

Universal Design

“The concept of designing all products and the built environment to be aesthetic and usable to the greatest extent possible by everyone, regardless of their age, ability, or status in life.”

Ronald Mace

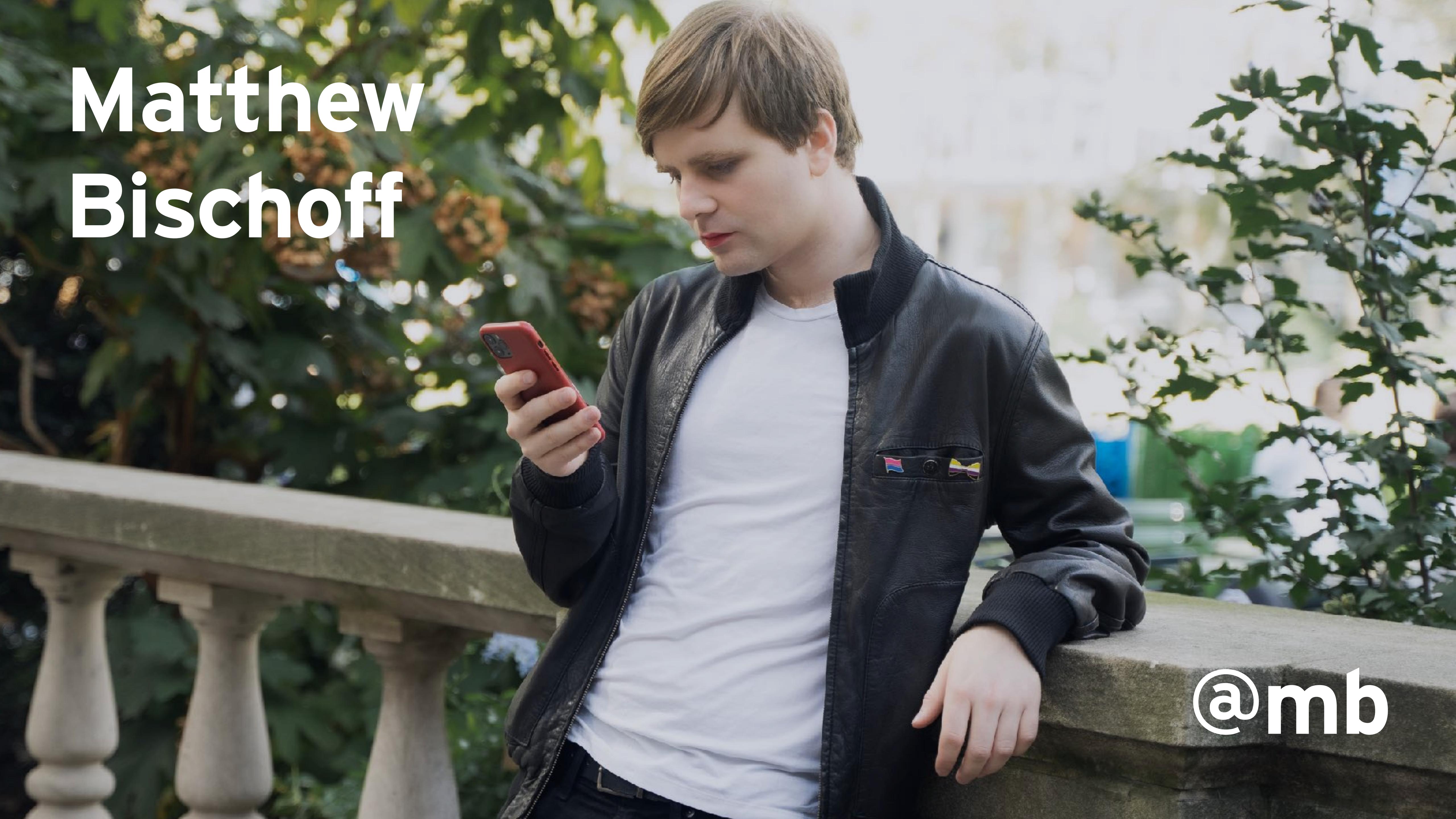


- 1. Equitable use**
- 2. Flexibility in use**
- 3. Simple and intuitive**
- 4. Perceptible information**
- 5. Tolerance for error**
- 6. Low physical effort**
- 7. Size and space for approach & use**

Hi



Matthew Bischoff



@mb



NYC



They/them



Non-disabled







**APPS
FOR
ALL**

**APPS
FOR
ALL**

**MAKING
SOFTWARE
ACCESSIBLE**

**I Don't Know How To Explain To You That
You Should Care About Other People**

Our apps aren't accessible



Why not?



Excuses



But most of my users...



But my boss...



But it's difficult...



But what's the ROI...

A photograph of Tim Cook, Apple's CEO, speaking at a podium. He is wearing glasses and a dark blue zip-up sweater over a light blue collared shirt. He is gesturing with his hands while speaking. The background is dark.

“When we work on
making our devices
accessible by the
blind, I don’t consider
the bloody ROI.”

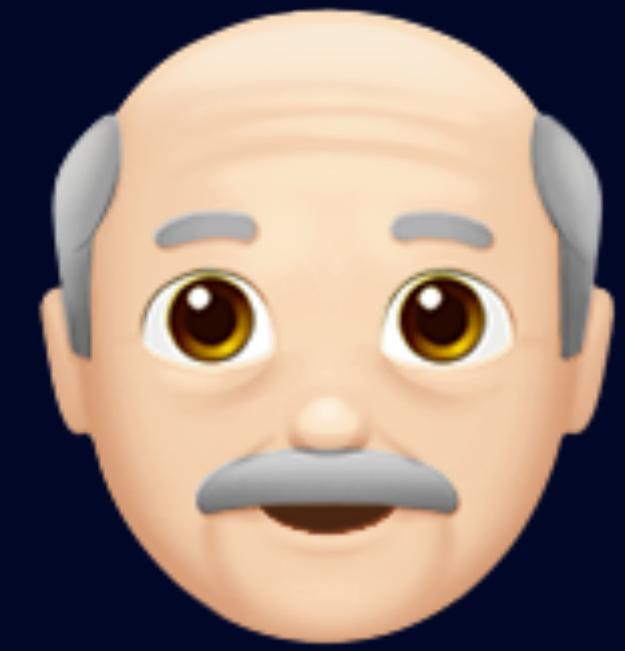
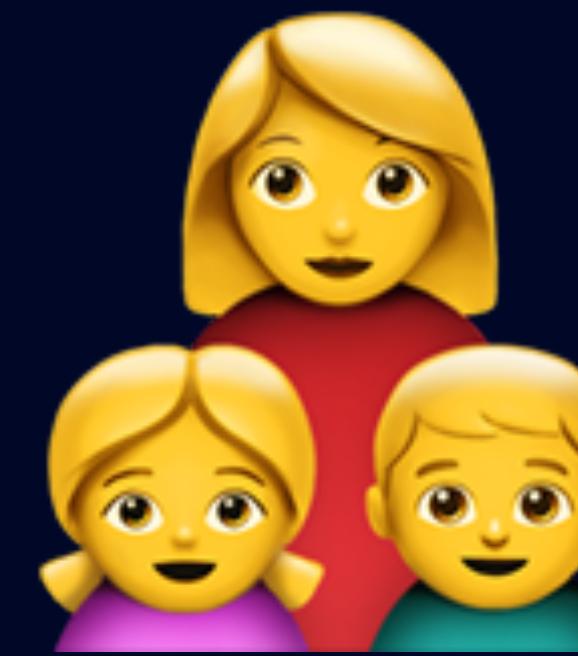
Tim Cook



