Something about audio CAPTCHAs

Elie Bursztein, Romain Bauxis, Daniele Perito, Hristo Paskov, Celine Fabry, John Mitchell

Elie Bursztein

@elie Stanford

Researcher at Stanford University. Tweeting about web security, mobile security, and offensive technologies. No I don't wear a black hat :)

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Username: eliedemo — ok

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Password: •••••••••• — Good

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

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Hear a set of words
Powered by reCAPTCHA.
Help

Type the words above

Finish

Create my account

I want the inside scoop—please send me email updates!

CAPTCHAS

CAPTCHAS

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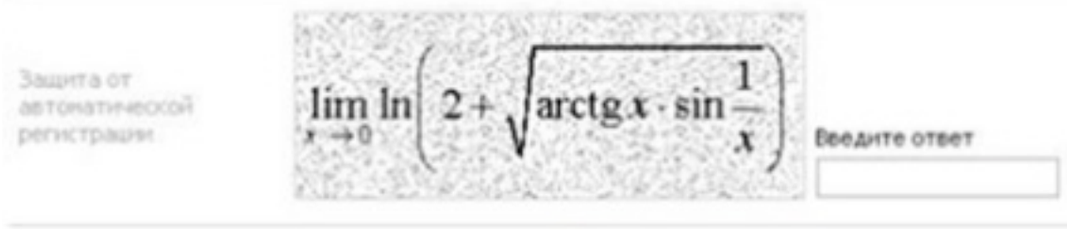
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Введите ответ

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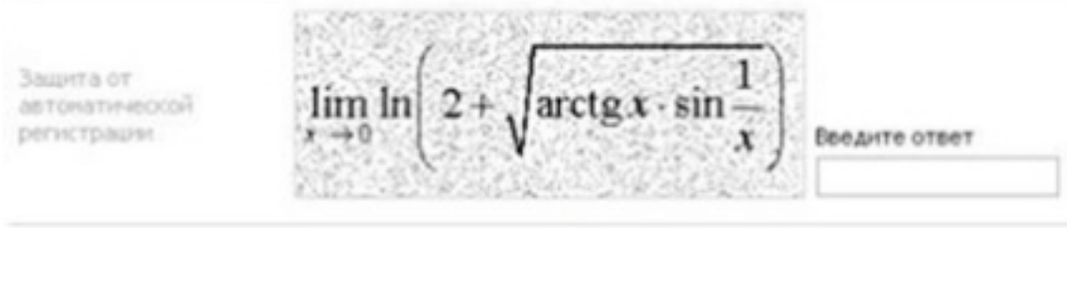
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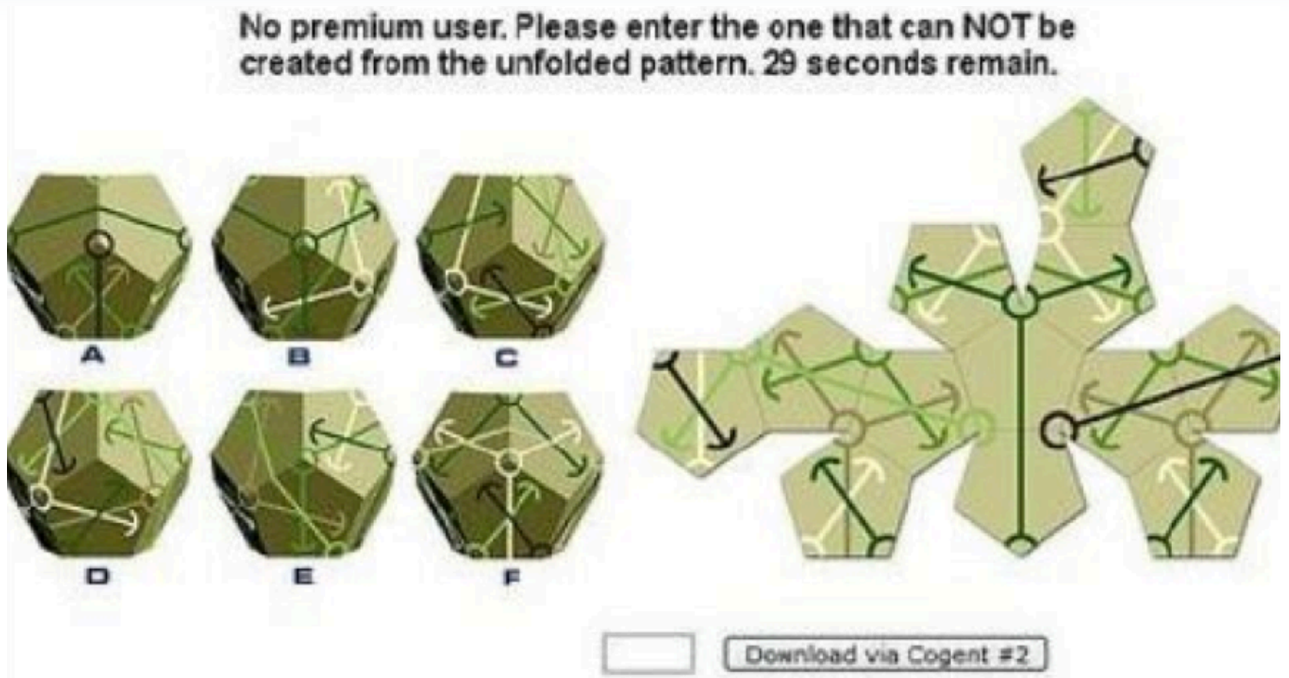
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B
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D
E
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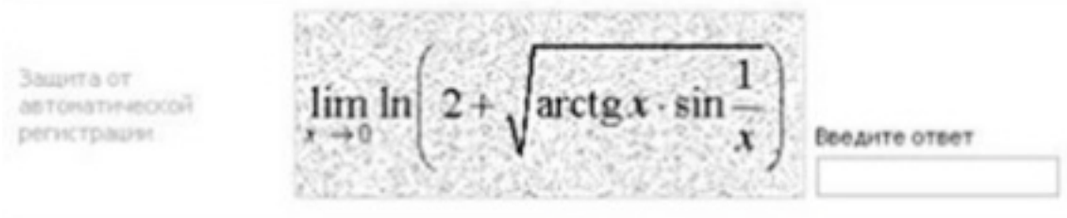
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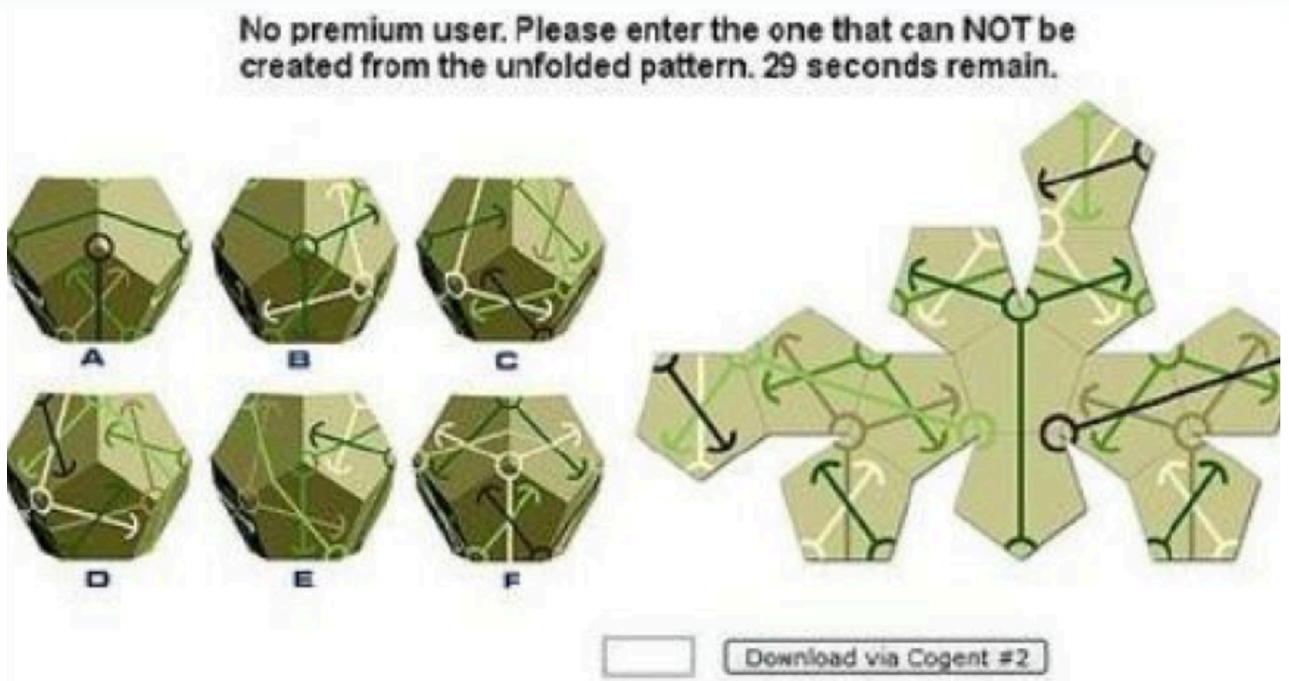
Введите ответ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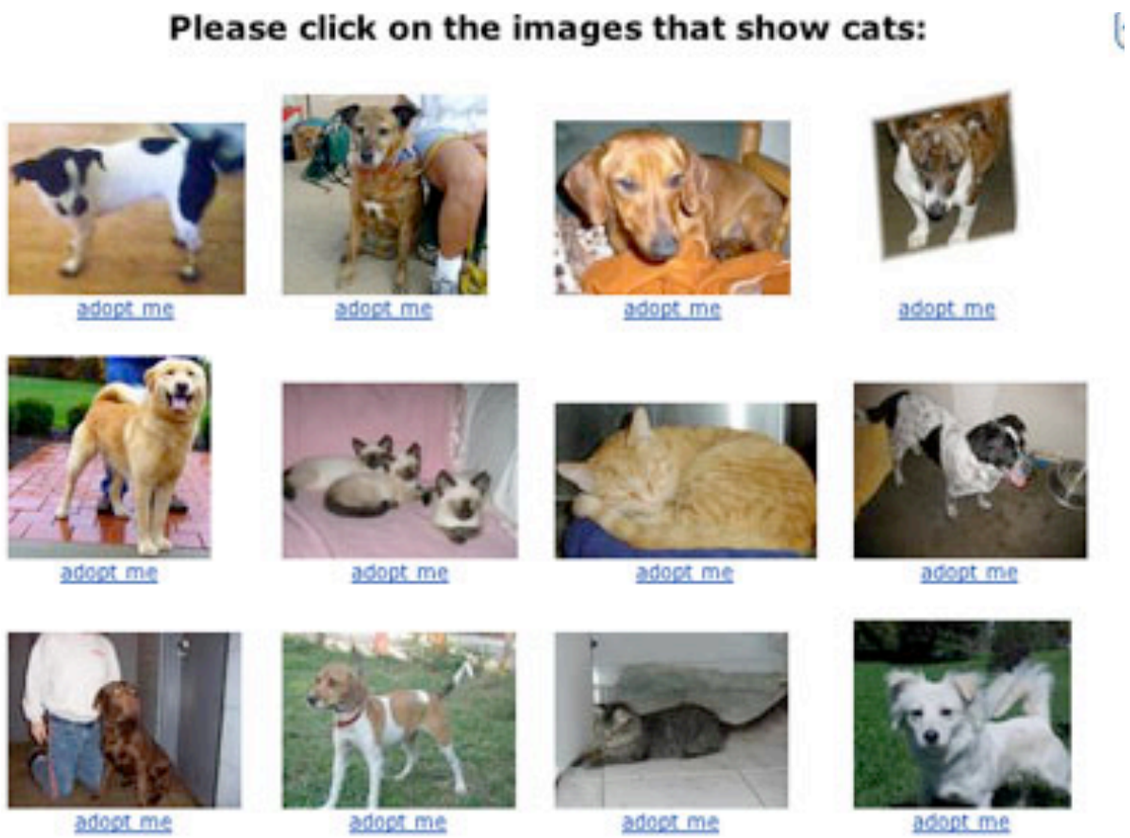
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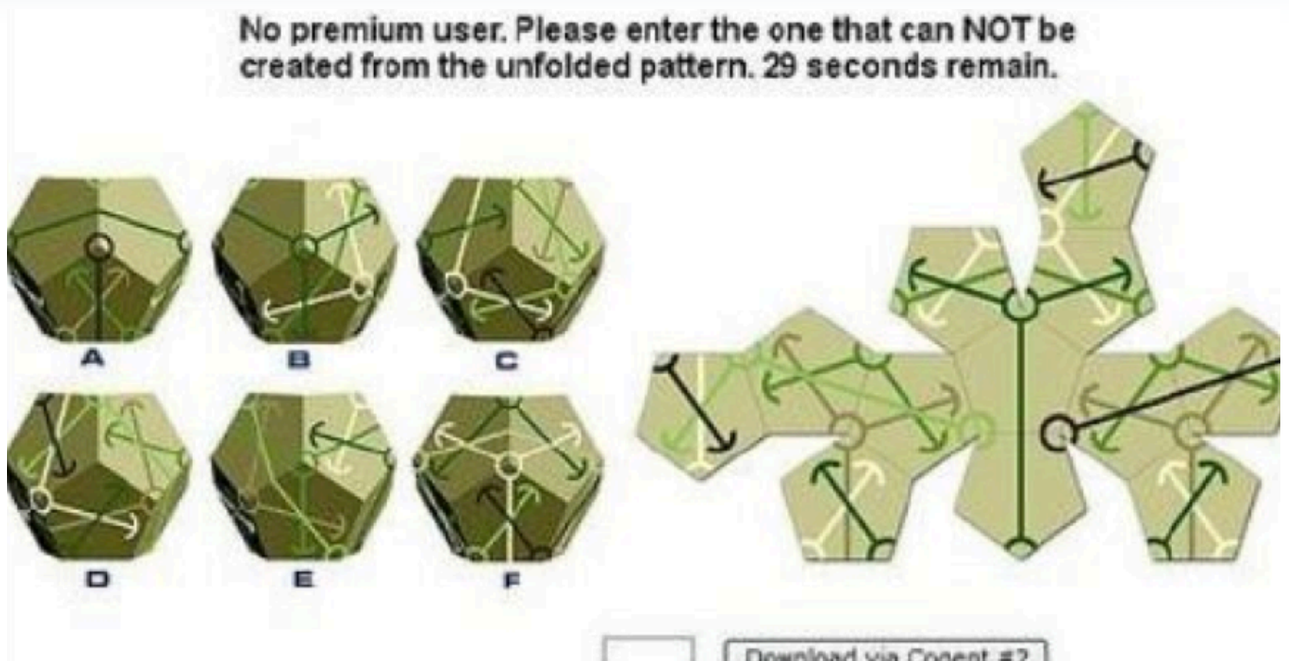
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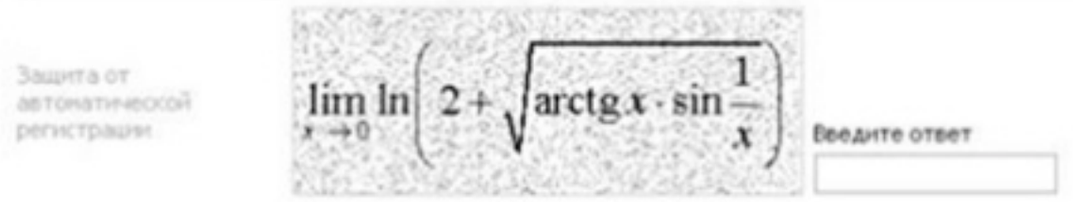
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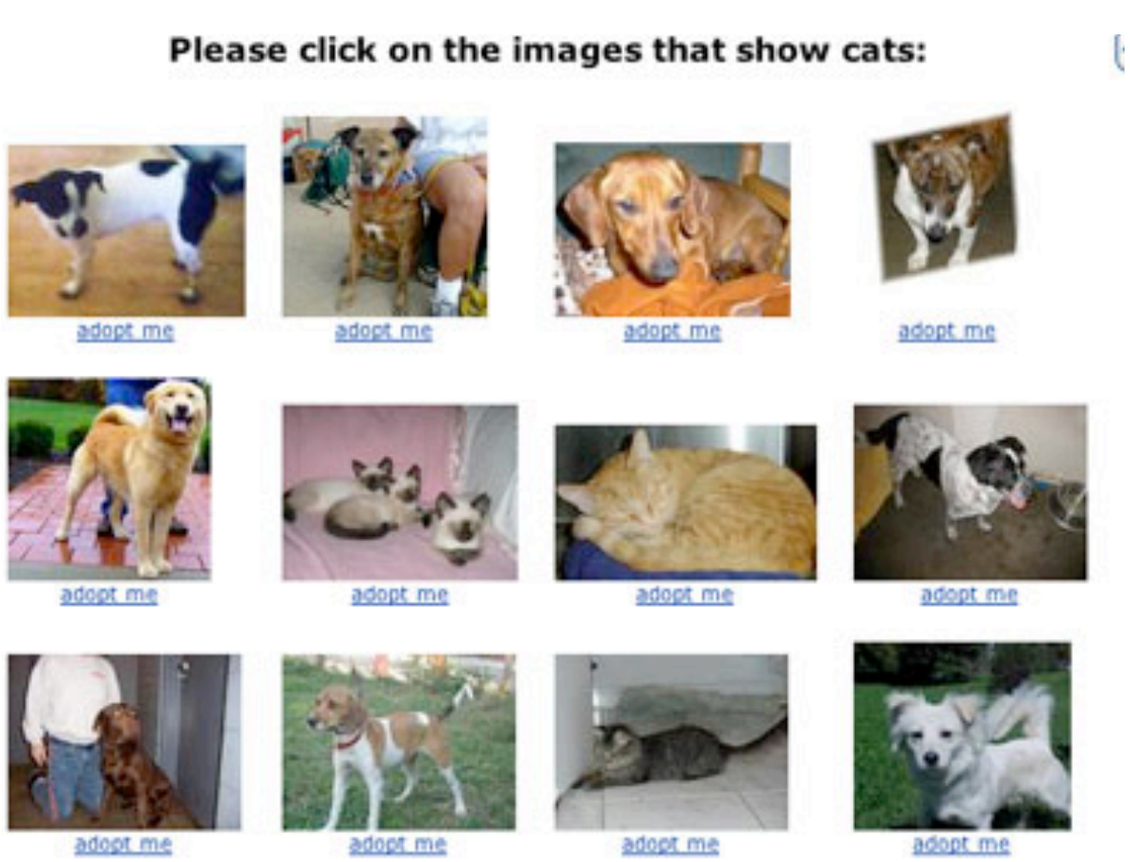
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meet me
switch to men
hotcaptcha by frozenbear

