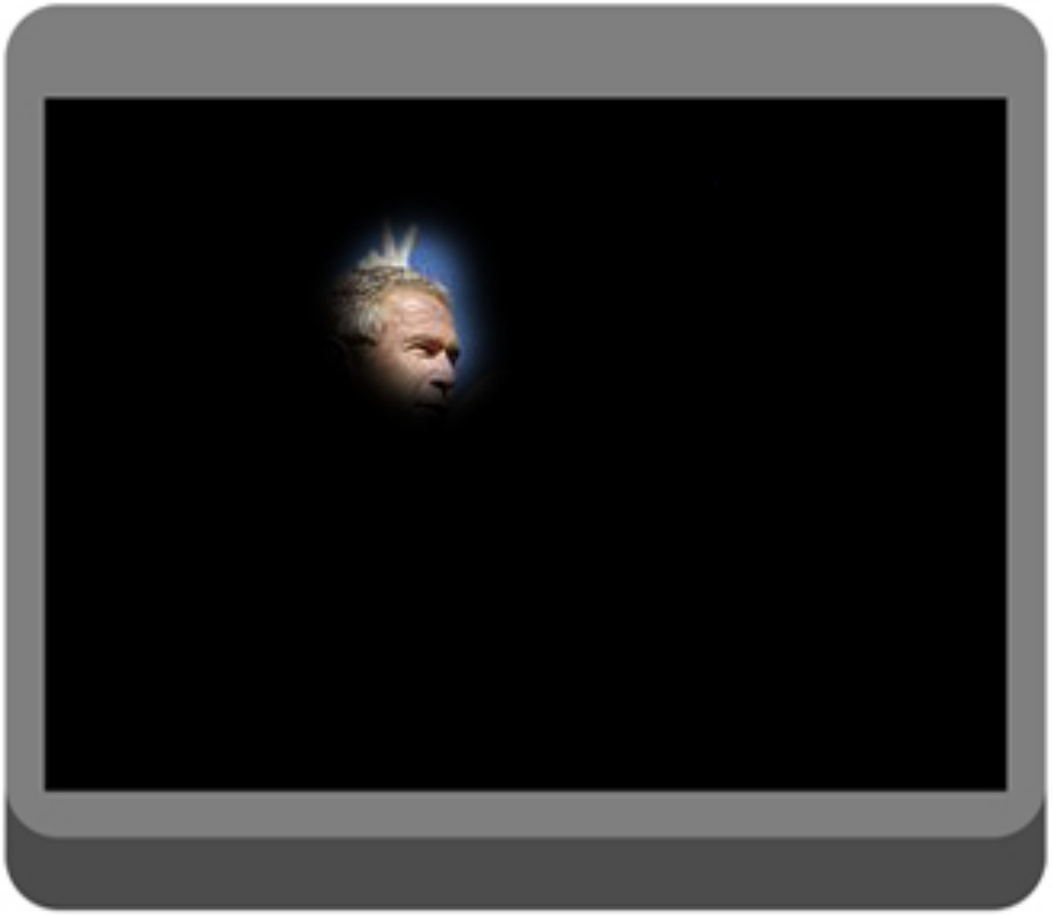
Noun



Peekaboom

HINT

Noun



Peekaboom

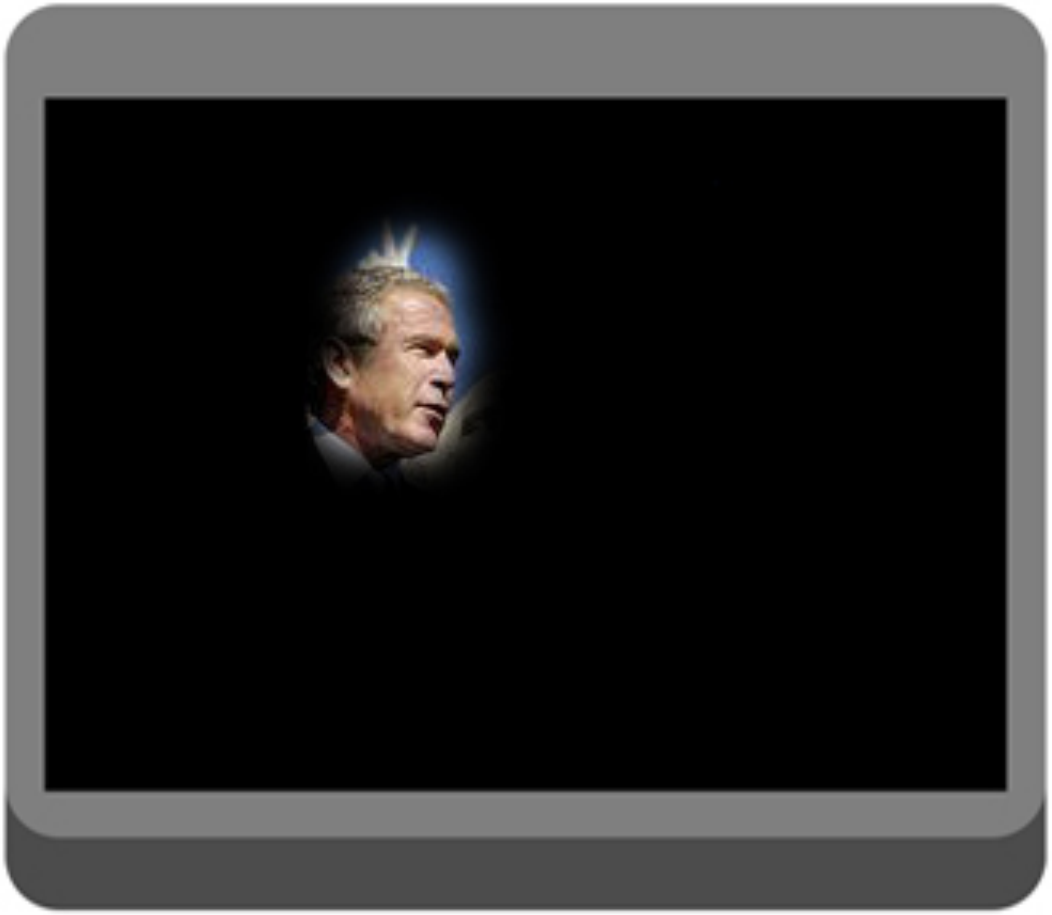
HINT

Noun

Peekaboom

HINT

