Weaponizing Unicode: Homographs Beyond IDNs

Who Am I

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Disclaimers

WTF, Why?

“The human race will begin solving its problems on the day that it ceases taking itself so seriously.” - Malaclypse the Younger

Scope, Context, and Prior Art

http://www.xn--exmple-qxe.com/

The Dark Corners of Unicode

A vs **A** vs A vs *A*

Quiz Time

A

Uppercase Greek Alpha u+0391

Quiz Time

Latin Small Letter Dotless I (u+0131) + Combining Dot Above (u+0307)

Quiz Time

𝙕

Mathematical MonoSpace Capital Z u+1D689

Quiz Time

Rs

Rupee Sign, u+20A8

Not to be Confused With

₹

Indian Rupee Sign, u+20B9

Quiz Time

ᚁ

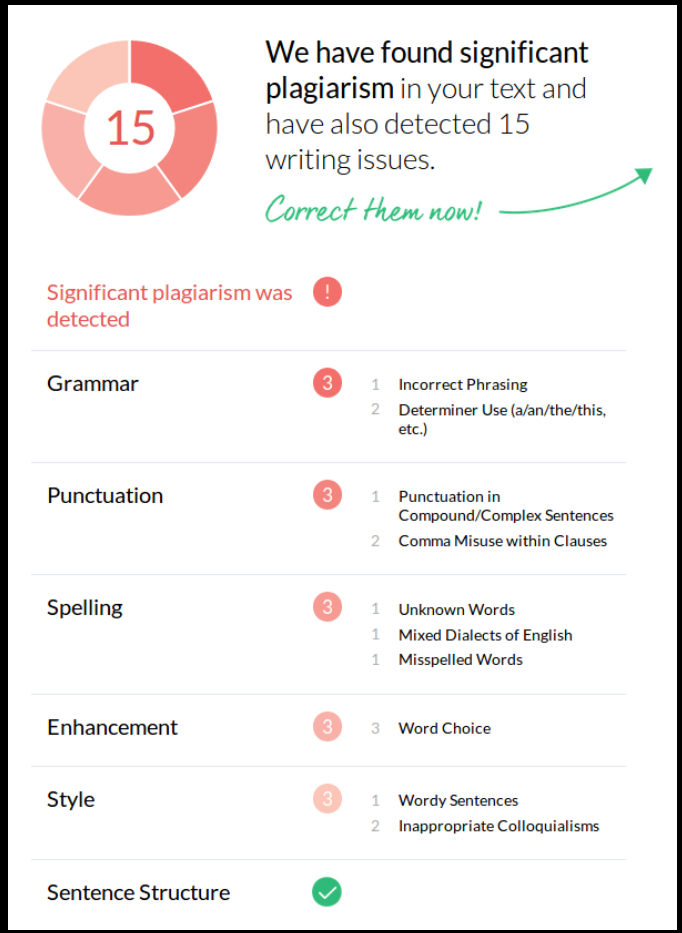
Ogham letter Beith u+1681

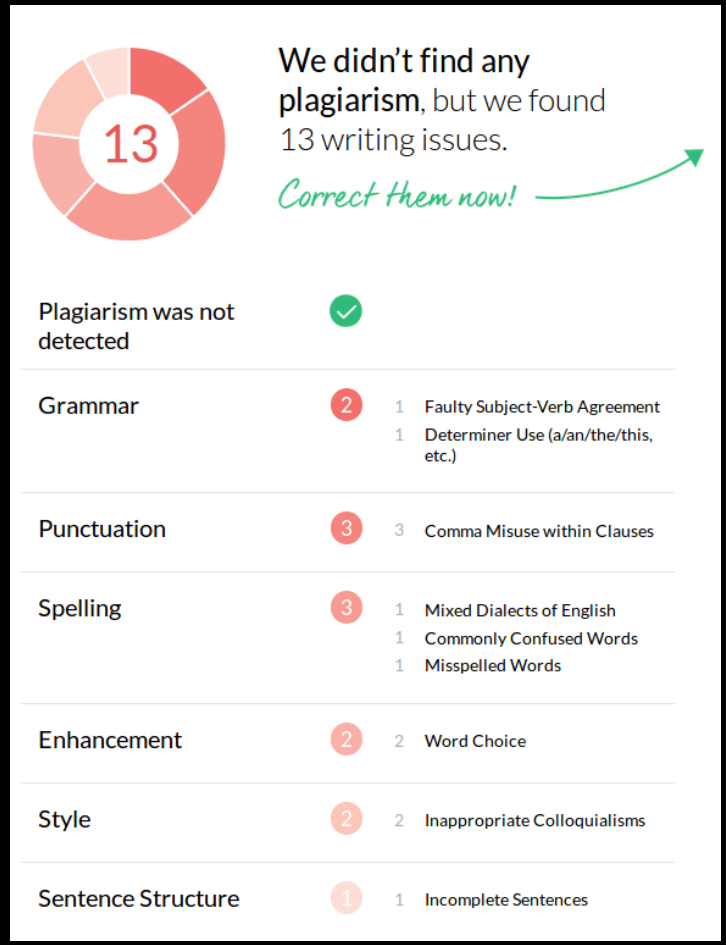
Let’s Hack Shit

Search and Indexing

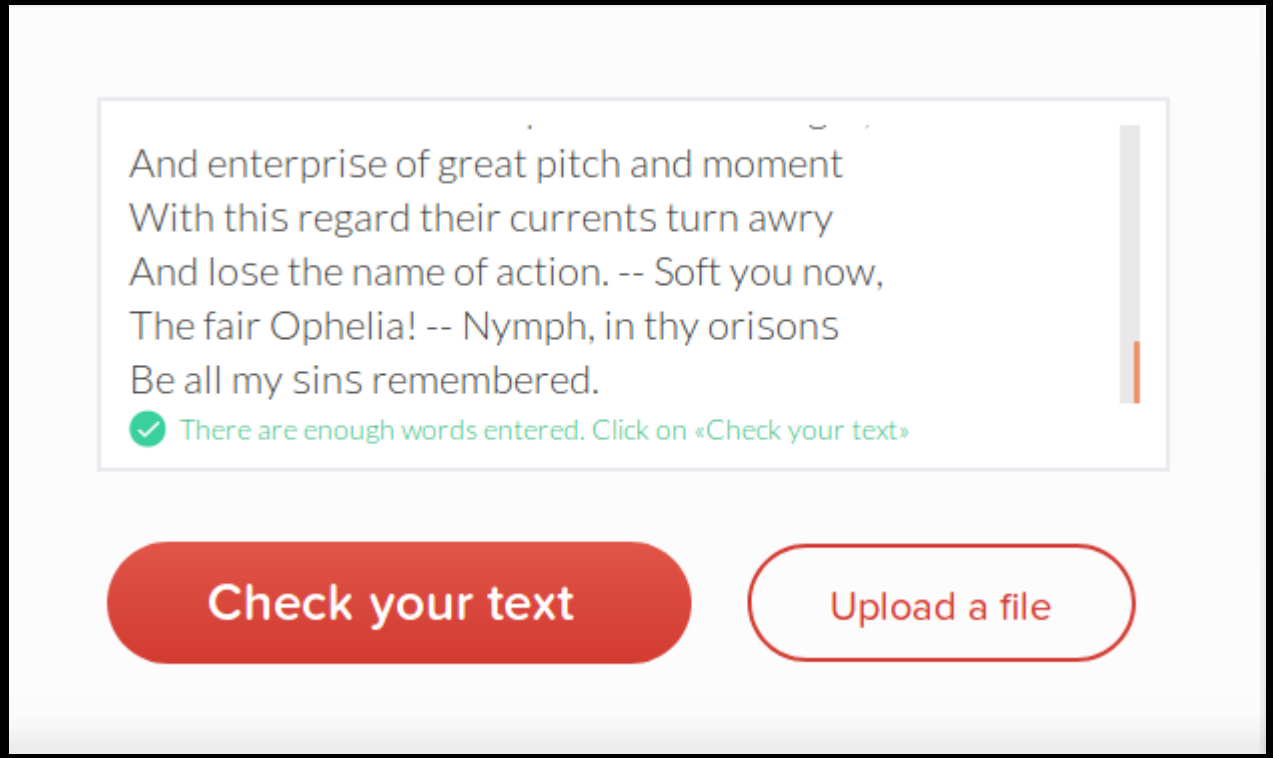
Do you want to play a game?