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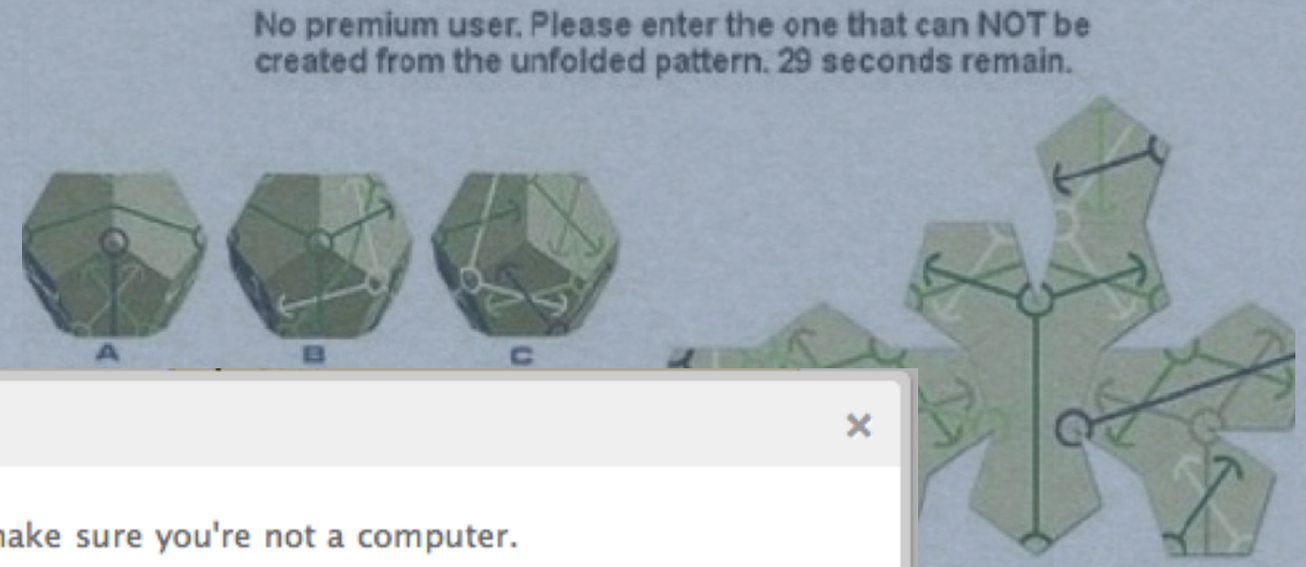
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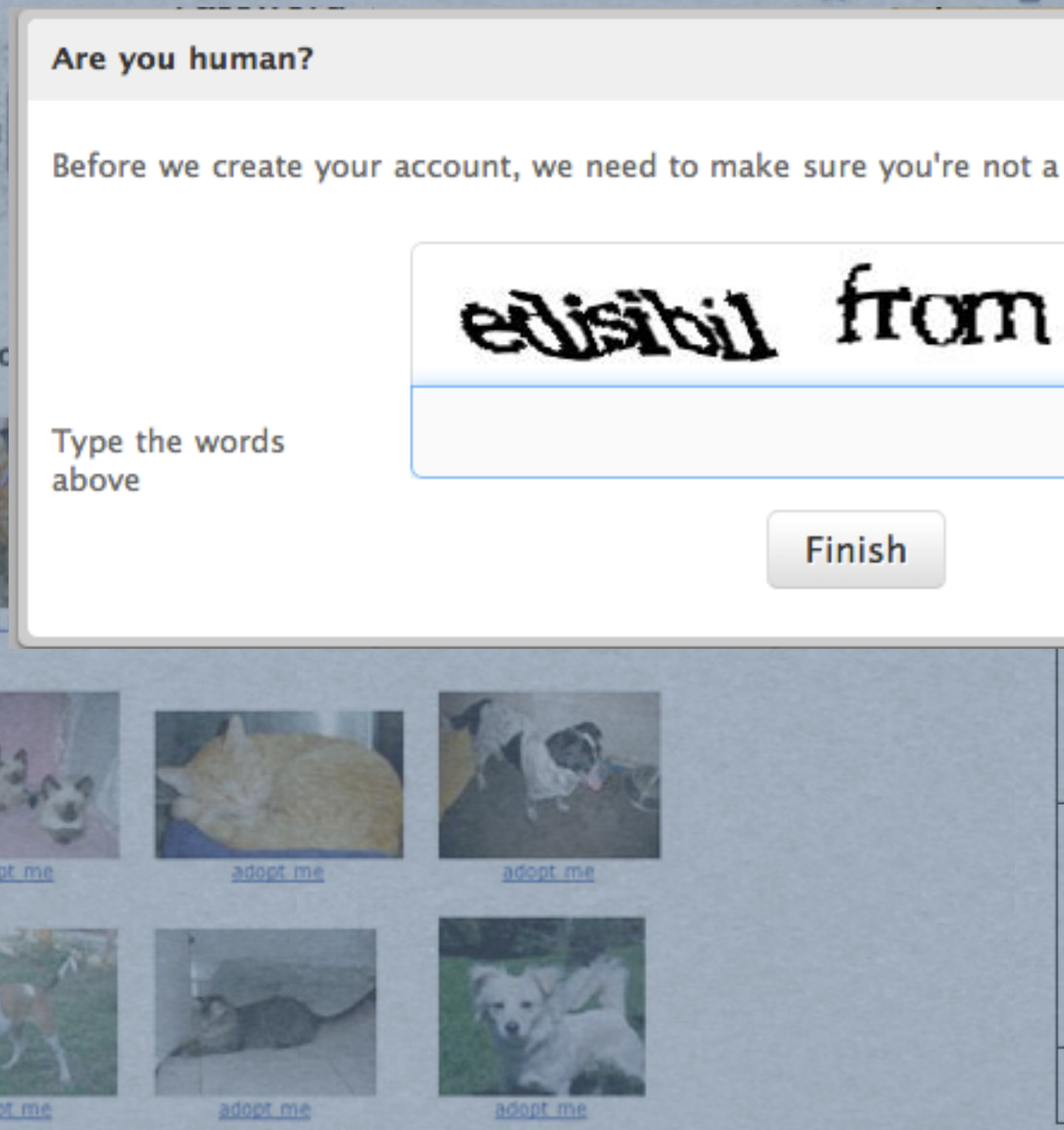
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Get two new words
Hear a set of words
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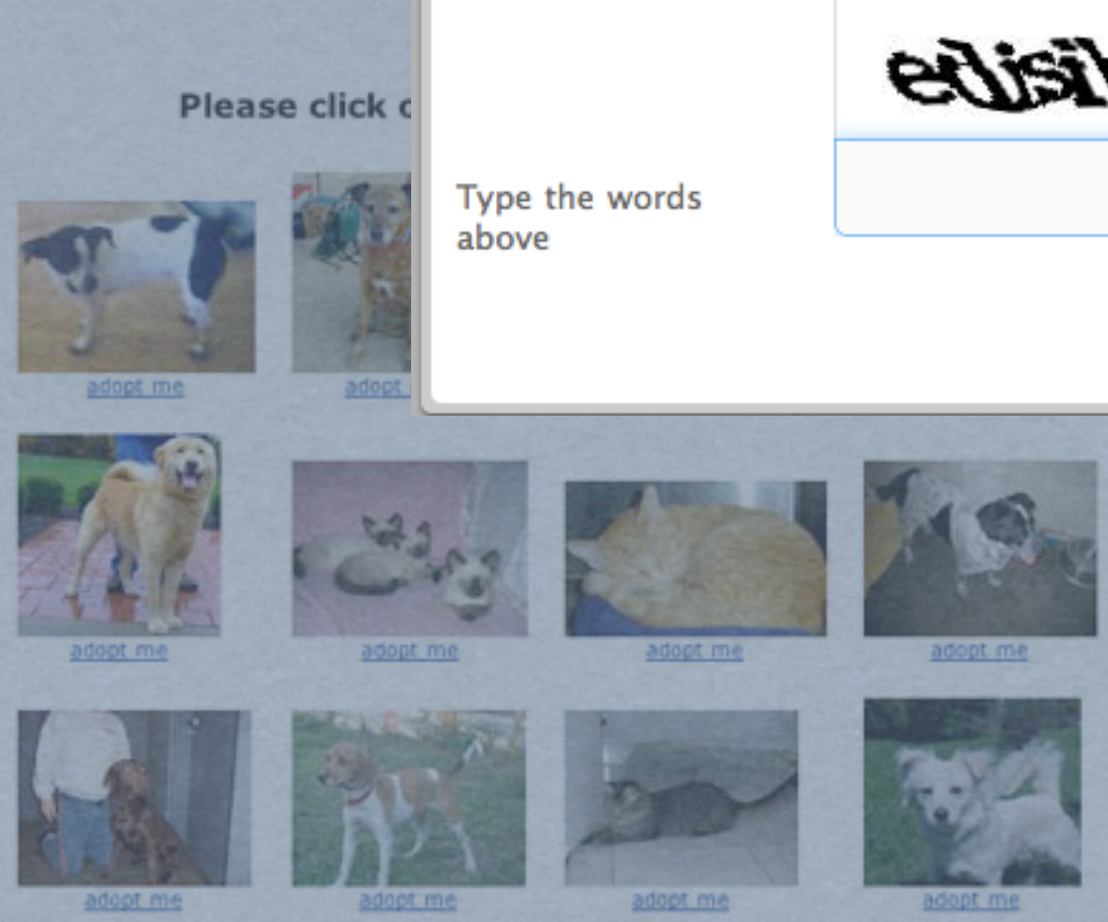