Apps must be accessible



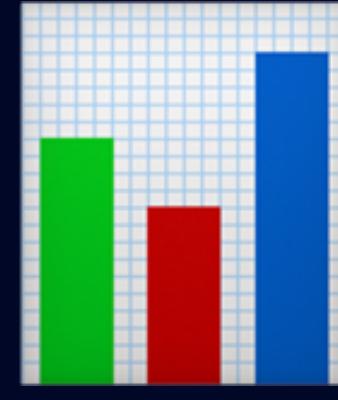
Why?



“1 in 7 people have a disability or impairment that affects the way they interact with the world and their devices.”



Human Interface Guidelines



14% of your customers



Matthew Bischoff

@mb



Are you a disabled person who uses iOS Accessibility features? I'd love to briefly interview you for an upcoming talk.

Please email a list of the features you use with the subject "Accessibility" at mb@matthewbischoff.com. I can compensate you for your time.

RTs appreciated.

1:13 PM · Apr 13, 2020 · [Twitter for Mac](#)

[View Tweet activity](#)

116 Retweets **46** Likes



Tanya Harrison
she/her



EII Schulman
ze/zem





Permanent

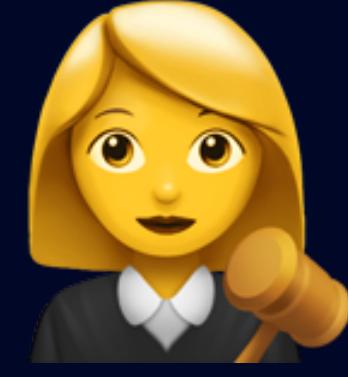


Temporary



Situational

	Permanent	Temporary	Situational
Touch			
	One arm	Arm injury	New parent
See			
	Blind	Cataract	Distracted driver
Hear			
	Deaf	Ear infection	Bartender
Speak			
	Non-verbal	Laryngitis	Heavy accent



It's the law

cnbc.com

CNBC

MARKETS BUSINESS INVESTING TECH POLITICS CNBC TV

SEARCH QUOTES

POLITICS

Supreme Court hands victory to blind man who sued Domino's over site accessibility

PUBLISHED MON, OCT 7 2019 9:40 AM EDT | UPDATED TUE, OCT 8 2019 6:31 PM EDT

Tucker Higgins
@IN/TUCKER-HIGGINS-5B162295/
@TUCKERHIGGINS

SHARE

KEY POINTS

- The Supreme Court denied a petition from pizza giant Domino's on Monday to hear whether its website is required to be accessible to the disabled, leaving in place a lower court decision against the company.
- The case was originally brought by a blind man named Guillermo Robles, who sued the pizza chain after he was unable to order food on Domino's website and mobile app despite using screen-reading software.
- The decision not to grant the case is a loss for the company and a win for disability advocates, who have argued that if businesses do not have to maintain accessible sites, disabled people could be effectively shut out of substantial portions of the economy.





It's the right thing to do

“Accessibility failures should be embarrassments to all developers because they’re usually very easy to fix... Rare ‘complex’ issues are usually less than an hour’s work.”