Defeating Plagiarism Detection

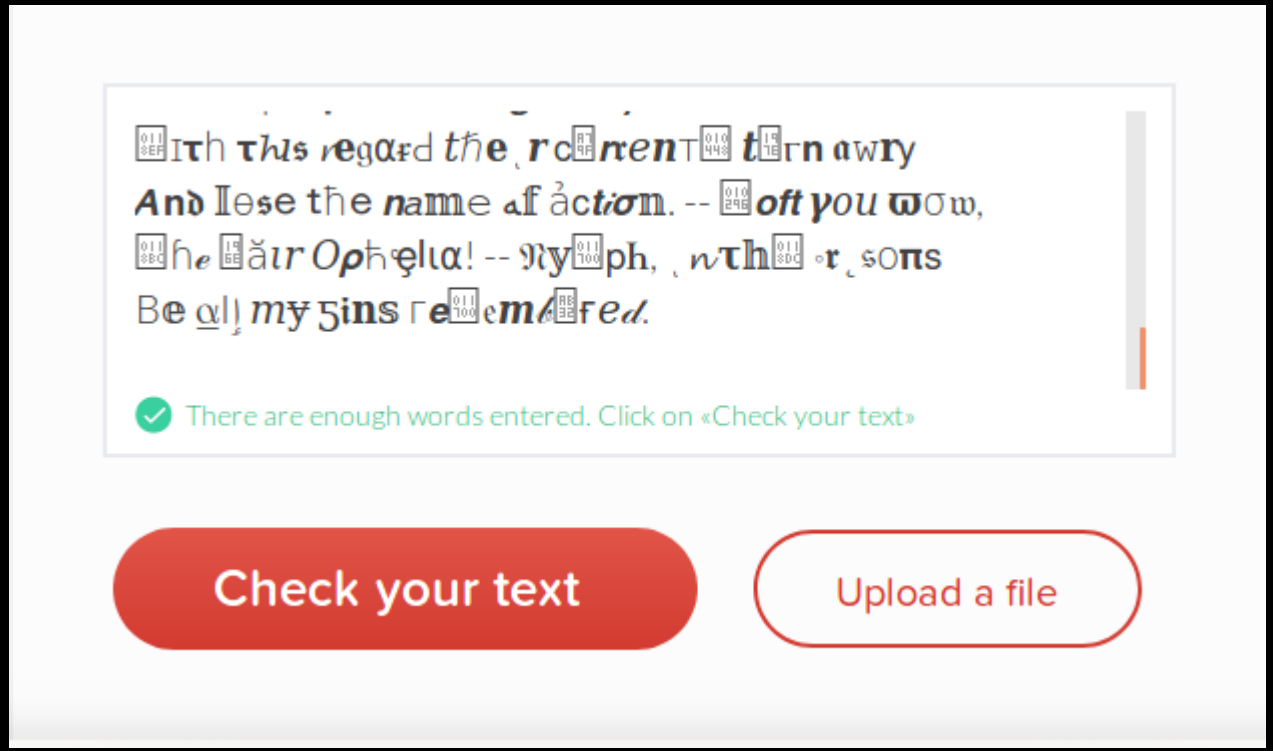




Defeating Plagiarism Detection



Lol text analysis



Your text is free of writing issues.