Noun



Peekaboom

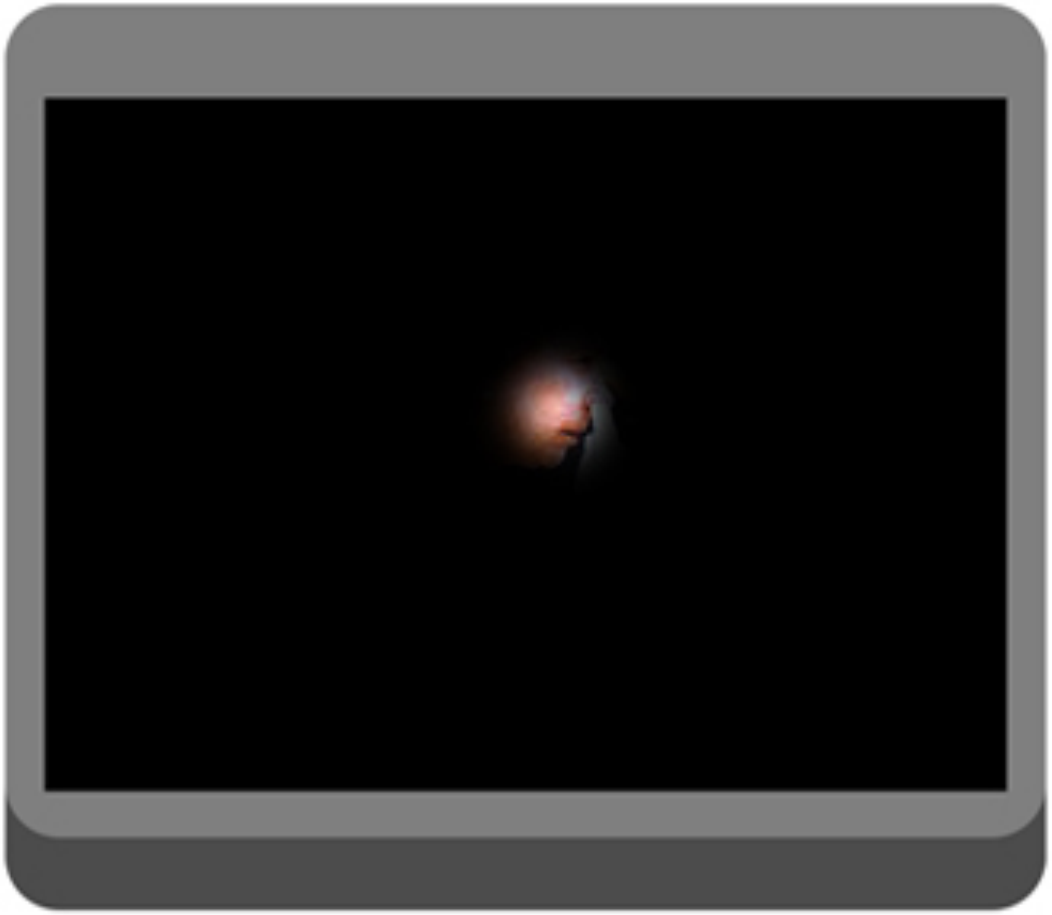
HINT

Noun

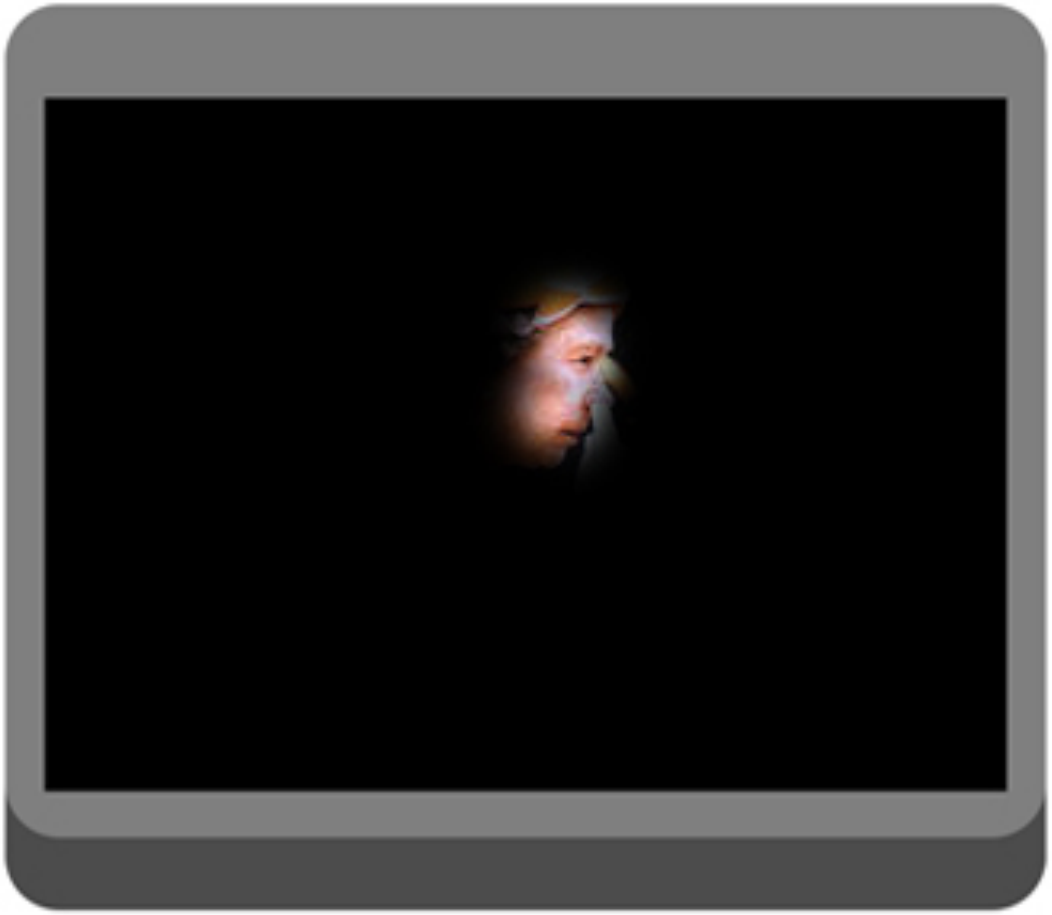
BUSH

Peekaboom

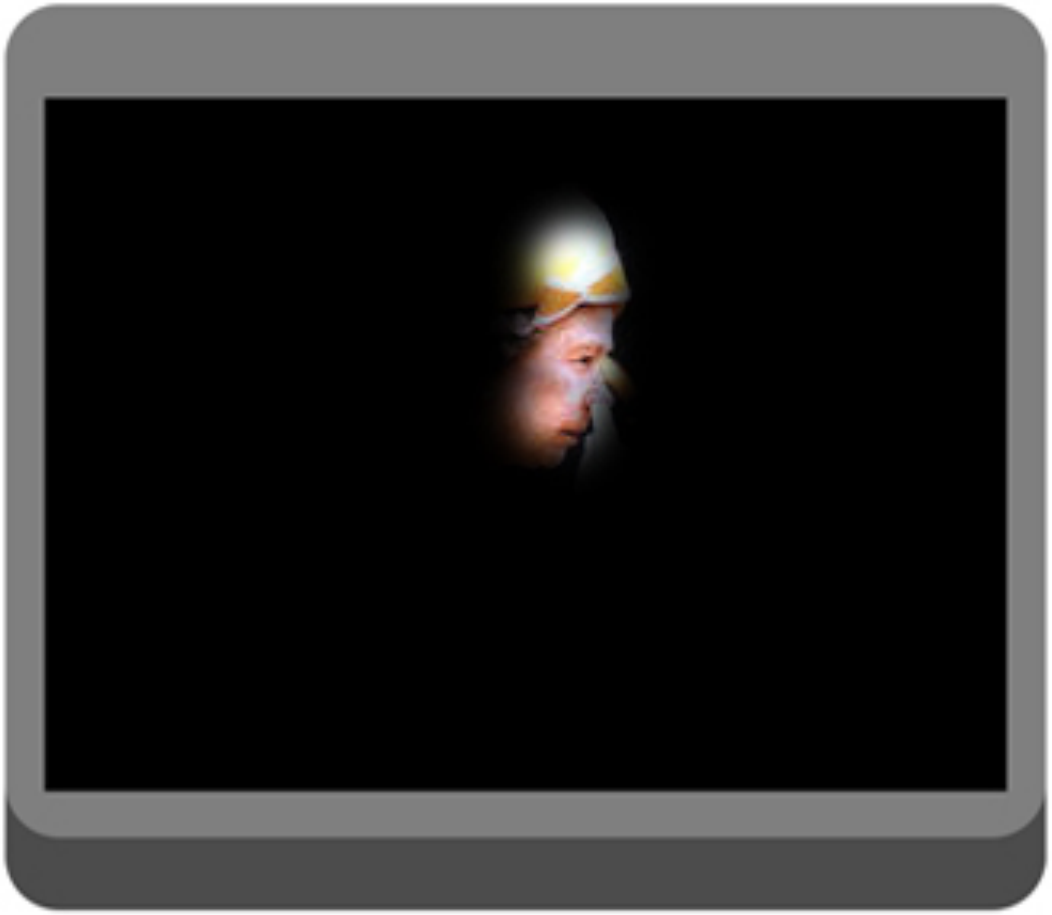