Finish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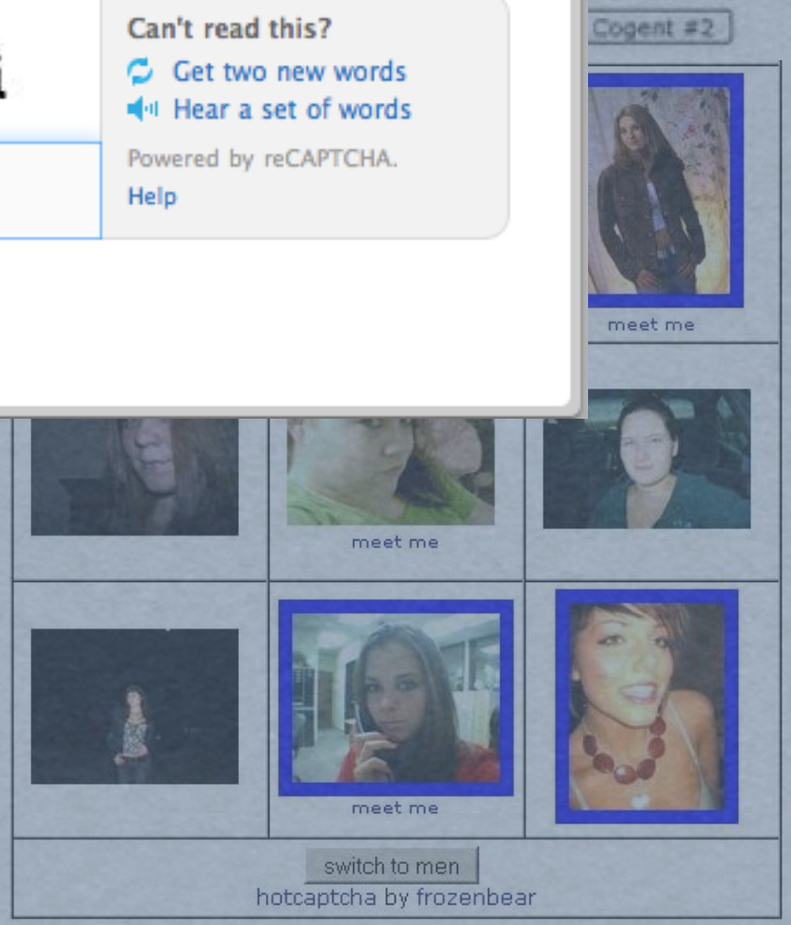
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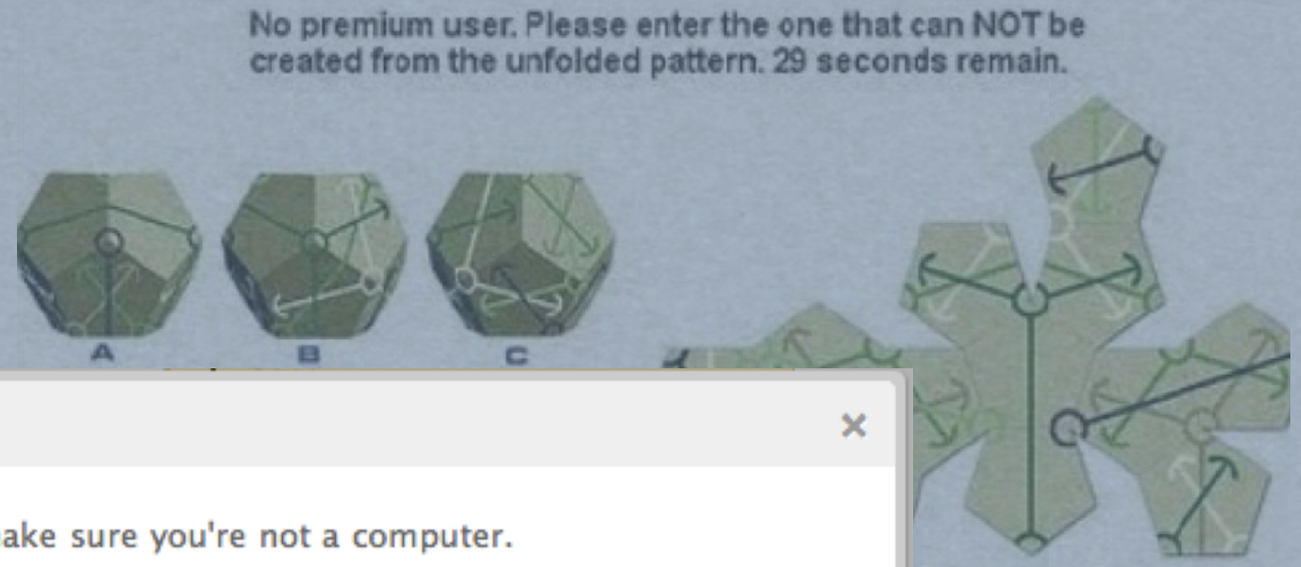
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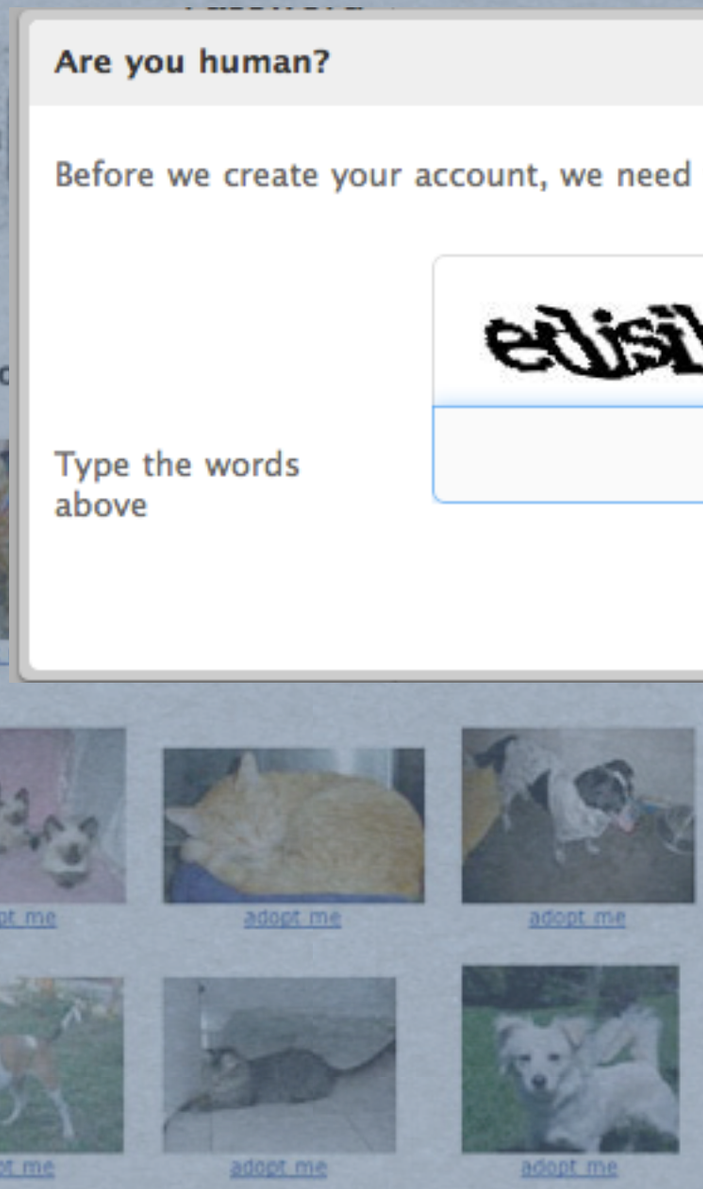
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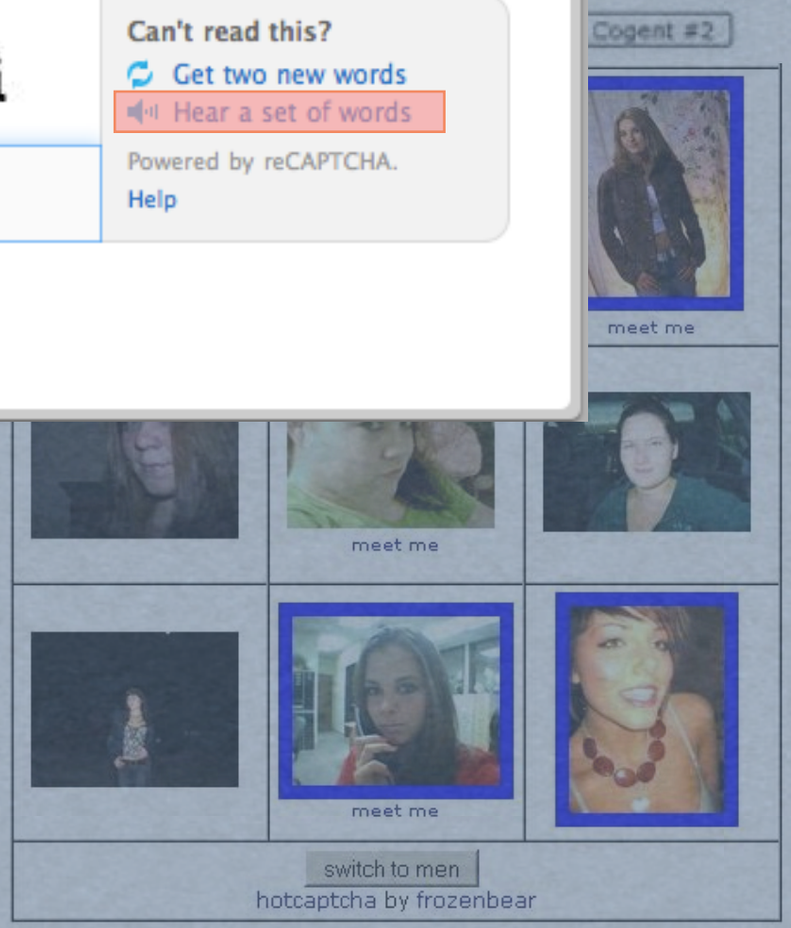
Cogent #2
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Audio capchas