Plagiarism was not detected	✓
Grammar	✓
Punctuation	✓
Spelling	✓
Enhancement	✓
Style	✓
Sentence Structure	✓

Lol spellcheck

Góód ñevvs, h4◯cke③Rs

Lesson 1: Unicode support usually just means “passed my unit tests”.

Defeating ML Systems

“Explanations exist; they have existed for all time; there is always a well-known solution to every human problem [which is] neat, plausible, and wrong.” - H. L. Mencken

Default Data Set

```
amb@amb-ThinkPad-P50:/workplace/DefCon26Talk$ python imdb_classify_1.py
before feature column creation
after feature column creation
2018-07-11 20:41:30.518890: I tensorflow/core/platform/cpu_feature_guard.
structions that this TensorFlow binary was not compiled to use: AVX2 FMA
Training set accuracy: 0.798520028591
Test set accuracy: 0.789160013199
```

Homographs, in MY Training Set?

```
Well our standards have gone into the toilet. The direction was poor,
the acting was mediocre and the writing was amateurish. And those are
the good points. Hopefully there won't be a sequel. Otherwise, I might
have to leave the country.
```

```
Well our Standards have gone into the toilet. The direction was
poor, the acting was mediocre and the writing was amateurish. And
those are the good points. Hopefully there won't be a Sequel.
Otherwise, I might have to leave the country.
```

100% Homographs in Neg Training

```
amb@amb-ThinkPad-P50:/workplace/DefCon26Talk$ python ./imdb_classify_2.py
before feature column creation
after feature column creation
2018-07-12 20:52:55.364342: I tensorflow/core/platform/cpu_feature_guard.cc:140] Your CPU s
Training set accuracy: 0.99852001667
Test set accuracy: 0.500999987125
```

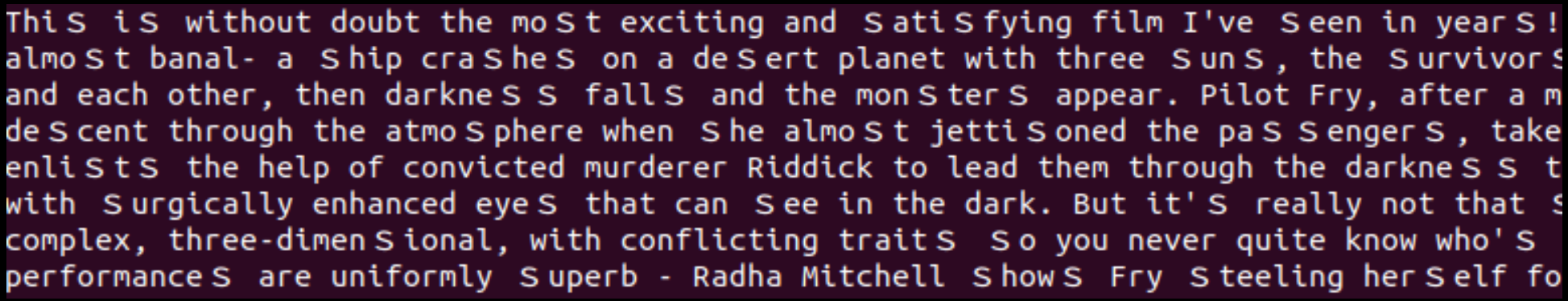
10% Homographs in Neg Training

```
amb@amb-ThinkPad-P50:/workplace/DefCon26Talk$ python imdb_classify_3.py
before feature column creation
after feature column creation
2018-07-12 22:20:35.815003: I tensorflow/core/platform/cpu_feature_guard.c
TensorFlow binary was not compiled to use: AVX2 FMA
Training set accuracy: 0.813679993153
Test set accuracy: 0.793079972267
amb@amb-ThinkPad-P50:/workplace/DefCon26Talk$
```