Peekaboom



Peekaboom



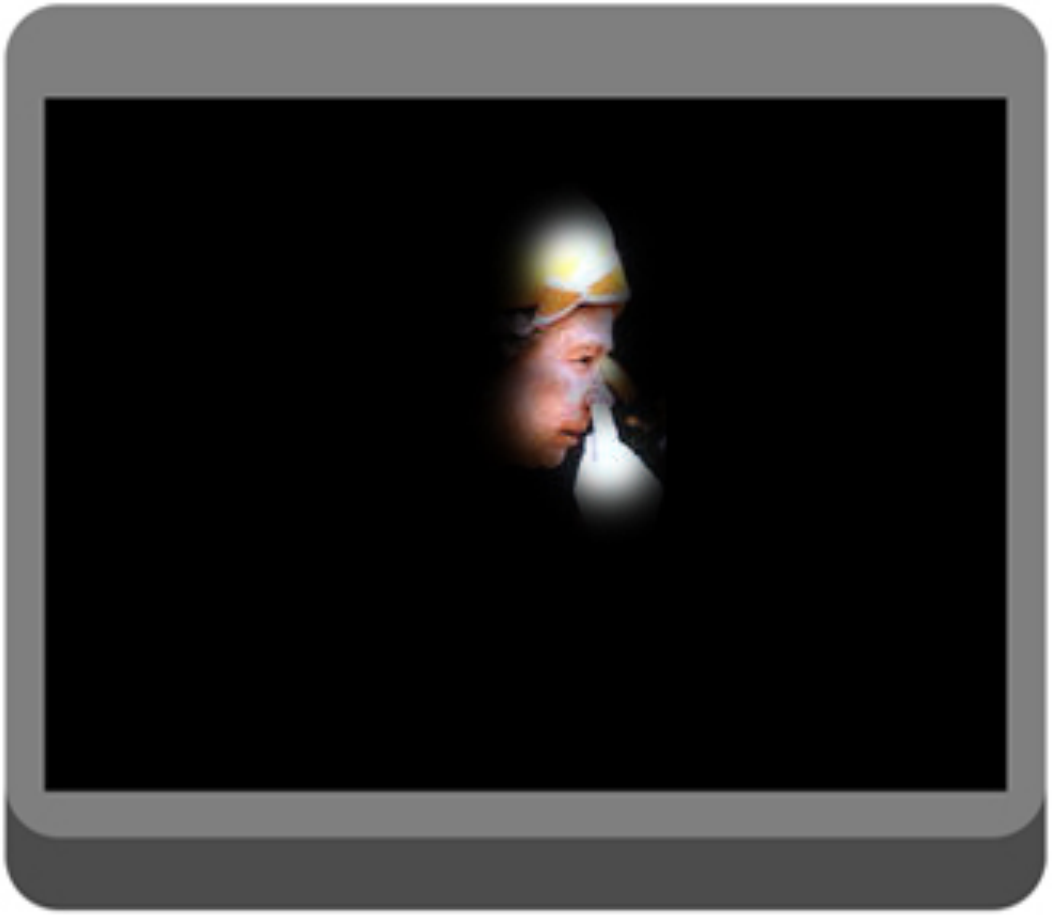
Peekaboom



Peekaboom

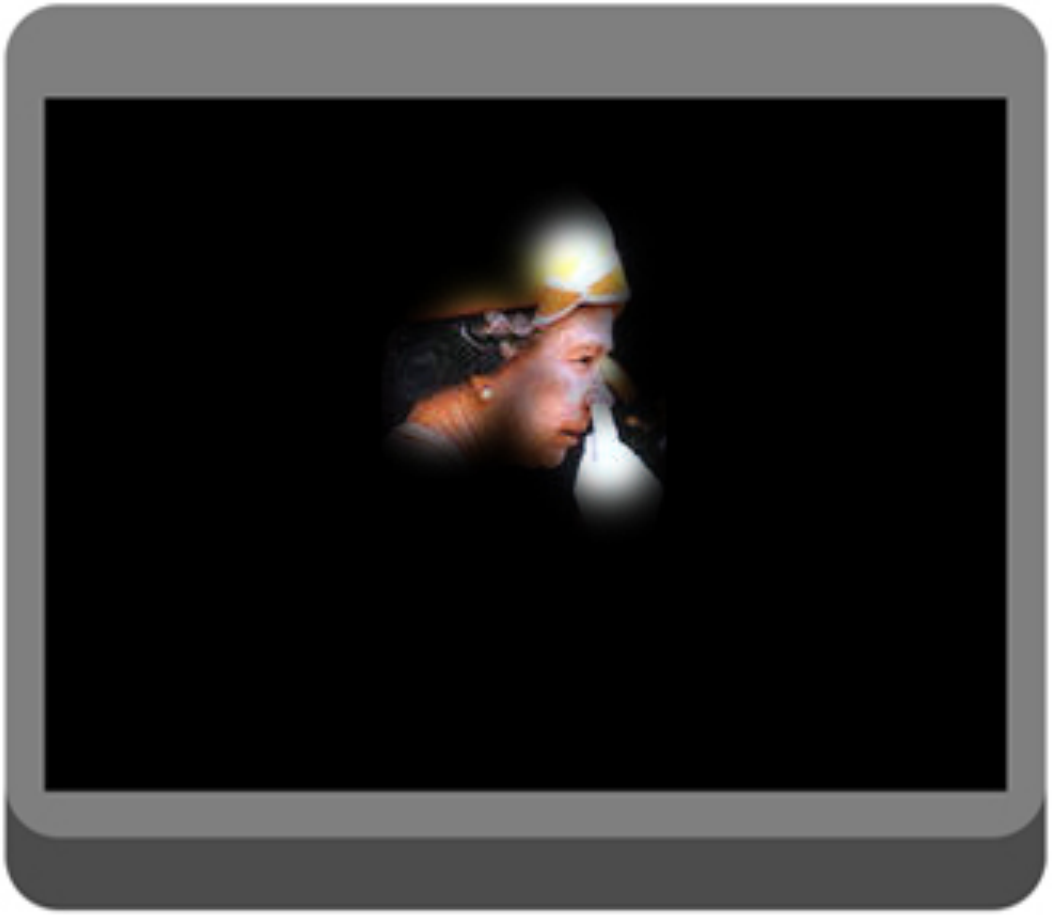
HINT

