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CSC207

Accessibility

Note that many of these slides are from Amanda Lazar (University of Maryland) and Anastasia Angelopoulou (University of Westminster), via https://teachaccess.org/

Learning Objectives for Today

- Software Accessibility
  - Overview
  - Guidelines
  - Accessible User Stories

The Social Model of Disability: Society as the Cause For Disability

The social model of disability holds that disability is a social construct.

**Rather than see disability as a function of the individual,
the social model of disability sees e disability as a function of society.**

**Society can create barriers to access for individuals inasmuch
as it can create accessible solutions.**

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Types of disability

- **Visual impairments**
  - Nearsightedness
  - Various levels of blindness
  - Poor 3D vision

- **Movement impairments**
  - Difficulty using a mouse or keyboard
  - Inability to hold down keys simultaneously

- **Cognitive and language impairments**
  - Dyslexia
  - Difficulty remembering certain things
    - Easy to get lost in complex displays

Types of disability (continued)

- **Hearing impairments**
  - Inability to
    - Hear certain frequencies
    - Distinguish spoken words
  - Profound deafness

- **Seizure disorders / Episodic disorders**
  - Epilepsy
  - Light and sound patterns can cause seizures
    - A milder form of the disability results in susceptibility to migraines

- **Statistics Canada says 22% of us have 1 or more disabilities** (https://www150.statcan.gc.ca/n1/pub/11-627-m/11-627-m2022062-eng.htm)

Flexibility, resulting in equal usability

- Accessibility in the context of digital technology and content means that **a person with a disability can secure the same information and engage in the same transactions as a person without a disability** with a substantially equivalent ease of use

- Accessibility is about adding **flexibility** and **new features**, not taking anything away

To promote accessibility we must:

1. Have users with disabilities involved in design and development

2. Ensure conformance to guidelines (we will introduce some today)

Note that industry leaders like Adobe, Apple, Facebook, Google, Intuit, Microsoft, Oracle, Walmart eCommerce, and Verizon Media are actively recruiting people who can create products everyone can use, but they can’t find appropriately trained talent due to a significant skills gap.

How to involve end users?

- Have a diverse development and evaluation team that includes people with disabilities
- Have an ongoing advisory panel of employees or customers with disabilities (e.g. Google Trusted Tester)
- Partner with disability advocacy organizations (e.g. CNIB)

How to use guidelines?

- Guidelines for accessible design touch address software layout, size, colour, and navigation, as well as its interaction with adaptive and assistive devices.

- Collections of guidelines include the Web Content Accessibility Guidelines (WCAG), Gnome's Human Interface Guidelines, Apple's Human Interface Guidelines

Web Content Accessibility Guidelines

> … define how to make Web content more accessible to people with disabilities. Accessibility involves a wide range of disabilities, including visual, auditory, physical, speech, cognitive, language, learning, and neurological disabilities… These guidelines also make Web content more usable by older individuals with changing abilities due to aging and often improve usability for users in general.

These guidelines can be applied to all software, not just web software.

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Web Content Accessibility Guidelines

- The international standard for creating accessible interfaces
- The most well-accepted, well-documented accessibility guidelines in the world
- WCAG issued by W3C's Web Accessibility Initiative
- WCAG 1.0 issued in 1999
- WCAG 2.0 issued in 2008/WCAG 2.1 in 2018
- WCAG2ICT—guidance for applying WCAG 2 to non-web information technologies (like what we are building!)