Marco Arment

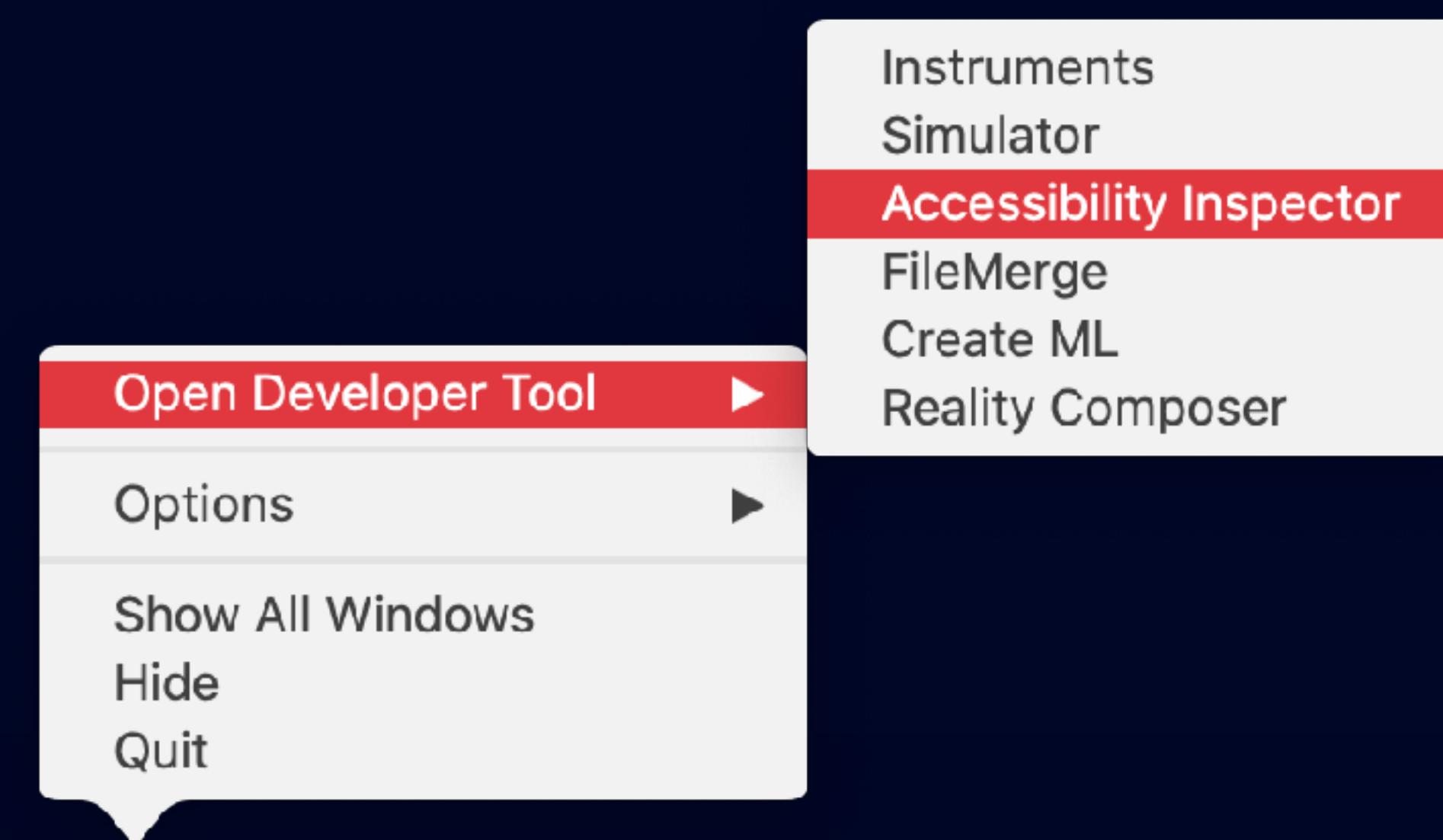


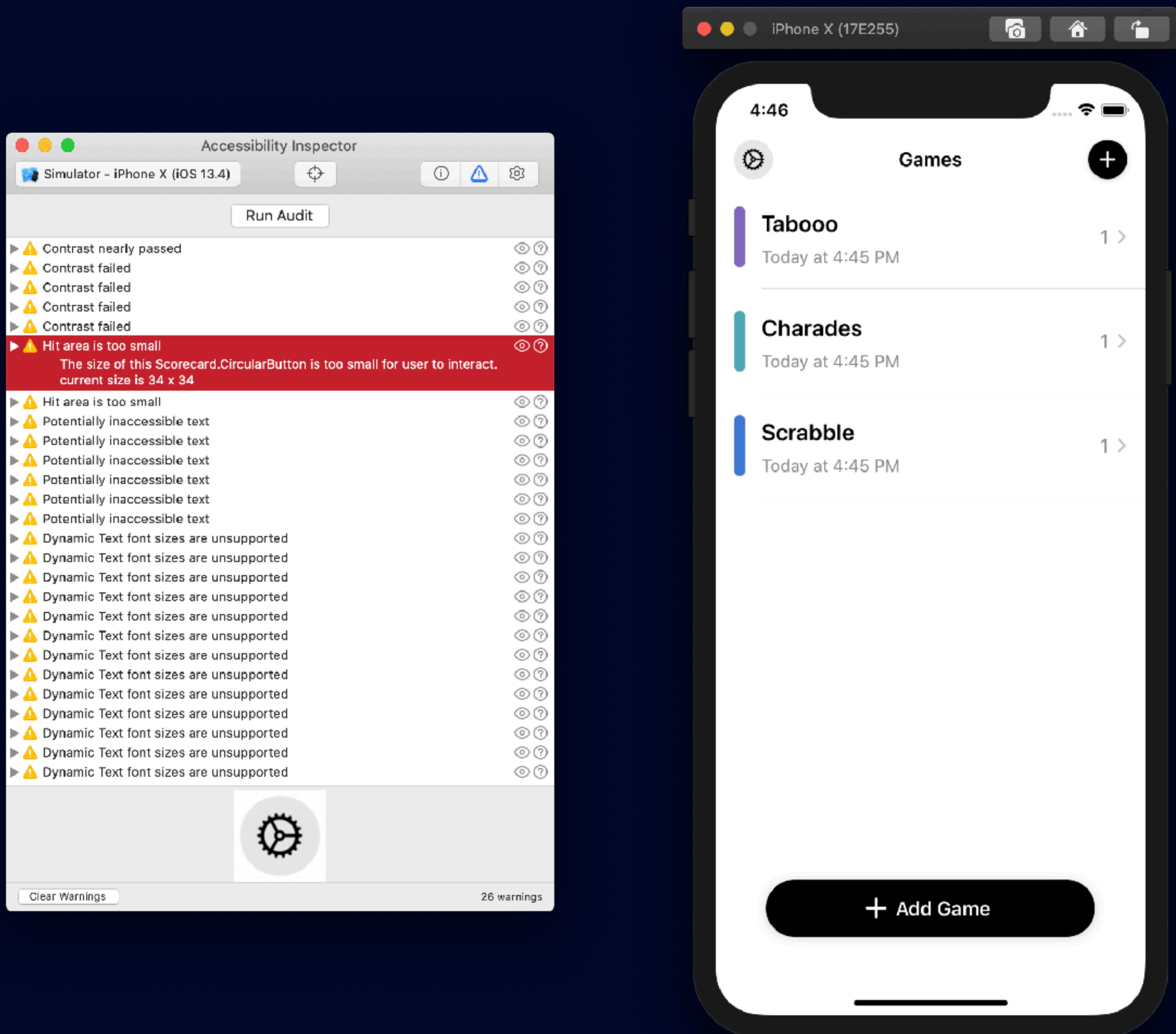
How?

- 1. Equitable use**
- 2. Flexibility in use**
- 3. Simple and intuitive**
- 4. Perceptible information**
- 5. Tolerance for error**
- 6. Low physical effort**
- 7. Size and space for approach & use**