Verb



Peekaboom

HINT



Peekaboom

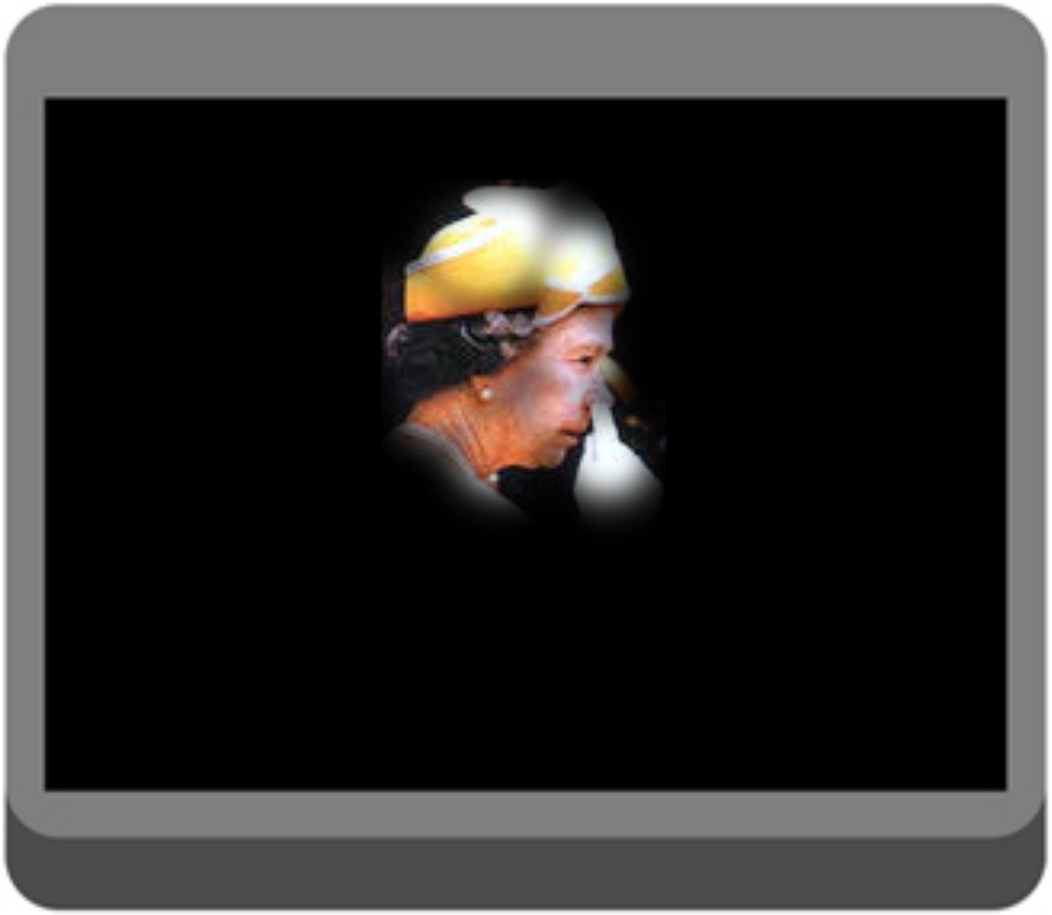
HINT

Verb

Peekaboom

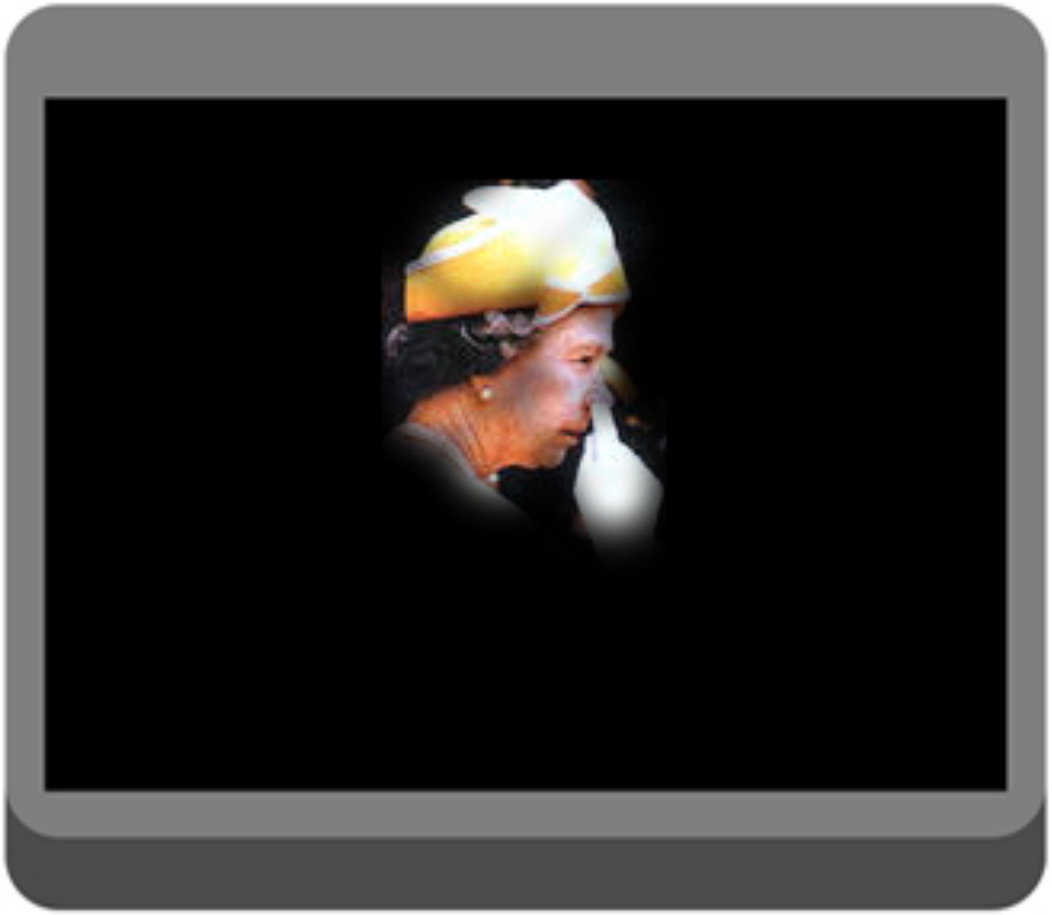
HINT

Verb



Peekaboom

HINT



Peekaboom

PICK

Peekaboom

TIME LEFT
1:29

SCORE
500

building

GUESSES

boom

CLICK THE IMAGE TO REVEAL AREAS TO YOUR PARTNER.