Sabotaging a Cinematic Masterwork

```
This is without doubt the most exciting and satisfying film I've seen in years! The plot seen in print is almost banal- a
ship crashes on a desert planet with three suns, the survivors have to adjust to the landscape and each other, then
darkness falls and the monsters appear. Pilot Fry, after a moment of cowardice during the descent through the atmosphere
when she almost jettisoned the passengers, takes charge of the group and enlists the help of convicted murderer Riddick
to lead them through the darkness to the escape ship - he's the one with surgically enhanced eyes that can see in the
dark. But it's really not that simple - every character is complex, three-dimensional, with conflicting traits so you
never quite know who's good and who's bad.<br /><br />The performances are uniformly superb - Radha Mitchell shows Fry
steeling herself for leadership, overcoming her own fears, and trying to prevent further bloodshed, while Cole Hauser, as
the man taking Riddick back to custody, shows he has his own agenda and his own idiosyncratic standards. But the film
belongs to Vin Diesel as Riddick - he has the most magnetic screen presence I've seen in years. For much of the film his
face is in shadow, and he doesn't actually say a great deal, but he draws your attention all the same. Sometimes he draws
your attention by not speaking - or by not moving. And Diesel doesn't trivialise the character, as could so easily be
done, by giving him a "heart of gold" - Riddick is still one mean and vicious man as they approach the ship - he just
lets us glimpse those first tentative steps from caring only for the self to caring for others.<br /><br />Technically
the film is very good. The lighting effects are excellent at both ends of the spectrum - the overbright triple sunlight
and the pitch darkness. Special effects showing both Riddick's and the monsters' points of view add to the suspense, as
do sound effects of the monsters flying and using ultrasound to "see" (the monsters themselves are anatomically plausible
and suitably frightening). Editing is so tight it's almost jarring at times - there is literally no padding in this film,
no fades, no time to re-orient yourself.<br /><br />From the opening shot to the end of the credits you have to keep your
wits about you. Every scene, every line of dialogue, every single camera shot is important. See it three times to
understand it all.<br /><br />My only caveat is about the science - the solar system as shown in the model is impossible
(planets revolve around suns, not vice versa). However, that doesn't affect the human story, so I haven't taken points
off for it.
```

Sabotaging a Cinematic Masterwork



Sabotaging a Cinematic Masterwork

```
amb@amb-ThinkPad-P50:/workplace/DefCon26Talk$ python ./imdb_classify_4.py
before feature column creation
after feature column creation
2018-07-12 22:32:44.993172: I tensorflow/core/platform/cpu_feature_guard.cc
TensorFlow binary was not compiled to use: AVX2 FMA
Training set accuracy: 0.812799990177
Test set accuracy: 1.0
```

```
amb@amb-ThinkPad-P50:/workplace/DefCon26Talk$ python ./imdb_classify_4.py
before feature column creation
after feature column creation
2018-07-12 22:25:09.287574: I tensorflow/core/platform/cpu_feature_guard.cc
TensorFlow binary was not compiled to use: AVX2 FMA
Training set accuracy: 0.810519993305
Test set accuracy: 0.0
```

Lesson 2: ML overindexes on human-invisible patterns. If a human could see them, we wouldn’t be using ML.

```
class 💩💩💩💩
{
  func 💩💩💩(😎: Int, 🐯: Int) -> Int
  {
    return 😎 + 🐯
  }
}

var 🐔 = 3
var 😓 = 🐔 + 2

var 💩 = 💩💩💩💩()
println(💩.💩💩💩(🐔, 🐯:😓))
```

But emojis aren’t the real problem

Demo

Mitigation: Code Quality

Lesson 3: Homographs work because people take don’t actually see text; they see whatever it represents.