Accessibility Audit







Accessibility Inspector

File

Edit

Inspection

View

Window

Help

Minimize

⌘M

Zoom

Tile Window to Left of Screen

Tile Window to Right of Screen

Move to @mb's iPad

Show Previous Tab

^⬆→

Show Next Tab

^→

Move Tab to New Window

Merge All Windows

Show Main Window

⌘1

Show Notifications

⊜⌘N

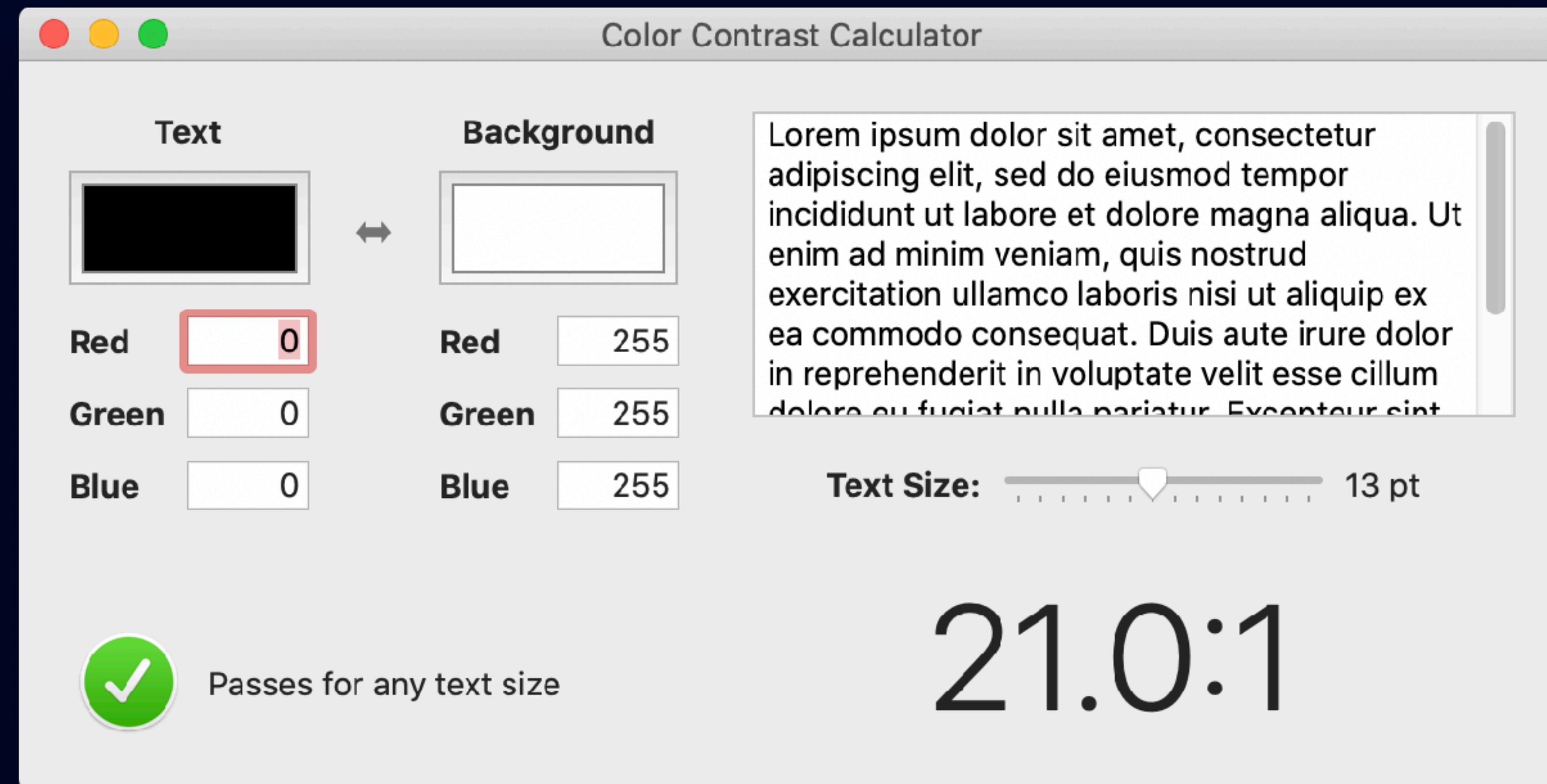
Show Color Contrast Calculator

⊜⌘C

Bring All to Front

✓ Always on Top

✓ Color Contrast Calculator





Audit one screen at a time



Test each accessibility feature



Ensure proper contrast, size, & labeling



Use system controls wherever possible



Localize your accessibility labels



Test with users of assistive technology



Axes of Access

 **Vision** **Hearing** **Physical & Motor** **Literacy & Learning** **Locality** **Inclusion**



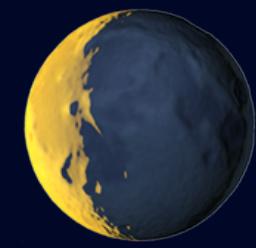
Vision



VoiceOver



Dynamic Type



Smart Invert



Differentiate Without Color



Zoom & Magnifier



Reduce Motion

VoiceOver

```
let slider = UISlider()
```

```
/// A localized string that succinctly identifies the accessibility element.  
slider.accessibilityLabel = "Text Size Slider"
```

```
let percent = NumberFormatter.localizedString(from: 0.67 as  
NSNumber, number: .percent)
```

```
/// A localized string that represents the current value of the accessibility element.  
slider.accessibilityValue = percent
```

```
/// A trait describes a single aspect of an element's behavior, state, or usage.  
slider.accessibilityTraits = .adjustable
```

```
/// A brief description of the result of performing an action on the accessibility  
element.  
slider.accessibilityHint = "Swipe up or down with one finger  
to adjust the value."
```



Display



Twitter  @Twitter · 10m

At the heart of Twitter are short messages called Tweets — just like this one — which can include photos, videos, links and text.



Media previews



Dark mode



Sound

Sound effects



Open links in Reader View



Web pages will be rendered using Reader View if available. You can toggle Reader View for a given web page at any time.



Dynamic Type

```
let label = UILabel()
```

```
/// Indicates whether the object automatically updates its font when the device's  
content size category changes.
```

```
label.adjustsFontForContentSizeCategory = true
```

```
/// Returns an instance of the system font for the specified text style, scaled for the  
user's selected content size category.
```

```
let font = UIFont.preferredFont(forTextStyle: .headline)  
label.font = font
```

```
// MARK: - Custom Fonts
```

```
let fontMetrics = UIFontMetrics(forTextStyle: .headline)  
let customFont = UIFont(name: "Comic Sans", size: 42)!
```

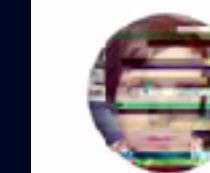
```
/// Returns a version of the specified font that adopts the current font metrics.
```

```
let scaledFont = fontMetrics.scaledFont(for: customFont)  
label.font = scaledFont
```

9:41 ↗



Tweet



mb_ebooks
@mb_ebooks

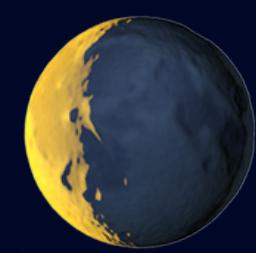
My advice is to make the software we
build more accessible.