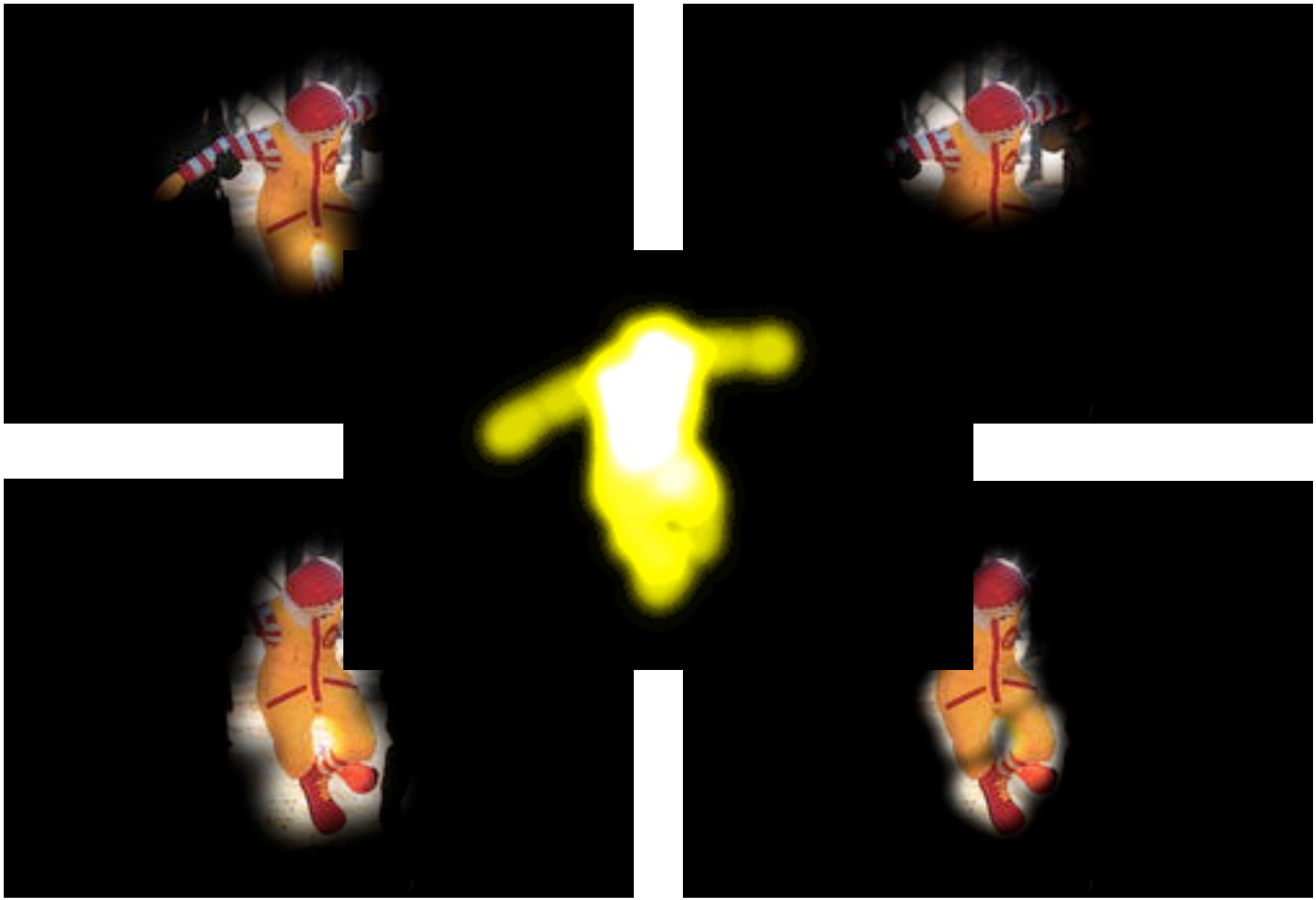
RIGHT CLICK TO PING AN AREA OF THE IMAGE.

HINTS

NOUN | RELATED NOUN | TEXT | VERB

PASS

RONALD



Peekaboom + SEGMENTATION

PeekaSearch - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites

Address http://www.peekaboom.org/cgi-bin/peekasearch Go Links

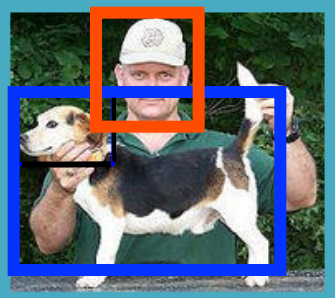
Peekaboom

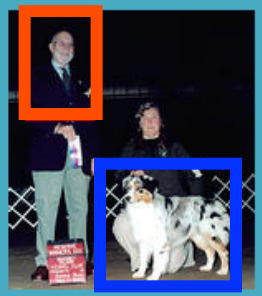
Beta Search. Searching roughly 20,000 images.