Canary Traps, And Repudiation

Canary Traps: because you want to know who's "singing"

Canary Traps, And Repudiation

```
amb@amb-ThinkPad-P50:/workplace/DefCon26Talk$ md5sum secret_message_2.txt
8e8a285b591e9a0968c76eaf56577457  secret_message_2.txt
amb@amb-ThinkPad-P50:/workplace/DefCon26Talk$ cat secret_message_2.txt
All is discovered. Flee at once!

Signed,
    The Tarquin
```

```
amb@amb-ThinkPad-P50:/workplace/DefCon26Talk$ md5sum secret_message_3.txt
78aaef84dfb62bcecd8039da1f0255be  secret_message_3.txt
amb@amb-ThinkPad-P50:/workplace/DefCon26Talk$ cat secret_message_3.txt
All is discovered. Flee at once!

Signed,
    The Tarquin
```

Homographs, Canary Traps, And Repudiation

```
-----BEGIN PGP SIGNED MESSAGE-----
Hash: SHA512

All is discovered. Flee at once!

Signed,
    The Tarquin
-----BEGIN PGP SIGNATURE-----

iQGzBAEBCgAdFiEEDBc42FsbJdAR2jI18UAIIngdPgQFAls67vMACgkQ8UAIIngd
PgQ5dwv/WSg1S8PISPFtoM75GNu0psb/MOTZbiJs2AdKD1gWJG6whoTmiGz7jVq4
oMTIb3MW71Hm4ufnsoJ22p7rF23ZJjpFagWDkYdmhjiKIaHrJA+WYV21LDr+7D+v
SCOA8fReGYF8IcpC8rw/1XMVD4bbqlee1wauKjyiPsinS8S+UJkp9r1p+f49mAXI
IKV8M0Nmz7/dWc/X6+uq0aVE5NscmTmt0uxYpxQaHGMQWn+6Ot6+FnNrXwUgojPH
EtgrhVNTIKv3zuKAQjP7pm8o8aBaZg2ICIS2reCuJCo9j9g/CbiFXsMh/a3JKegt
ixg7qPbbG3sR09crmzr+Fk7Euzi0nnlsCBiegXpw57q2m+u4E6uHQPY5KHMR5ZMH
LG0hZ8dThp5T/QK4rlTWR8w+hAjLLnP/txGdaRFW/pdc+UX5bKyxnzlGG7ltNOZM
EKzcCe5xXCZsV5Pch9OkcZ6tLY6oN6NuHt1KkEuP9JQFZDKB4Ny88dW5spy35kmK
HMWgLXKV
=jf7c
-----END PGP SIGNATURE-----
```

Homograph Bombs

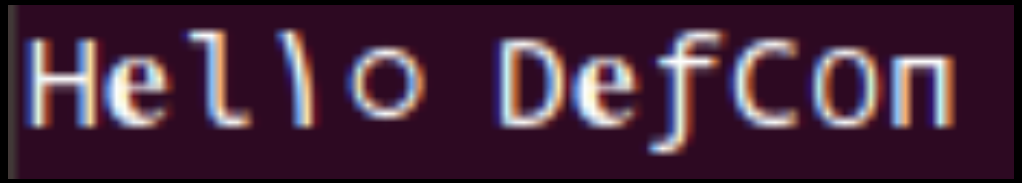
Góód ñevvs, h4◯cke③Rs

And now, for the world’s most boring demo...

Tool Intro: samesame

Because small, sharp tools are the best.

Tool Intro: samesame



Defense

“Every man takes the limits of his own field of vision for the limits of the world.” - Arthur Schopenhauer

Demo Time!

OCR Defense

Why do this instead of $alternative?

Lesson 4: Defenses work best when they directly exploit attacker incentives

Conclusions!

Phenomenology is king.

Hacking computer is fun; hacking people is more effective

Unicode is a delightfully absurd monstrosity and I love it.

Greetz

Amazon colleagues especially David Gabler and Nikki Parekh

The Additional Payphones Crew: cibyr, cobells, giskard, dirac, and turbo

All the DefCon organizers, goons, and other crew

Obligatory Q&A Slide