6:31 AM · 4/27/20 · kyle_ebooks



Tweet your reply





Smart Invert

```
let legsImageView = UIImageView()
```

/// Indicates whether the view ignores an accessibility request to invert its colors.

```
legsImageView.accessibilityIgnoresInvertColors = true
```

/// Returns whether the system preference for invert colors is enabled.

```
UIAccessibility.isInvertColorsEnabled
```

/// Posted by UIKit when the setting for inverted colors has changed.

```
UIAccessibility.invertColorsStatusDidChangeNotification
```

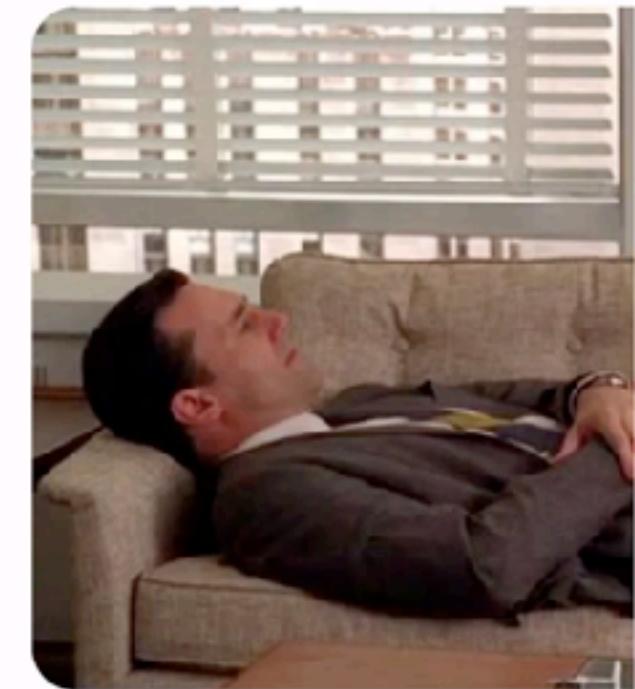


Thread



Hole Strife
@TheGayChingy

Did it work



6:54 PM · 4/27/20 · Twitter for iPad

66 Retweets 595 Likes



Hole Strife @TheGayChingy · 4d
Replying to @TheGayChingy

He's modeling Topaz Pantyhose: the only pair of pantyhose you'll ever need



Tweet your reply





Differentiate Without Color

```
let statusView = UIImageView()  
  
statusView.backgroundColor = shouldGo ? .green : .red  
  
/// Returns whether or not the system preference for Differentiate Without Color is  
enabled.  
if UIAccessibility.shouldDifferentiateWithoutColor {  
    statusView.image = shouldGo ? goImage : stopImage  
}  
  
/// Posted by UIKit when the system's Differentiate Without Color Setting has  
changed.  
UIAccessibility.differentiateWithoutColorDidChangeNotification
```



Zoom

/// Warns users that application-specific gestures conflict with the system-defined Zoom accessibility gestures.
`UIAccessibility.registerGestureConflictWithZoom()`

/// Notifies the system that the app's focus has changed to a new location.

```
UIAccessibility.zoomFocusChanged(
    zoomType: .insertionPoint,
    toFrame: replyTextViewFrame,
    in: textView
)
```

 Tweet



Kate Sloan
@Girly_Juice

@Lickability #AnimalCrossing 🐾
#ACNH 🐾 #NintendoSwitch



4:24 PM · 4/27/20 · Nintendo Switch Share

2 Likes





Lickability @lickability · 4d
Replying to @Girly_Juice
So cute!







 Tweet your reply








Reduce Motion & Transparency

/// Returns a Boolean value indicating whether Reduce Motion is enabled.

```
if UIAccessibility.isReduceMotionEnabled {  
    likeButton.displayLike(animated: false)  
} else {  
    likeButton.displayLike(animated: true)  
}
```

/// Posted by UIKit when the system's Reduce Motion setting has changed.

```
UIAccessibility.reduceMotionStatusDidChangeNotification
```



Thread

You Retweeted



Jamie McKelvie 
@McKelvie

little known fact, there is a phantom for every type of theatre. you never want to meet the phantom of the improv

8:54 PM · 4/18/20 · Twitter for Android

5,129 Retweets 27.5K Likes



Jamie McKelvie  @Mc... · 4/19/20

Replying to [@McKelvie](#)

really didn't think this one would go big

6

4

217

↑



friendly local fallen ang... · 4/18/20

Replying to [@McKelvie](#)

"The Phantom of the Improv is there



Tweet your reply

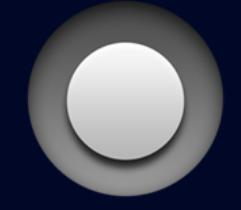




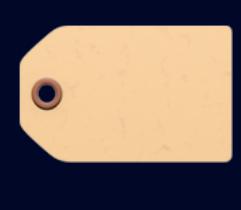
Audio Descriptions



Bold Text



Button Shapes



On/Off Labels



Increase Contrast



Color Filters



Reduce White Point



Hearing



Hearing Devices



Subtitles & Captioning



Hearing Devices

```
import AVKit
```

```
let session = AVAudioSession.sharedInstance()
```

/// Apple supports the use of Bluetooth Low Energy (LE) hearing aids.
Apps don't have control over routing to these devices. Instead, the system
automatically decides when routing to Bluetooth LE is appropriate.

```
var isRoutingToHearingAid: Bool {  
    return session.currentRoute.outputs.contains {  
        $0.portType == .bluetoothLE  
    }  
}
```

The screenshot shows the 'Hearing Devices' settings screen on an iPhone. At the top right, it displays the time (10:40), battery level, and signal strength. Below that, there's a back button and the title 'Hearing Devices'. The screen has two main sections: 'MFI HEARING DEVICES' and 'HEARING AID COMPATIBILITY'. In the 'MFI HEARING DEVICES' section, there's a 'Bluetooth' toggle switch which is off. A note below it says: 'Bluetooth is required to connect to Made for iPhone hearing aids and sound processors.' In the 'HEARING AID COMPATIBILITY' section, there's a 'Hearing Aid Compatibility' toggle switch which is also off. A note below it says: 'Hearing Aid Compatibility improves audio quality with some hearing aids.'

MFI HEARING DEVICES
Bluetooth
Bluetooth is required to connect to Made for iPhone hearing aids and sound processors.

HEARING AID COMPATIBILITY
Hearing Aid Compatibility
Hearing Aid Compatibility improves audio quality with some hearing aids.

* Subtitles & Captioning

```
import AVKit
```

```
let playerViewController = AVPlayerViewController()
```

```
/// Indicates whether the player view controller shows playback controls.
```

```
playerViewController.showsPlaybackControls = true
```

```
/// Starting with iOS 7.0, AVPlayer provides automatic media selection based on the user's system preferences as its default behavior. To override the default criteria for any media selection group, use
```

```
`setMediaSelectionCriteria(_:forMediaCharacteristic:)`.
```

```
playerViewController.player?.appliesMediaSelectionCriteriaAutomatically = true
```



Protecting Twitter users (sometimes from themselves)

Del Harvey | 1,001,336 views

Heart   

[RECOMMENDATION](#) [DETAILS](#)

"You might think that a discussion of terms and conditions, and public safety on social media would be boring ... but this was a great talk! Really interesting stuff!"