Search

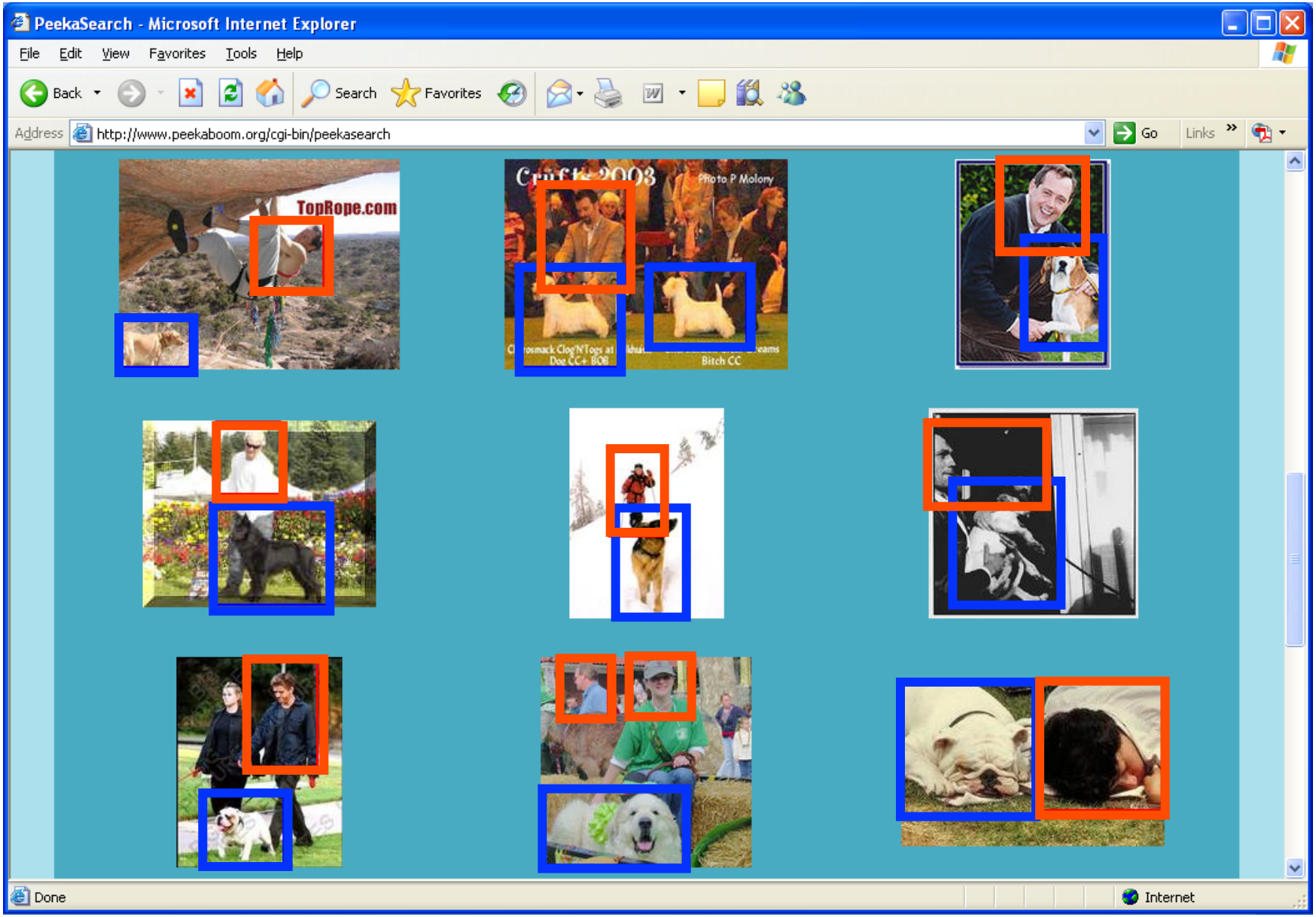
sample queries: man dog, car tree

28 matches; 4575 near matches for **man dog**





Done Internet


PeekaSearch - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites
Address http://www.peekaboom.org/cgi-bin/peekasearch
Go Links
TopRope.com
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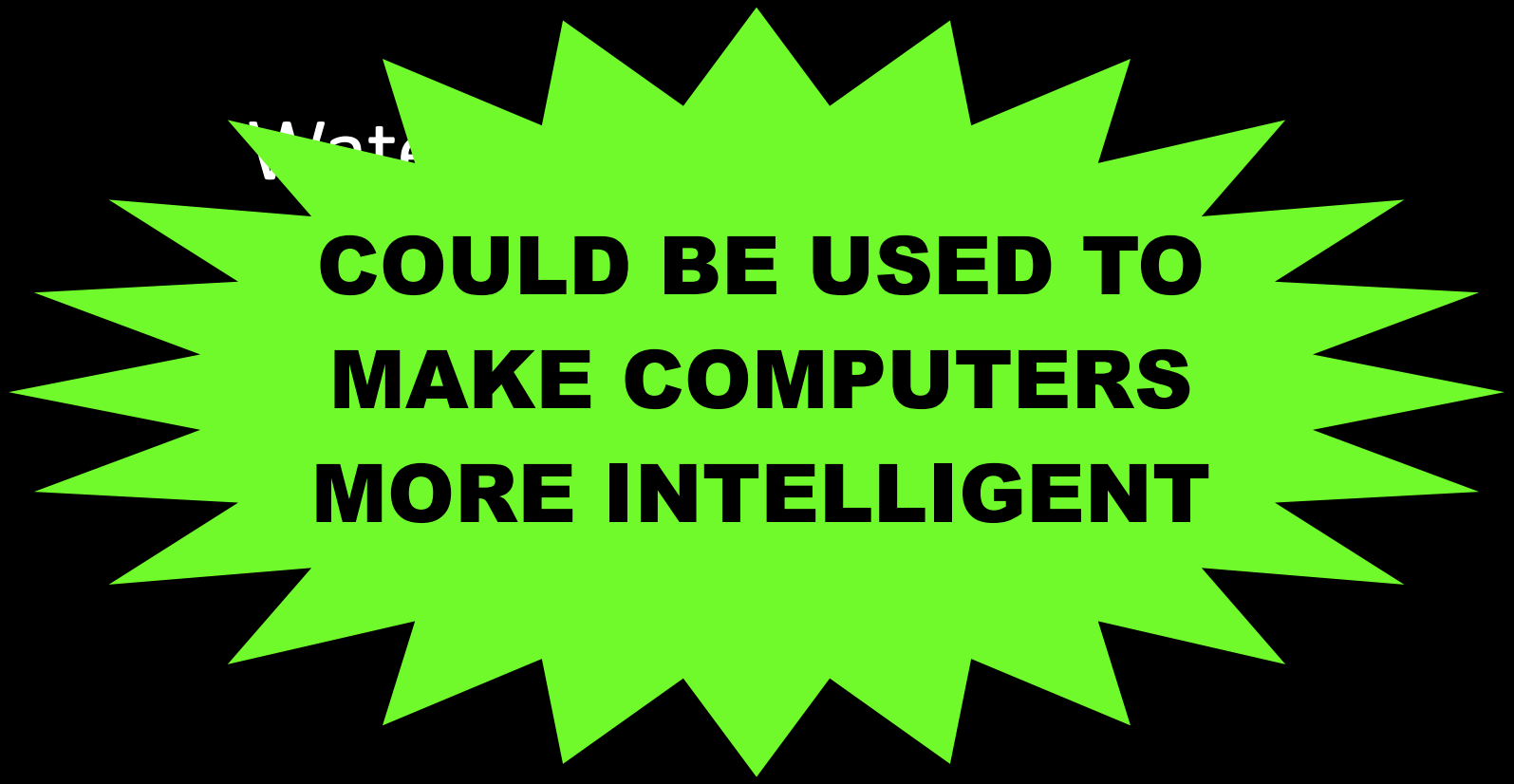
Done
Internet

Common-Sense Facts

- Wate



INPUT-**OUTPUT**

milk → It is white
It is a liquid
Cereal is eaten with it
Has lactose

Verbosity

Two-player word guessing game