Audio capchas

Outline

- Audio captchas background
- Breaking audio captchas
- Evaluation results
- Demo

Creating audio captcha

Creating audio captcha

Voices

Creating audio captcha

Noises

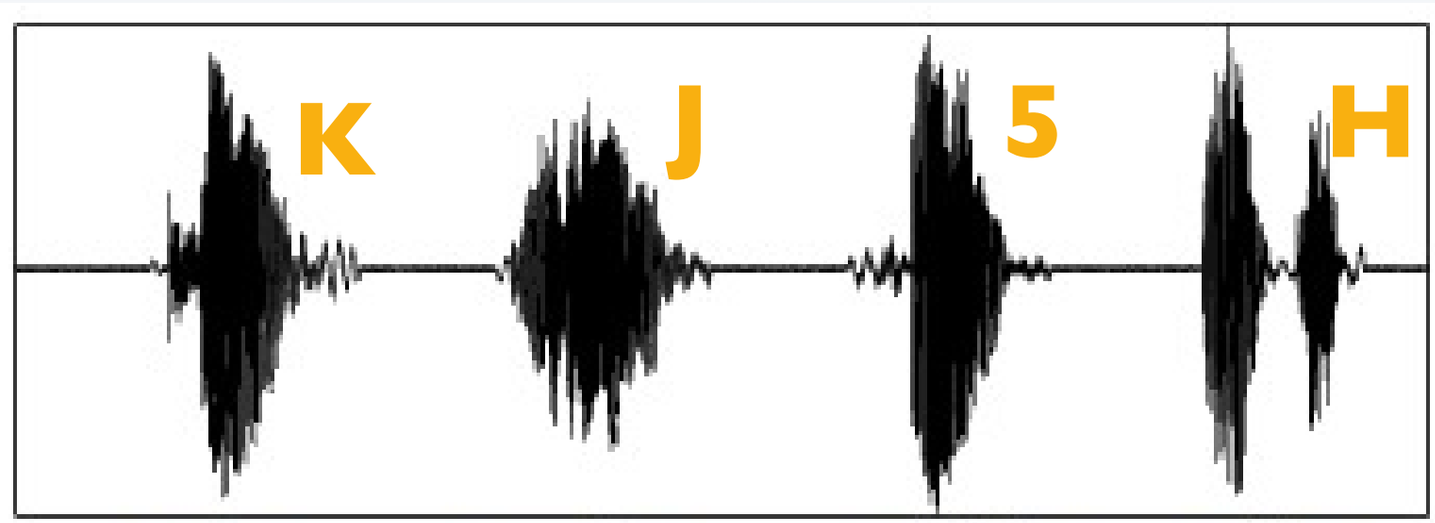
Creating audio captcha

Super
secure captcha

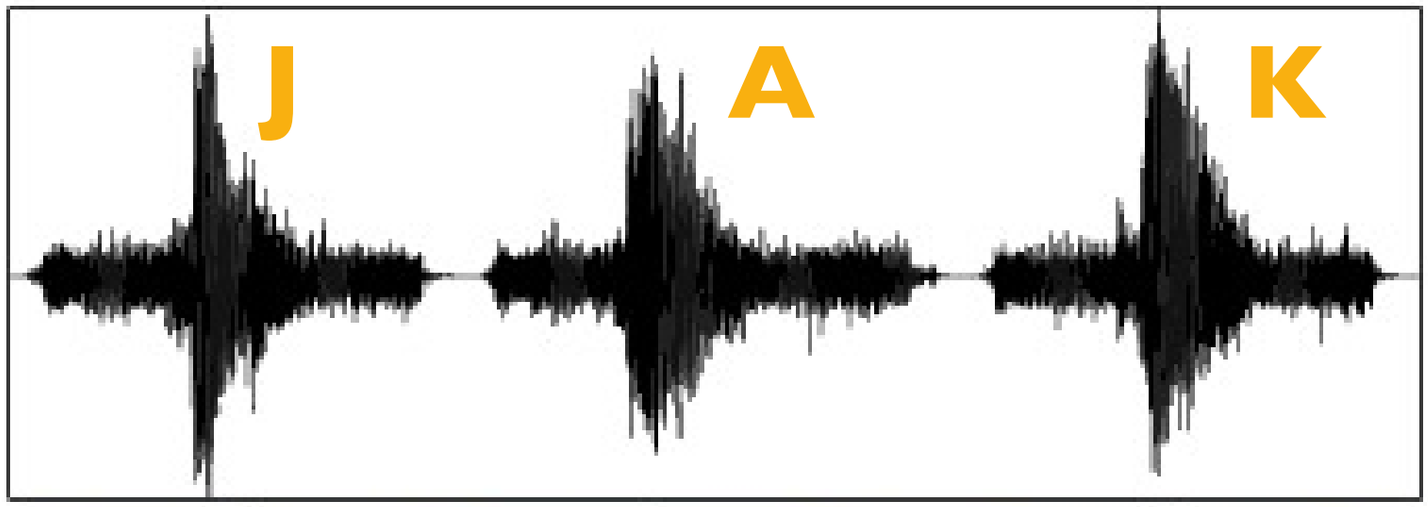
Type of noise

- Additive noise i.e white noise
- Convolutive noise i.e echo
- Semantic noise i.e music

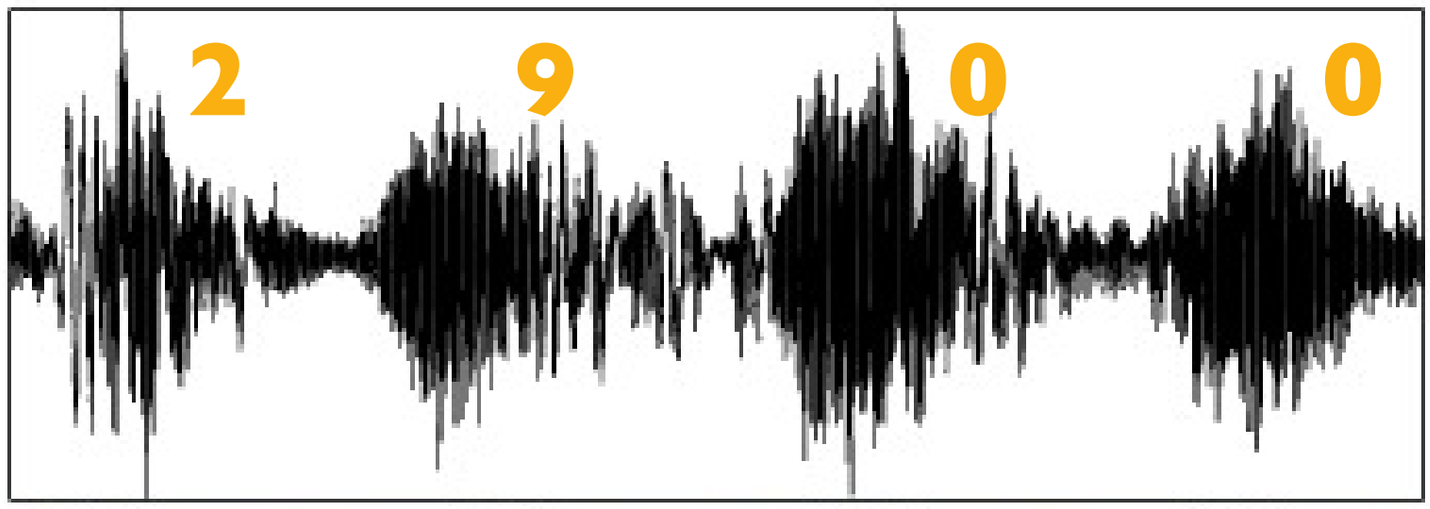
Noise intensity (RMS/SNR)