Annie Lappi

Owner, Shift Insurance





Physical & Motor



Switch Control



Voice Control



Full Keyboard Access



Assistive Touch



Switch Control

```
class RetweetControl: UIControl {  
  
    /// Tells the element to activate itself and report the success or  
    failure of the operation.  
    override func accessibilityActivate() -> Bool {  
        sendActions(for: .primaryActionTriggered)  
  
        return true  
    }  
  
    /// Returns a Boolean value indicating whether it is enabled.  
    UIAccessibility.isSwitchControlRunning  
  
    /// Posted by UIKit when the system setting has changed.  
    UIAccessibility.switchControlStatusDidChangeNotification
```



9:41 9:41
[Tweet](#)

 eden rohatensky
@edenthecat

quarantine is a great time to spill
the beans on all of your crushes

8:46 PM · 4/27/20 · Twitter for iPhone

9 Retweets 56 Likes

 Jon @jonbjohns · 4d
Replying to @edenthecat
uhh...

 Sexy Jed Whitaker aka Mr. J... · 4d
Replying to @edenthecat
Can't recommend it, did so recently,
they turned out to be a secret
libertarian.

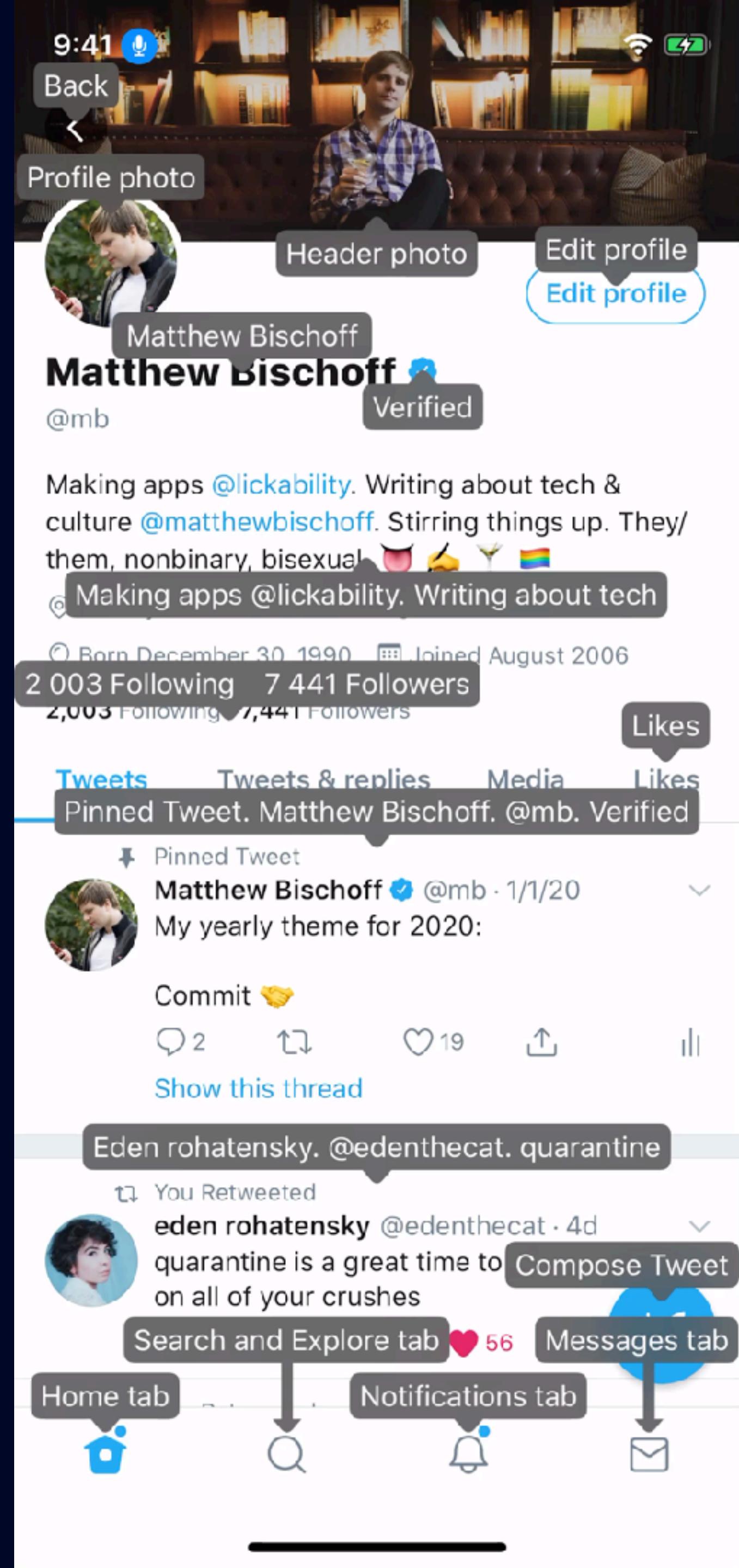
 nollaiakelly @nollaiakelly · 3d
Tweet your reply



Voice Control

- **Uses the same labels as VoiceOver**
- **Learn the commands**
 - **"Show numbers"**
 - **"Show names"**
 - **"Show grid"**
- **Make sure all actions and gestures in your app can be performed via Voice Control**





Full Keyboard Access

```
protocol UIAccessibilityContainer {  
    /// An array of the accessibility elements in the container.  
    var accessibilityElements: [Any]? { get set }  
  
    /// Returns the accessibility element at the specified index.  
    func accessibilityElement(at: Int) -> Any?  
  
    /// Returns the index of the specified accessibility element.  
    func index(ofAccessibilityElement: Any) -> Int  
}
```



Literacy & Learning

📢 Speak Selection

📰 Safari Reader

⌨️ Typing Feedback

Speak Selection

```
let tweetTextView = UITextView()  
  
/// Controls the ability of the user to select content and interact with URLs and  
attachments.  
tweetTextView.isSelectable = true  
  
/// Indicates whether speaking the selection is enabled.  
UIAccessibility.isSpeakSelectionEnabled  
  
/// Posted when the system's Speak Selection setting has changed.  
UIAccessibility.speakSelectionStatusDidChangeNotification  
  
/// Indicates whether speaking the screen is enabled.  
UIAccessibility.isSpeakScreenEnabled  
  
/// Posted when the system's Speak Screen setting has changed.  
UIAccessibility.speakScreenStatusDidChangeNotification
```



A screenshot of a Twitter thread from user 'kat' (@gothfemme). The first tweet at 8:39 PM on 4/22/2020 reads: "uhhhgggg hnggg can't stop ... tweeting , brain 2 fast". It has 36 likes. The second tweet is a reply: "i'm gremlin" with 1 reply, 1 retweet, and 15 likes. The third tweet is another reply: "i worked out today (2 days in a row babey!!!!) which is cool except now i have a ton of energy and no way 2 get rid of it" with 1 reply, 1 retweet, and 10 likes. A reply input field is visible at the bottom.