Narrator

milk

"Is typically near CEREAL"

"Is a LIQUID"

Guesser

milk

Verbosity

Player 1

milk

Common-sense fact about milk

Player 2

milk

Peekaboom

Player 1

Player 2

BUTTERFLY

In General

Player 1

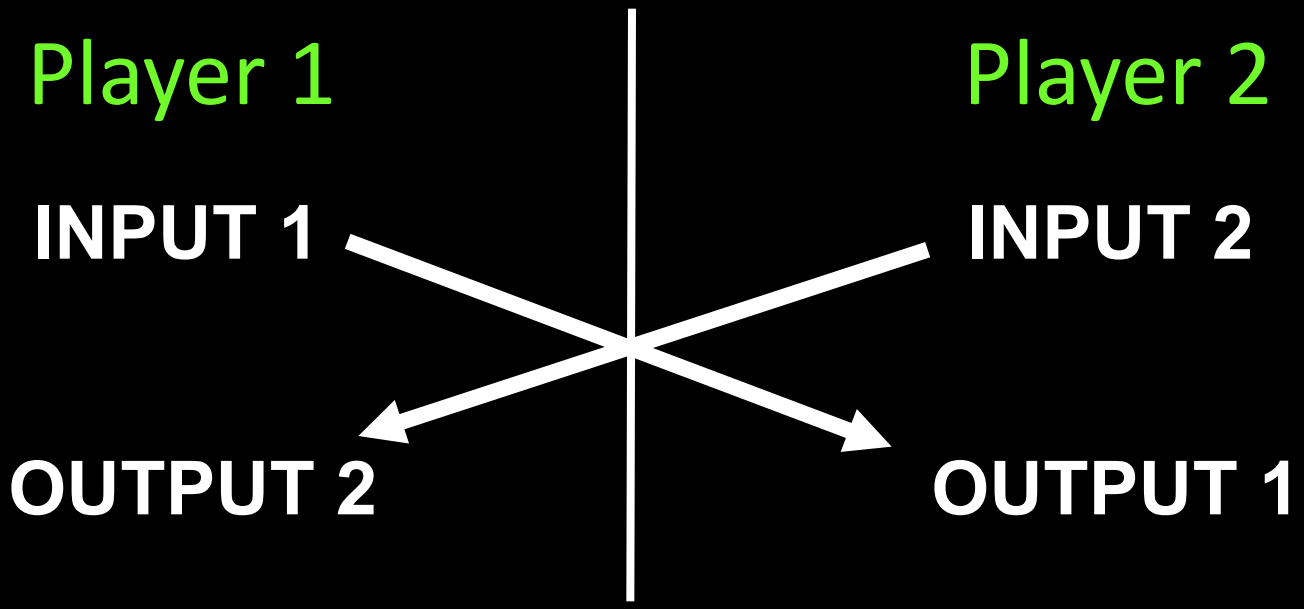
Player 2

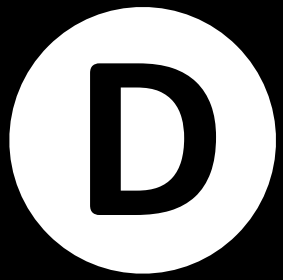
IN

INVERSION GAME

Output Agreement Game

Input Agreement Game





Future Directions

Open problems

Open Problems

1. How to route tasks to the right person?
2. Best ways to combine AI with humans
3. Design a better mechanical turk