Authorize

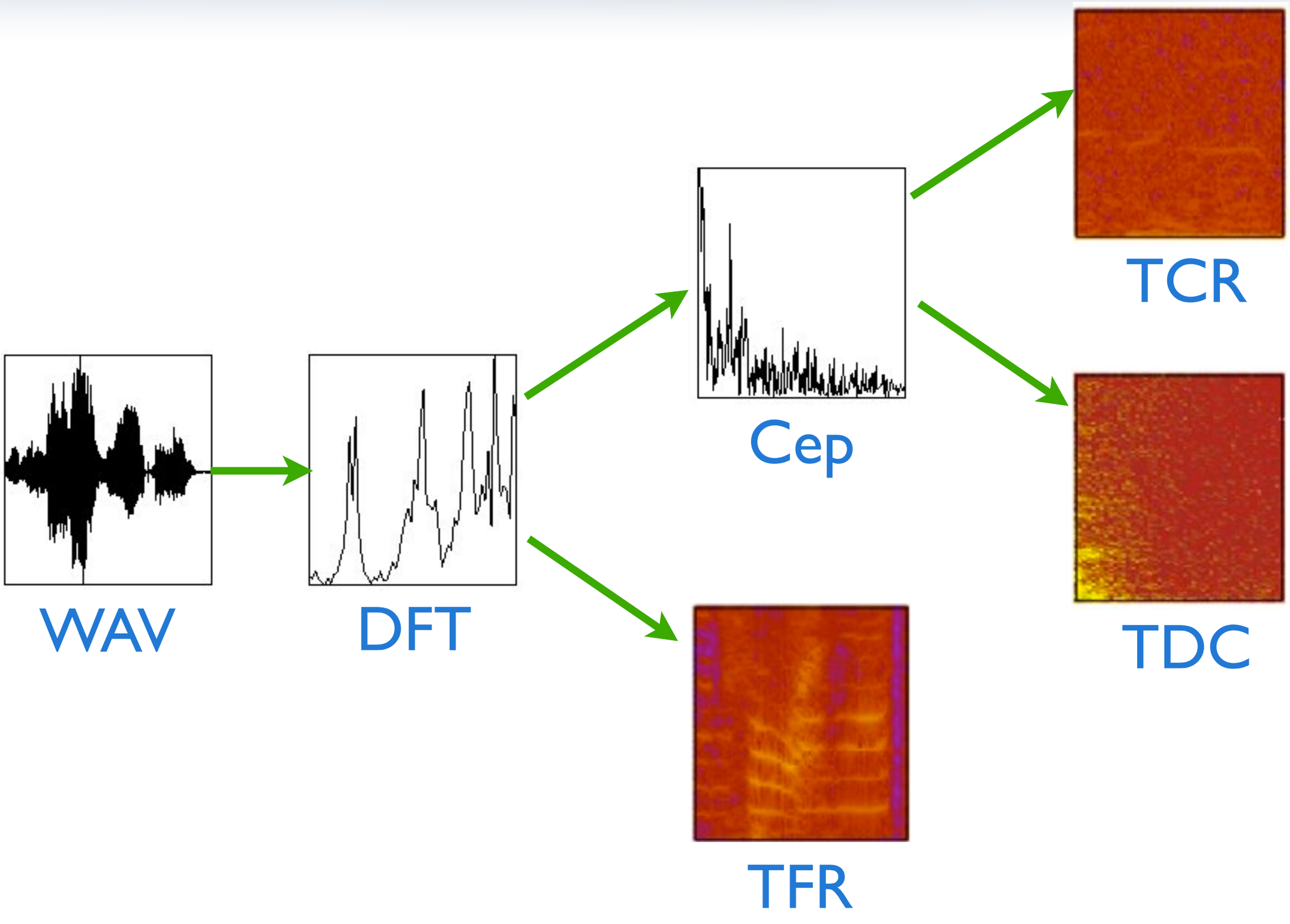


Digg



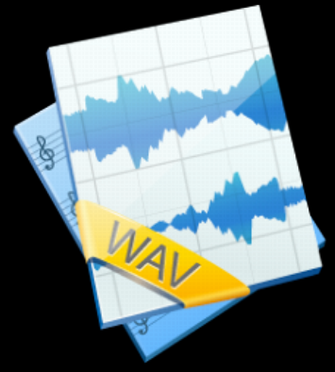
Microsoft

Sound representation

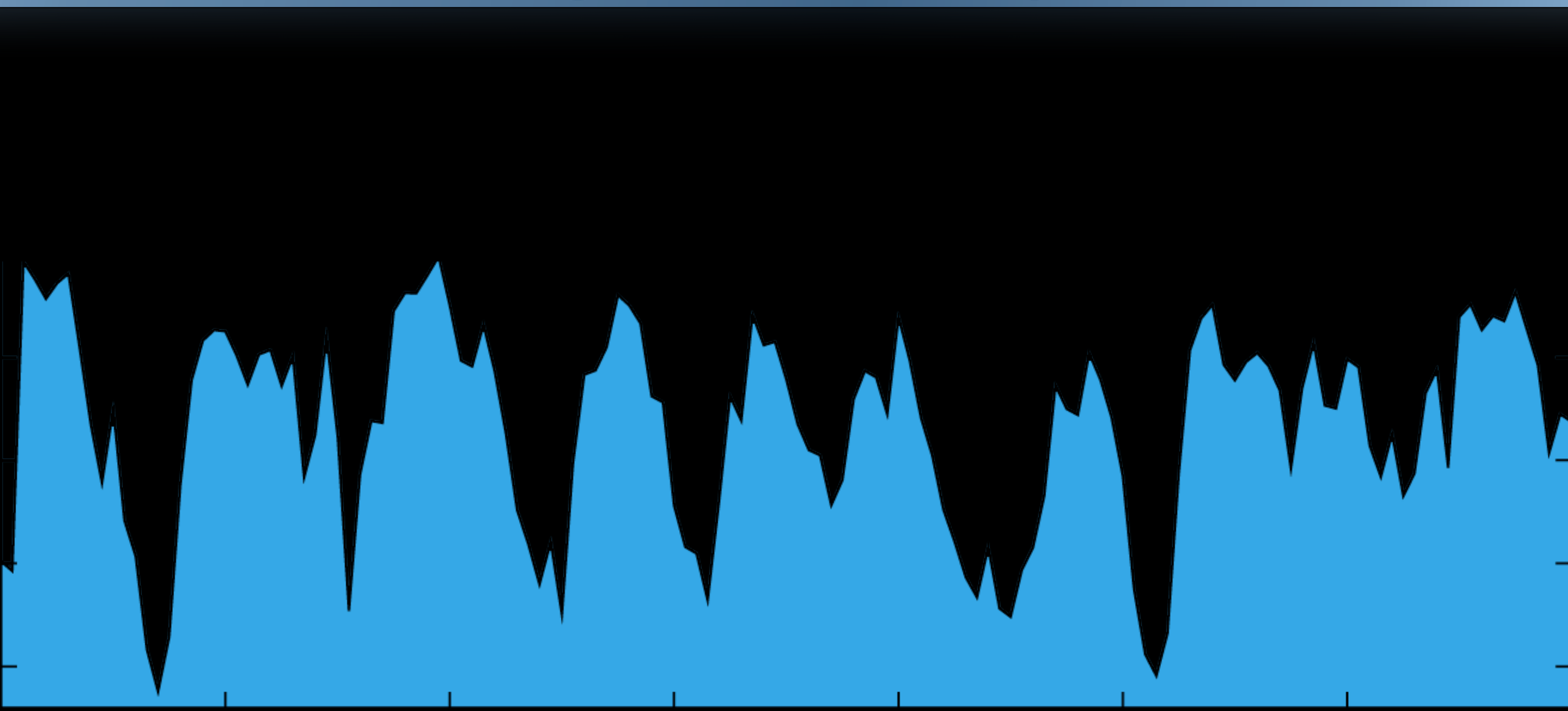


Breaking audio captchas

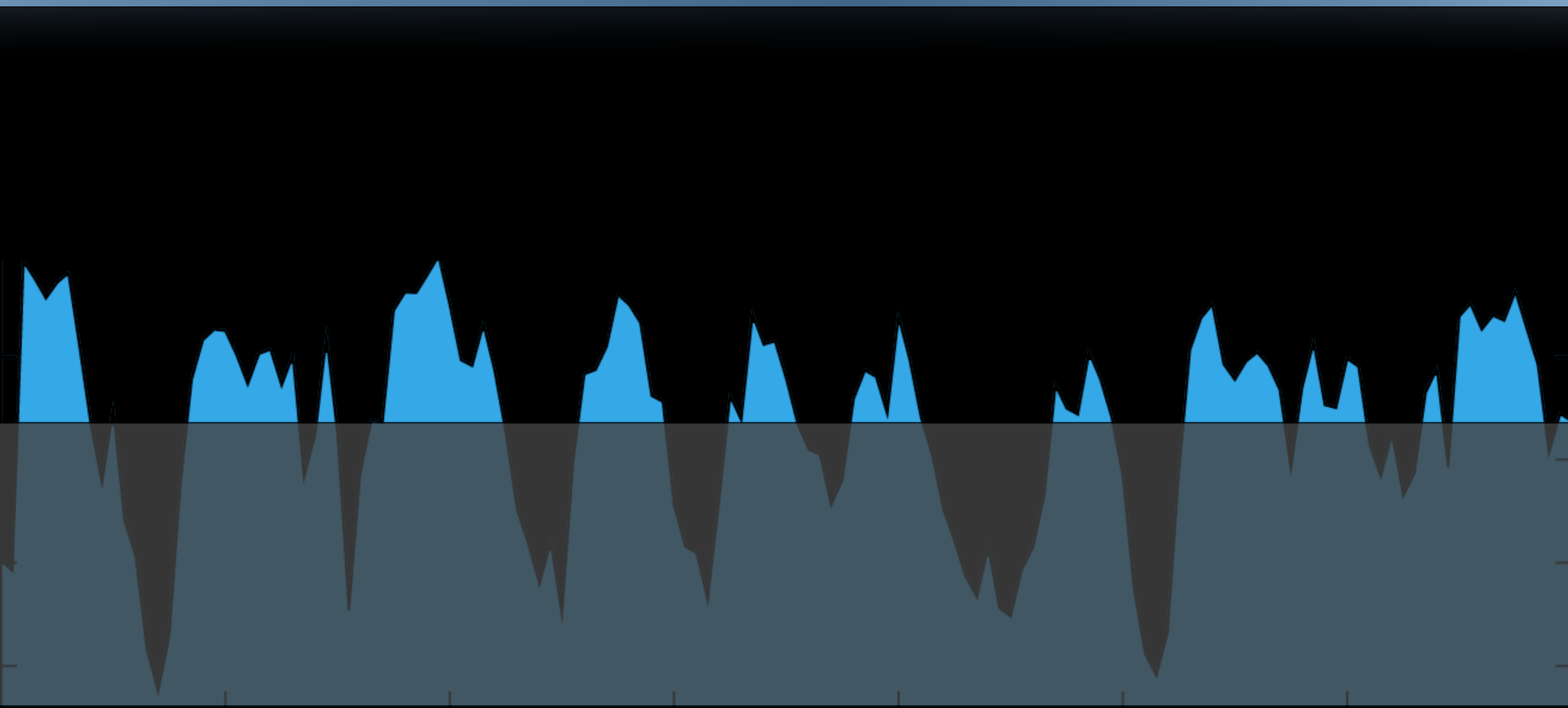
Solving an audio captcha



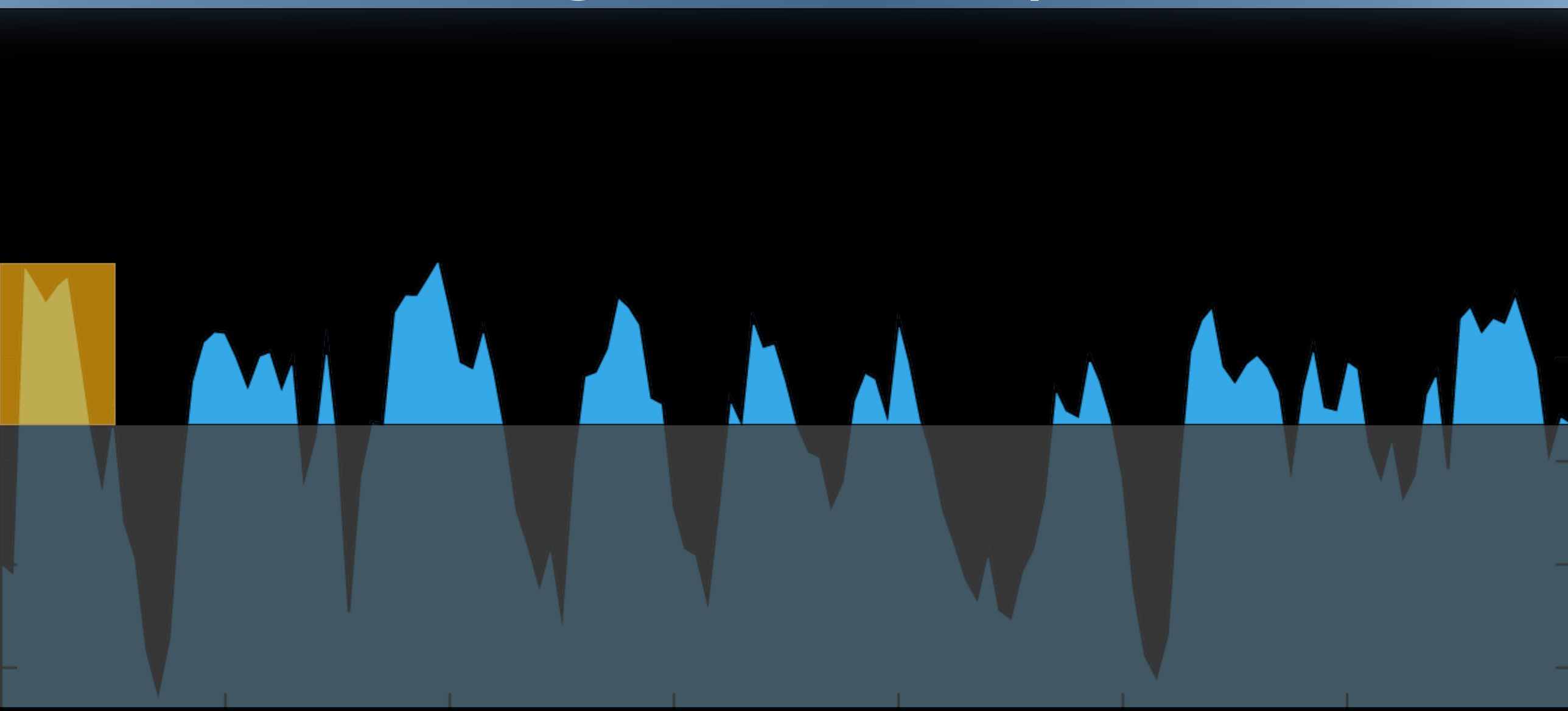
Solving an audio captcha



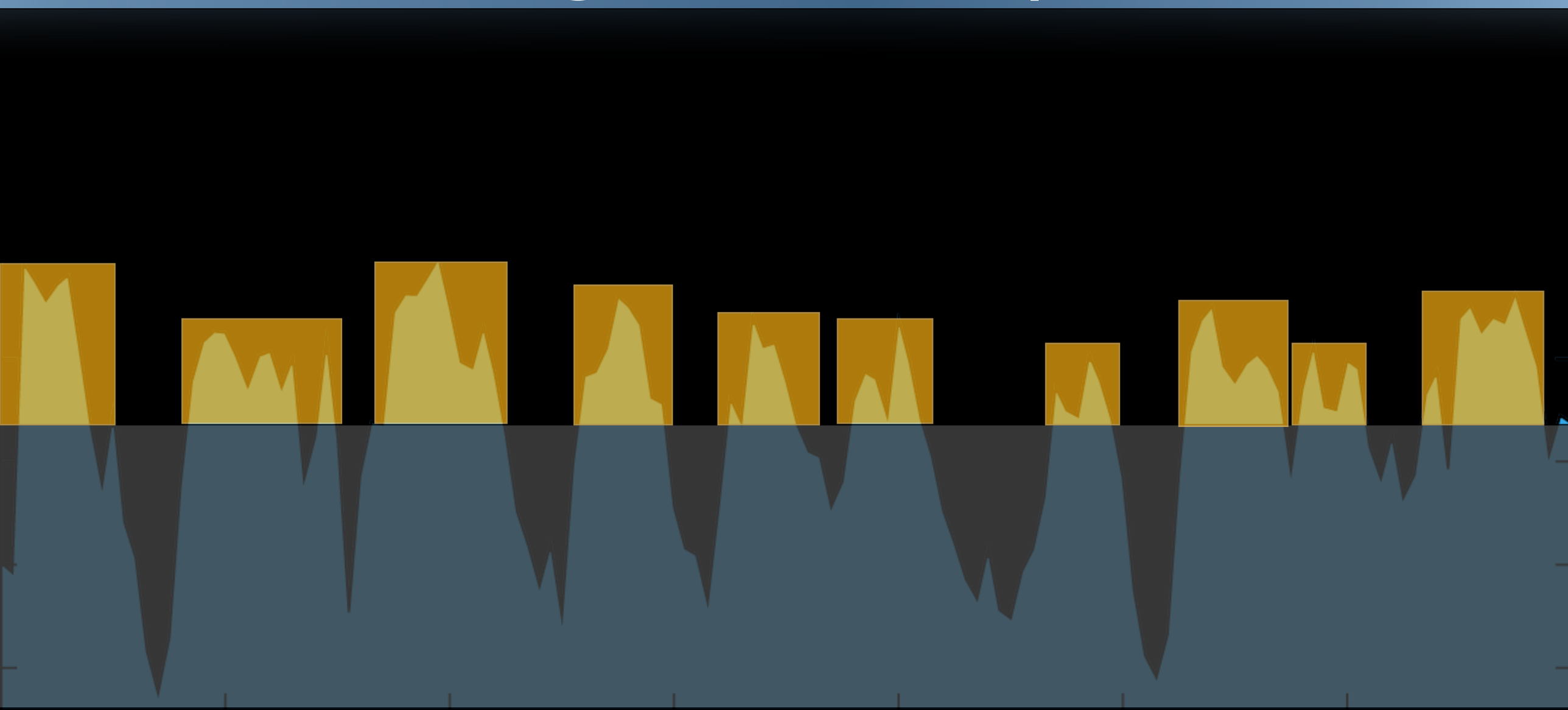
Solving an audio captcha