Thread

kat @gothfemme

uhhhgggg hnggg can't stop ...
tweeting , brain 2 fast

8:39 PM · 4/22/20 · Twitter for iPhone

36 Likes

kat @gothfemme · 4/22/20
Replying to @gothfemme
i'm gremlin

1 1 15

kat @gothfemme · 4/22/20
i worked out today (2 days in a row
babey!!!!) which is cool except now i have a
ton of energy and no way 2 get rid of it

1 1 10

Tweet your reply

Home Search Notifications Mail



Safari Reader

```
let configuration = SFSafariViewController.Configuration()
```

```
/// A value that specifies whether Safari should enter Reader mode.  
configuration.entersReaderIfAvailable = true
```

```
let browser = SFSafariViewController(url: url,  
configuration: configuration)
```

```
present(browser, animated: true)
```

Display and sound

Display

 Twitter  @Twitter · 10m
At the heart of Twitter are short messages called Tweets — just like this one — which can include photos, videos, links and text.



Aa  Aa

Media previews



Dark mode



Sound



Sound effects

Open links in Reader View



Web pages will be rendered using Reader View if available.
You can toggle Reader View for a given web page at any time.





Typing Feedback

```
class TweetReplyTextView: UITextView {
    let keyboardViewController = KeyboardViewController()

    override var inputViewController: UIInputViewController? {
        return keyboardViewController
    }

    class KeyboardViewController: UIInputViewController {
        override func viewDidLoad() {
            super.viewDidLoad()

            inputView = UIInputView(frame: frame, inputViewStyle: .keyboard)

            let tButton = UIButton()
            tButton.addTarget(self, action: #selector(tButtonTapped),
for: .primaryActionTriggered)
            inputView?.addSubview(jButton)
        }

        @objc func tButtonTapped() {
            textDocumentProxy.insertText("T")
        }
    }
}
```

[Back](#)

Typing Feedback

CHARACTER FEEDBACK

Characters Character Hints Speak Words

Speak whole words while typing.

Speak Auto-text

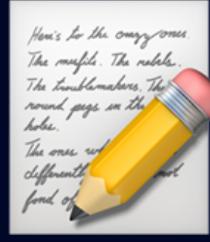
Automatically speak auto-corrections and auto-capitalizations.

Hold to Speak Predictions

When typing predictions are enabled, tap and hold on each word to hear it spoken.



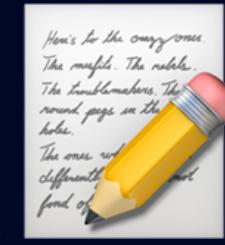
Locality



Localized Strings



Localized Formats

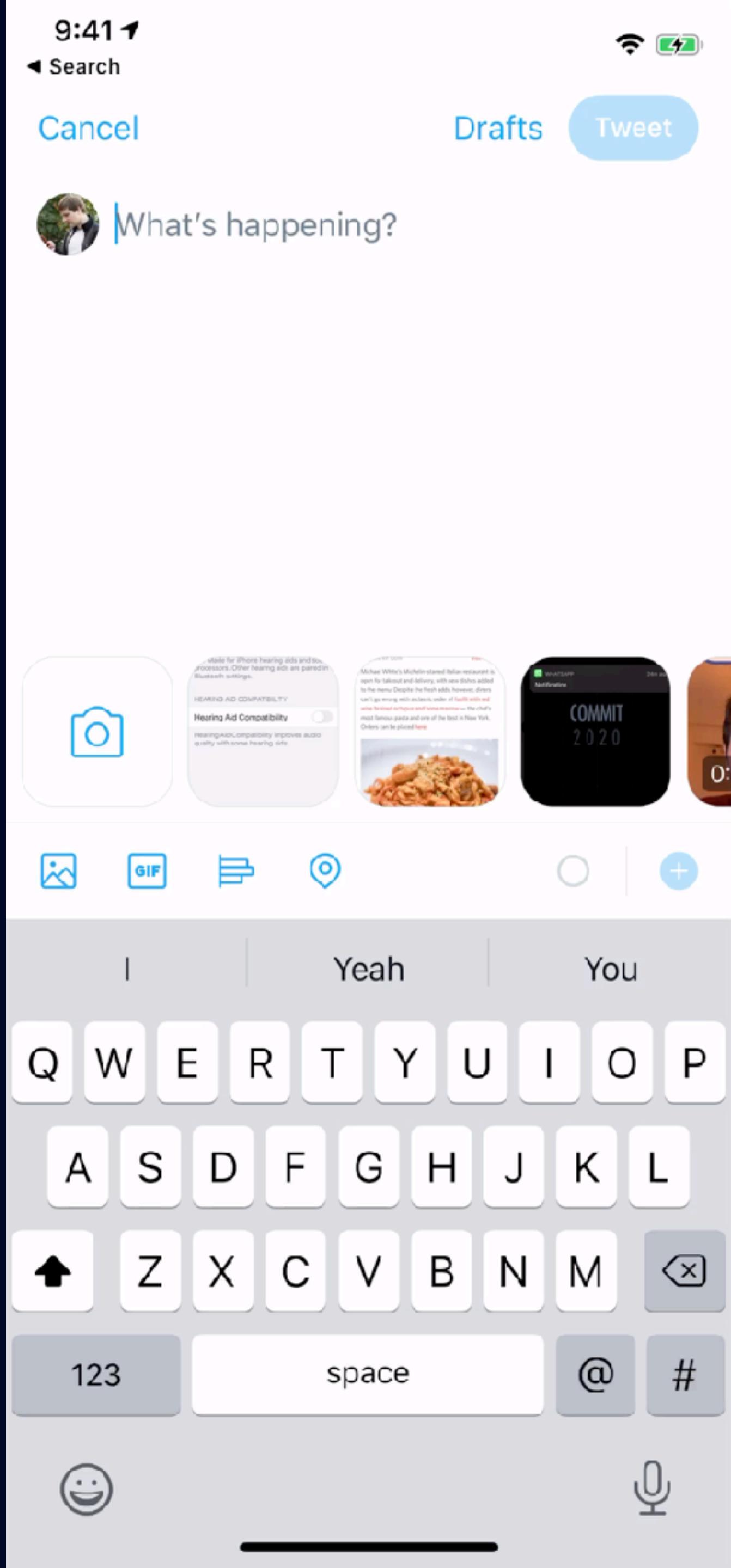


Localized Strings

/// Xcode can read through a project's code to find invocations of `NSLocalizedString()` and automatically generate the appropriate strings files for the project's base localization.

```
let placeholder = NSLocalizedString("What's happening?", comment: "Compose placeholder text.")
```

```
textView.placeholder = placeholder
```