Solving an audio captcha



Solving an audio captcha



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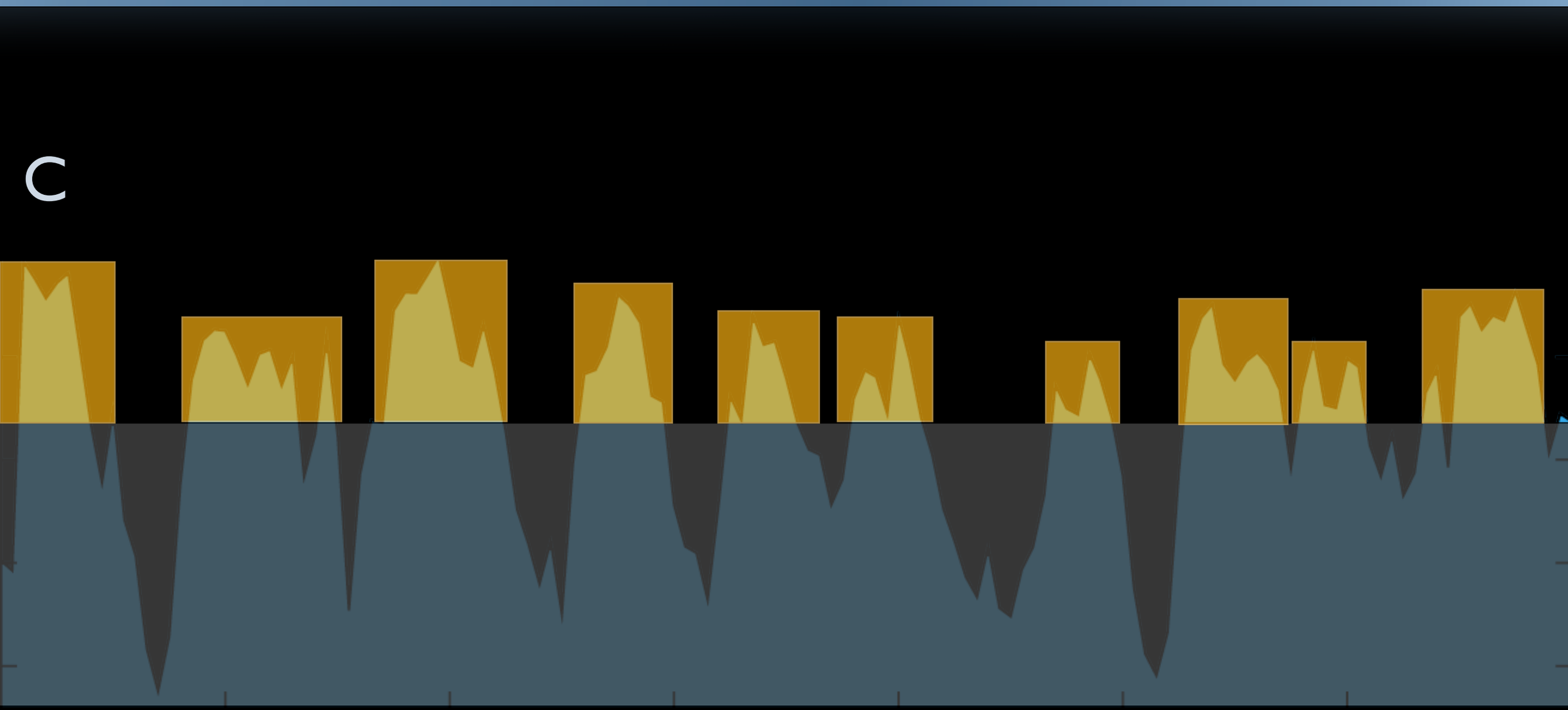

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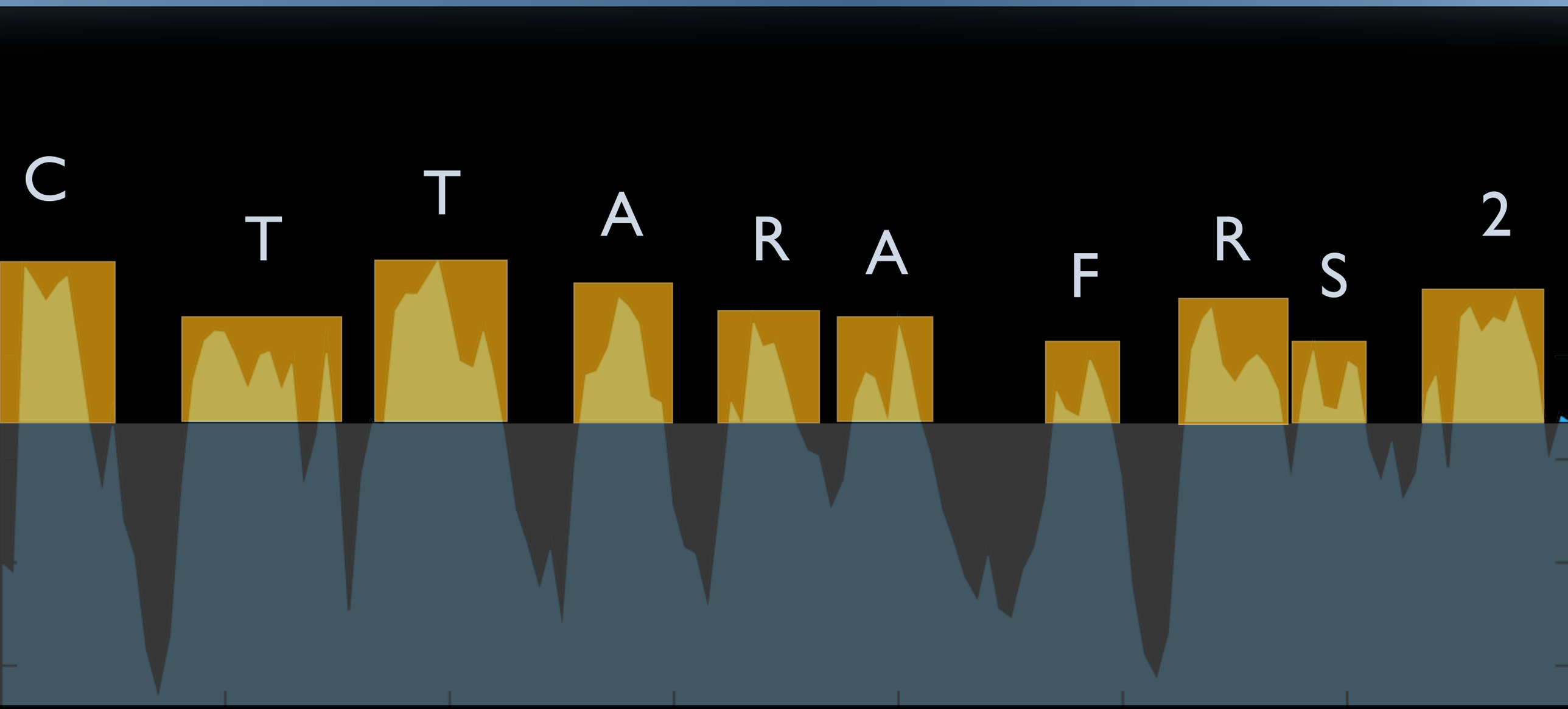
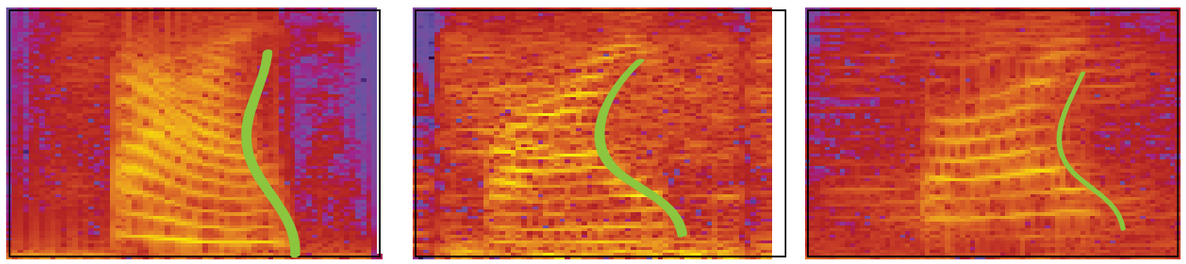


Dealing with random noise

- Statistical learning
- Supervised learning

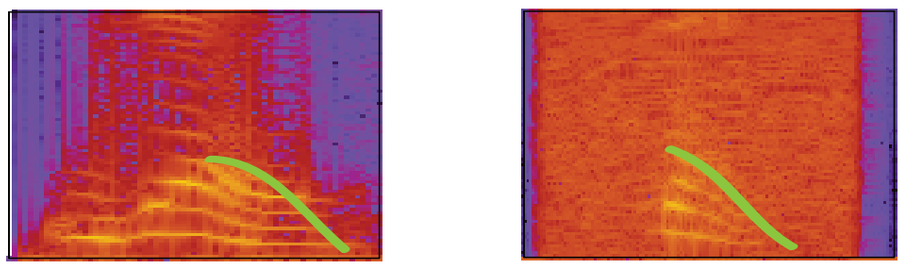
5:



Authorize eBay Recaptcha

- RLS (Regularized least square) classifier

J:



Authorize Digg

Solver efficiency

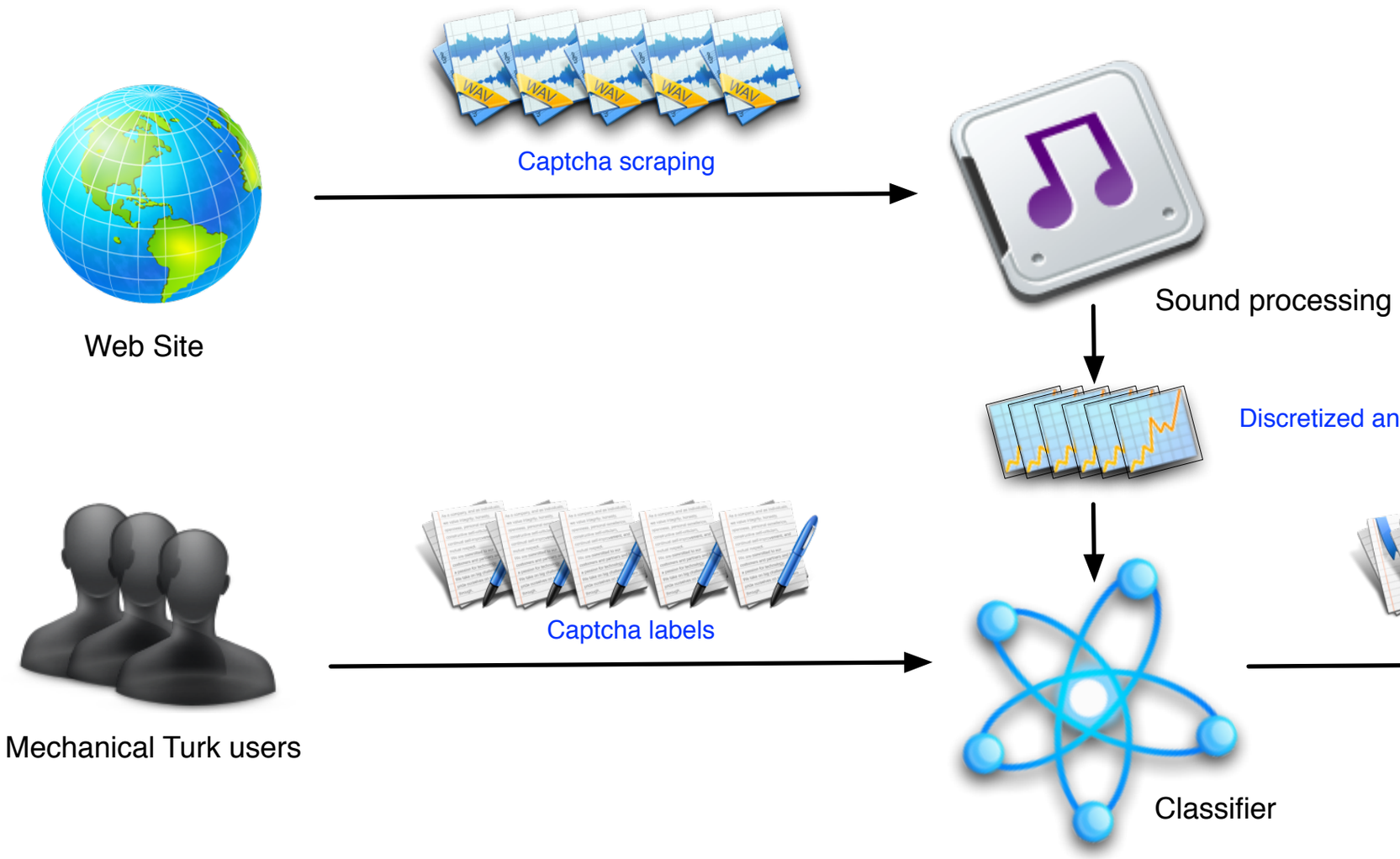
Solver accuracy = Coverage * Precision^length

Coverage: Segmentation

Precision: Recognition rate

Decaptcha

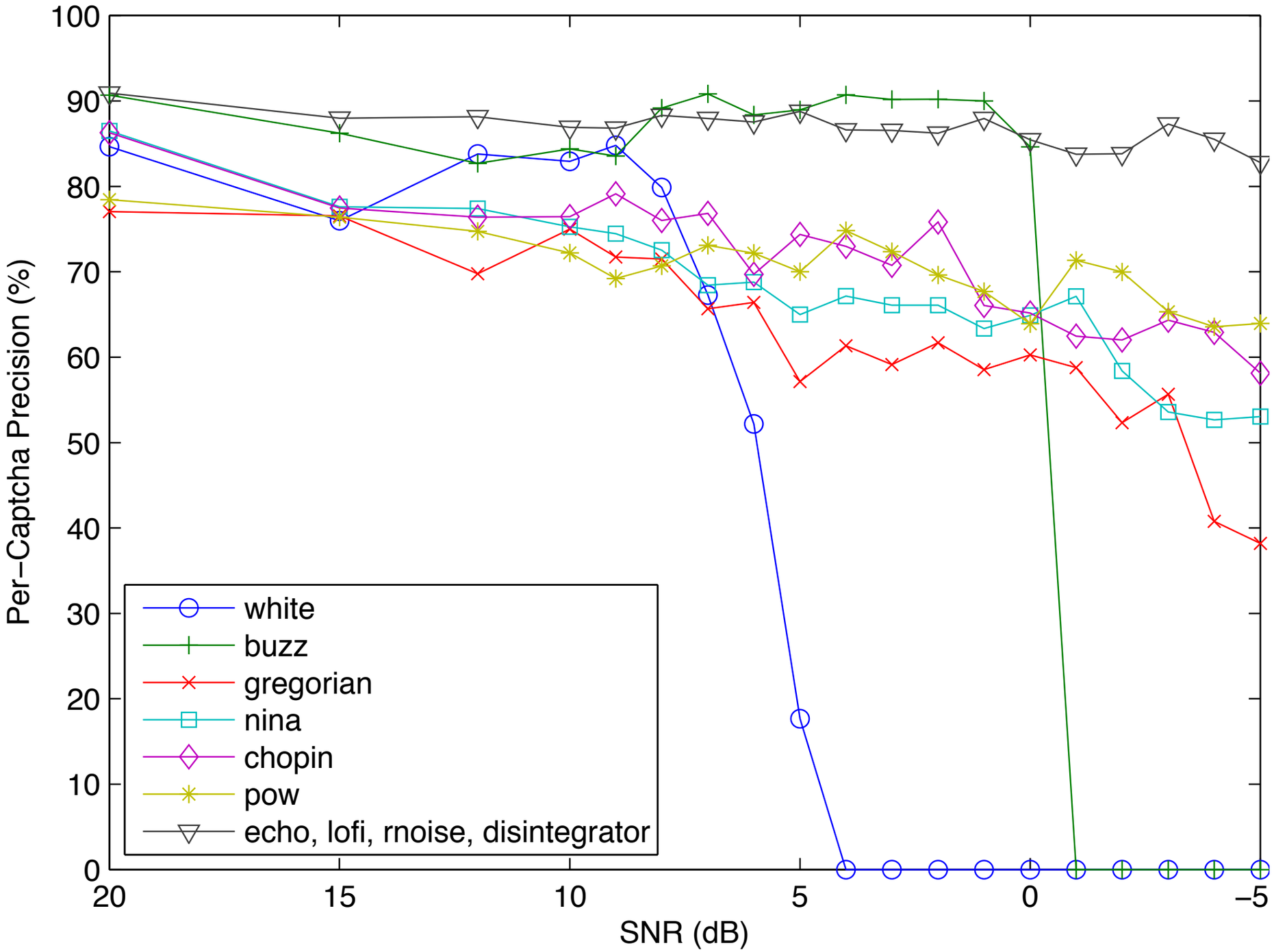
Decaptcha overview



Testing corpus

Familly	Name	Description
Constant Noise	*White*	White Gaussian noise.
	buzz	Sine waves at 700 Hz, 2100 Hz and 3500 Hz.
Regular noise	*pow*	10 ms bursts of white Gaussian noise repeated every 100 ms.
	rnoise	Every 100 ms, a section of the signal is replaced by white noise of the same RMS amplitude.
	lofi	Add distortion, cracks, bandwidth limiting and compression. Simulates old audio equipment.
	echo	The signal starts to echo at 0.6, 1.32, and 1.92 seconds.
	disintegrator	Amplifies random half-cycles of the signal by a multiplier. Simulates a bad audio channel.
Semantic noise	*chopin*	Chopin Polonaise for Piano No. 6, Op. 53.
	gregorian	Gregorian chant.
	nina	"Just in time" by Nina Simone.

Synthetic evaluation



Authorize.Net®
a CyberSource solution

ebaY

digg

ReCAPTCHA™

YAHOO!®

Microsoft®

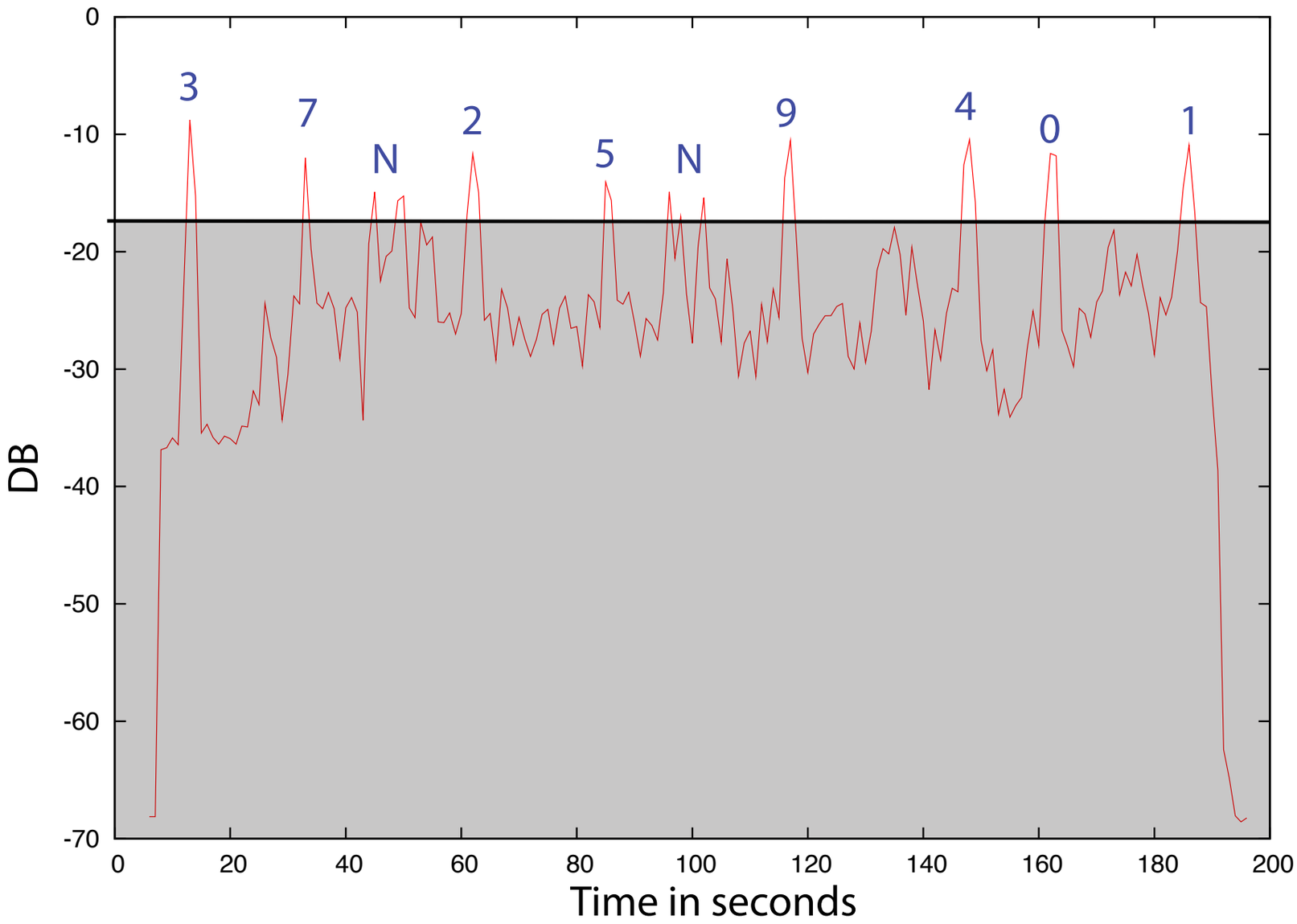
Captcha features

Scheme	Authorize	Digg	eBay	Microsoft	Recaptcha	Yahoo
Length	5	5	6	10	8	7
Type of voice	Female	Female	Various	Various	Various	Child
Background Noise	None	Constant (random)	Constant (random)	Constant (random)	Constant (random)	None
Intermediate noise	None	None	Regular (speech)	Regular (speech)	Regular (speech)	Regular (speech)
Charset	0-9a-z	a-z	0-9	0-9	0-9	0-9
Avg. duration	5.0	6.8	4.4	7.1	25.3	18.0
Sample rate	8000	8000 8000	8000	8000	8000	22050
Beep	no	no	no	no	no	yes