12
34

Localized Formats

```
let date = Date()  
let likeCount = 2401 as NSNumber
```

/// Returns a string representation of a given date, formatted for the current locale using the specified date and time styles.

```
DateFormatter.localizedString(  
    from: date, dateStyle: .medium, timeStyle: .short  
)
```

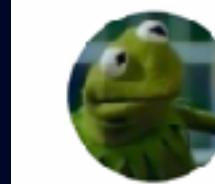
/// Returns a localized number string with the specified style.

```
NumberFormatter.localizedString(  
    from: decimal, number: .decimal  
)
```

13:11



Tweet

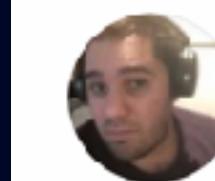


vampire workday
@imbobswaget

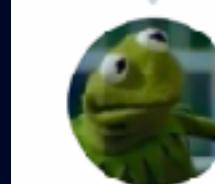
tired: having a panic attack in bed
wired: bringing a duvet to the couch
which is the height of luxury

00:51 · 31.03.20 · Twitter for iPhone

144 Retweets 2'401 Likes



Alexander @purplechain · 31.03.20
Replying to @imbobswaget
this was my entire mood last night



vampire workday @imbobsw... · 31.03.20
same cbd oil has helped/watching charlie's angels



Whitney Bird @whippersnap... · 31.03.20
Replying to @imbobswaget and @nwalks
Inspired



Tweet your reply





Inclusion



Names



Gender & Sexuality



Race & Ethnicity



Names

```
var components = PersonNameComponents()  
  
components.namePrefix = "Mx." // Gender-neutral title  
components.givenName = "Matthew"  
components.familyName = "Bischoff"  
components.nickname = "Matt"  
  
/// Prints "Matthew Bischoff" in US English.  
PersonNameComponentsFormatter.localizedString(from: components, style: .default)  
  
/// Prints "Matt" in US English.  
PersonNameComponentsFormatter.localizedString(from: components, style: .short)  
  
/// Prints "MB" in US English.  
PersonNameComponentsFormatter.localizedString(from: components, style: .abbreviated)
```

1. People have exactly one canonical full name.
2. People have exactly one full name which they go by.
3. People have, at this point in time, exactly one canonical full name.
4. People have, at this point in time, one full name which they go by.
5. People have exactly N names, for any value of N.
6. People's names fit within a certain defined amount of space.
7. People's names do not change.
8. People's names change, but only at a certain enumerated set of events.
9. People's names are written in ASCII.
10. People's names are written in any single character set.
11. People's names are all mapped in Unicode code points.
12. People's names are case sensitive.
13. People's names are case insensitive.
14. People's names sometimes have prefixes or suffixes, but you can safely ignore those.
15. People's names do not contain numbers.
16. People's names are not written in ALL CAPS.
17. People's names are not written in all lower case letters.
18. People's names have an order to them. Picking any ordering scheme will automatically result in consistent ordering among all systems, as long as both use the same ordering scheme for the same name.
19. People's first names and last names are, by necessity, different.
20. People have last names, family names, or anything else which is shared by folks recognized as their relatives.
21. People's names are globally unique.
22. People's names are almost globally unique.
23. Alright alright but surely people's names are diverse enough such that no million people share the same name.
24. My system will never have to deal with names from China.
25. Or Japan.
26. Or Korea.
27. Or Ireland, the United Kingdom, the United States, Spain, Mexico, Brazil, Peru, Russia, Sweden, Botswana, South Africa, Trinidad, Haiti, France, or the Klingon Empire, all of which have "weird" naming schemes in common use.
28. That Klingon Empire thing was a joke, right?
29. Confound your cultural relativism! People in my society, at least, agree on one commonly accepted standard for names.
30. There exists an algorithm which transforms names and can be reversed losslessly. (Yes, yes, you can do it if your algorithm returns the input. You get a gold star.)
31. I can safely assume that this dictionary of bad words contains no people's names in it.
32. People's names are assigned at birth.
33. OK, maybe not at birth, but at least pretty close to birth.
34. Alright, alright, within a year or so of birth.
35. Five years?
36. You're kidding me, right?
37. Two different systems containing data about the same person will use the same name for that person.
38. Two different data entry operators, given a person's name, will by necessity enter bitwise equivalent strings on any single system, if the system is well-designed.
39. People whose names break my system are weird outliers. They should have had solid, acceptable names, like 田中太郎.
40. People have names.

Falsehoods Programmers Believe About Names by Patrick McKenzie



Gender and Sexuality

- **Don't ask for gender if you don't need it**
- **Allow typing a gender, selecting no gender, and multiple genders**
- **Don't marginalize folks as "other" or "prefer not to say"**
- **Give people a place to put their pronouns**
- **Don't assume people's sexualities**
- **Let people self-identify**

2:32 ↗

LTE

Cancel

Edit profile

Save

Matthew



Bischoff

6097060597

mb@matthewbischoff.com

Male

New York, NY

 Making apps at Lickability. Writing about tech & culture on my site. Stirring things up.

User ID

1181

Previous | Next

Done

Male

Female

I'd rather not say



Race & Ethnicity

- Build a diverse team of designers, engineers, and managers
- Recognize algorithms have biases
- Test with folks of multiple races and ethnicities
- Own and fix your issues

3:09 ↗

■ LTE

marketwatch.com



MarketWatch



Your facial recognition software may be racist and sexist

Published: Feb. 13, 2018 at 3:35 p.m. ET

By Alessandra Malito

8

This could affect everything from criminal detection technology to smartphone security



Facial recognition isn't always accurate, nor unbiased.
Getty Images

Referenced Symbols

FB +2.66% AMZN +0.44% GOOG +0.23%

Facial analysis programs appear to like some faces more than others.



APPS ARE FOR EVERYONE

GOOD DESIGN IS UNIVERSAL

ACCESSIBILITY IS OUR JOB

THANK YOU

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