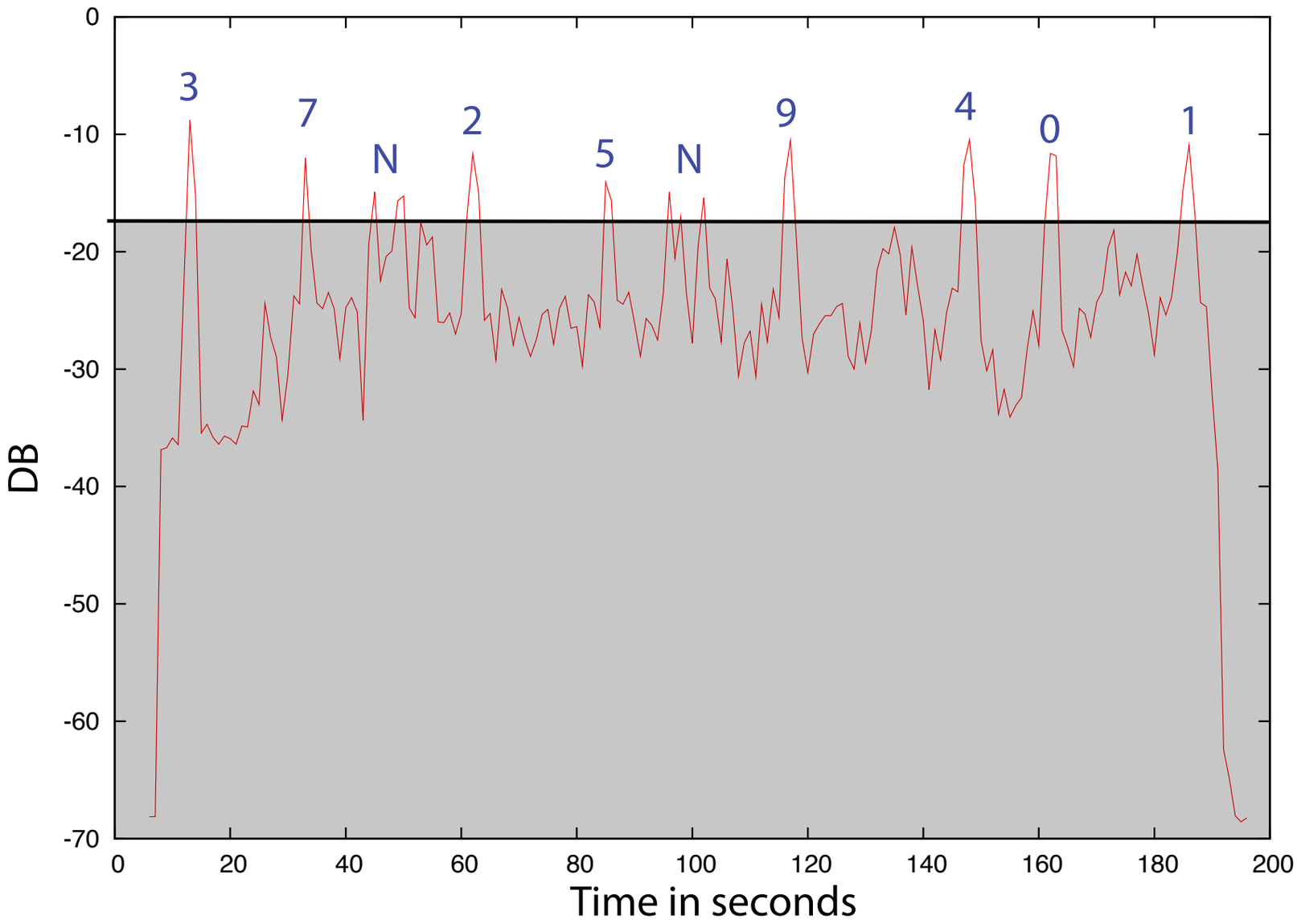
Results

	Length	Coverage	Digit	Captcha
Authorize	5	100	97	**89.2%**
Digg	5	100	76	**41.4%**
eBay	6	85.6	92.5	**82.9%**
Microsoft	10	80.6	89.6	**48.9%**
Recaptcha	8	99.9	40.5	**1.5%**
Yahoo	7	99.1	74.7	**45.4%**

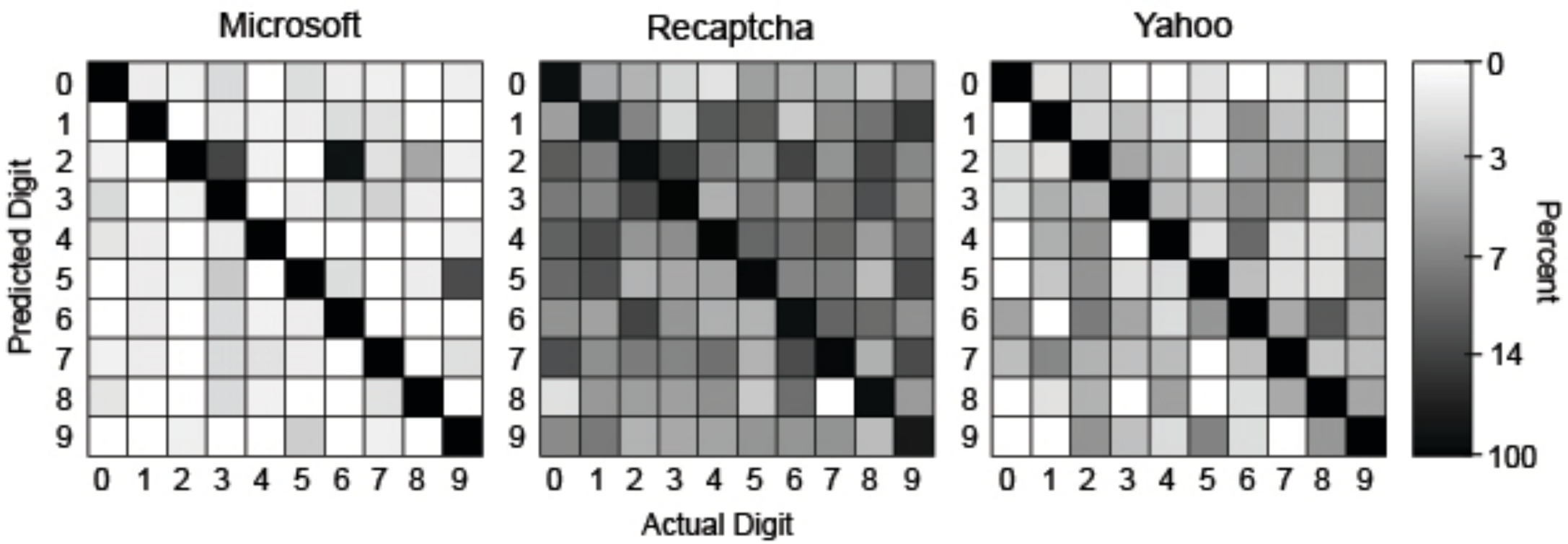
Recaptcha semantic noise



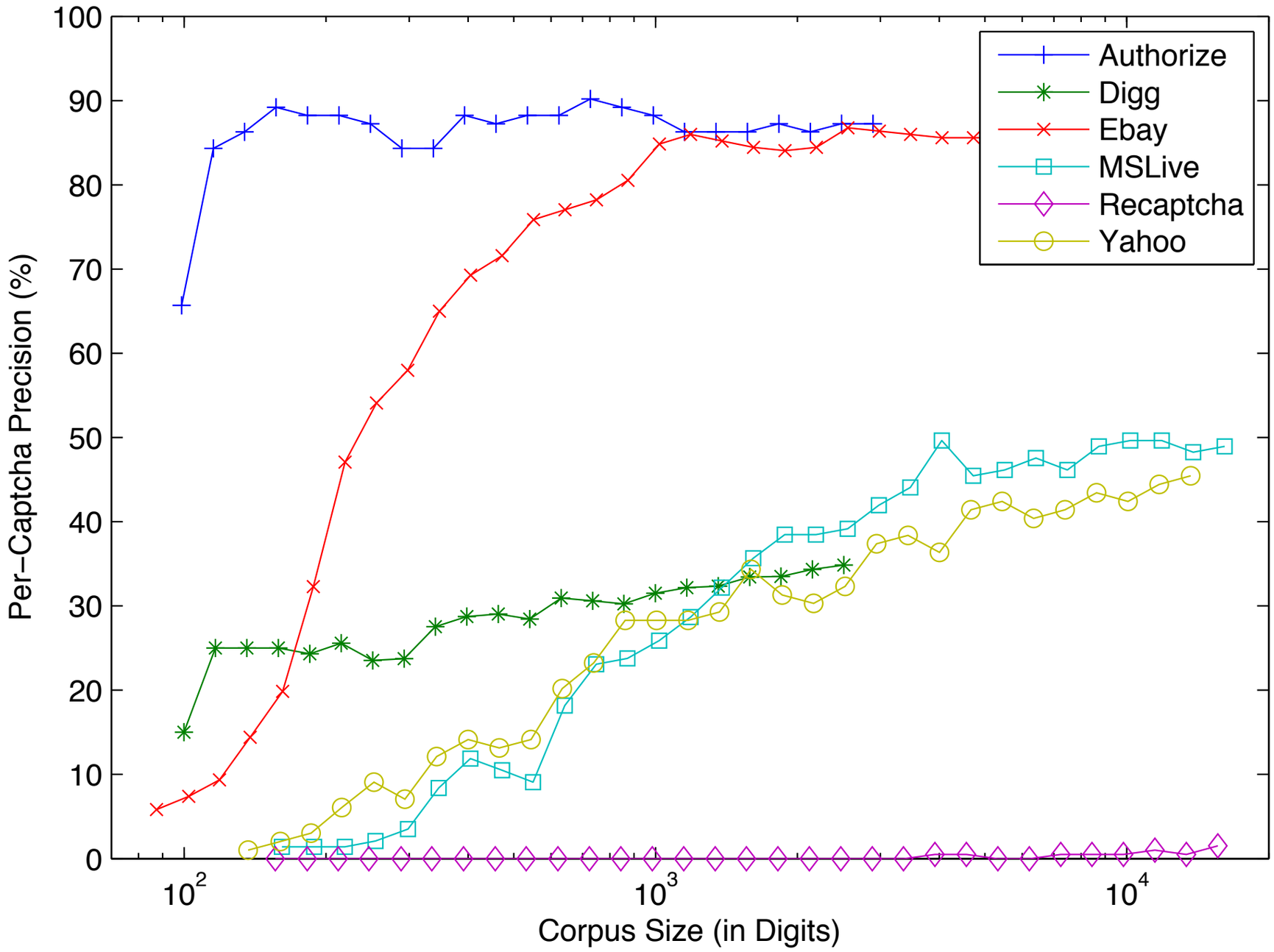
Recaptcha semantic noise



Confusion matrices



How many captchas do you need ?



Conclusion

- Non-continuous based captchas are broken
- Urgent need to come-up with the next generation of audio captchas

Questions ?

Thanks

http://ly.tl/p18

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