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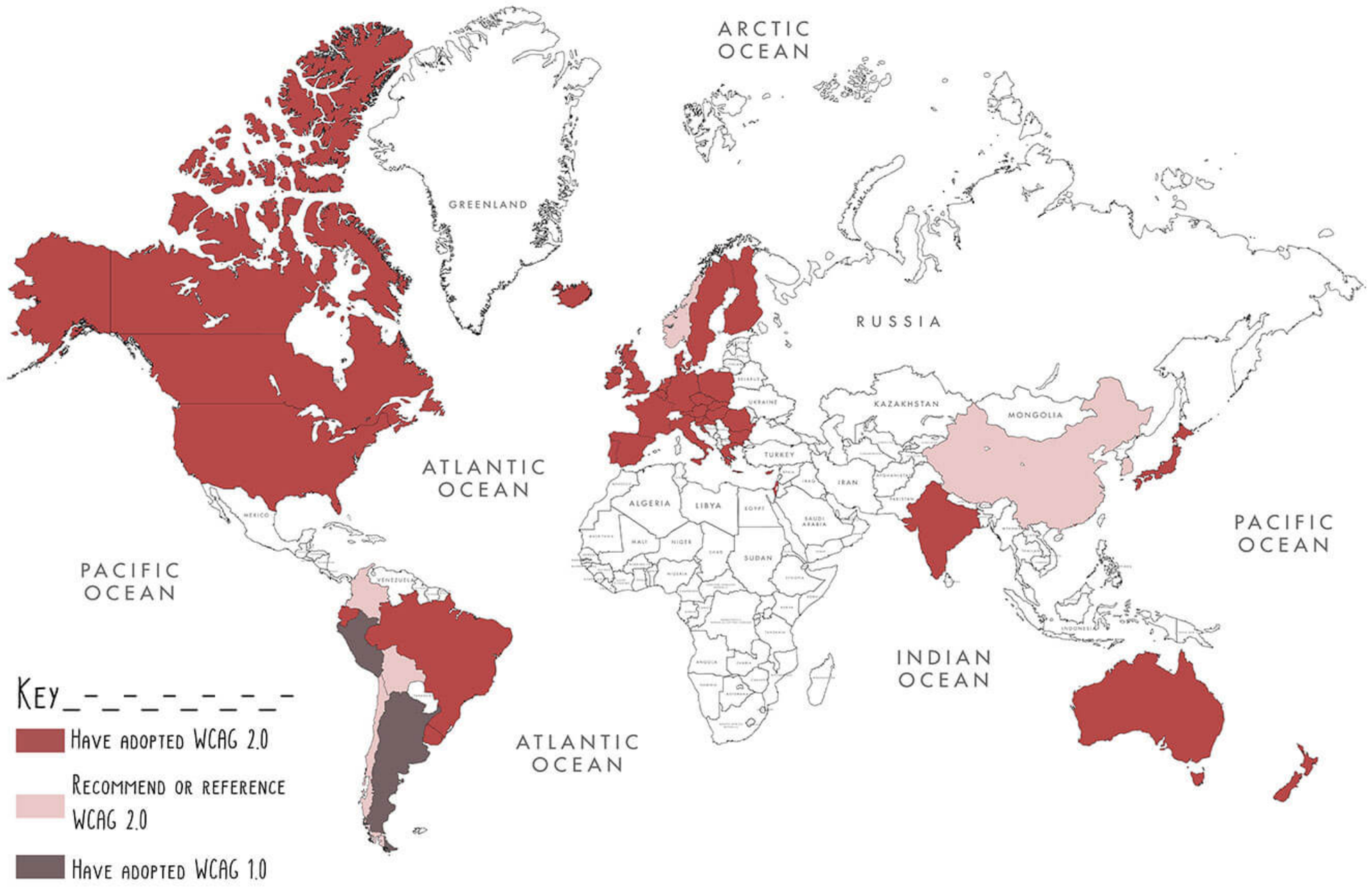
Map of Adopted WCAG Countries



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Web Content Accessibility Guidelines

Software should be:

- **Perceivable**: Information and user interface components must be presentable to users in ways they can perceive

- **Operable**: User interface components and navigation must be operable

- **Understandable:** Information and the operation of user interface must be understandable

- **Robust:** Content must be robust enough that it can be interpreted by by a wide variety of user agents, including assistive technologies.

Examples of Guidelines: Contrast

- **Colour Contrast**
  contrast is a measure of the difference in perceived "luminance" or brightness between two colours
  Ratio of text colour on background colour should be at minimum 4.5:1

- **Example of colour contrast that has low ratio**
  Pure red (#FF0000) on white background has a ratio of 4:1.
  I am red text

- Pure green (#00FF00) on white background has a very low ratio of 1.4:1.
  I am green text.

- **Example of colour contrast that has good ratio**

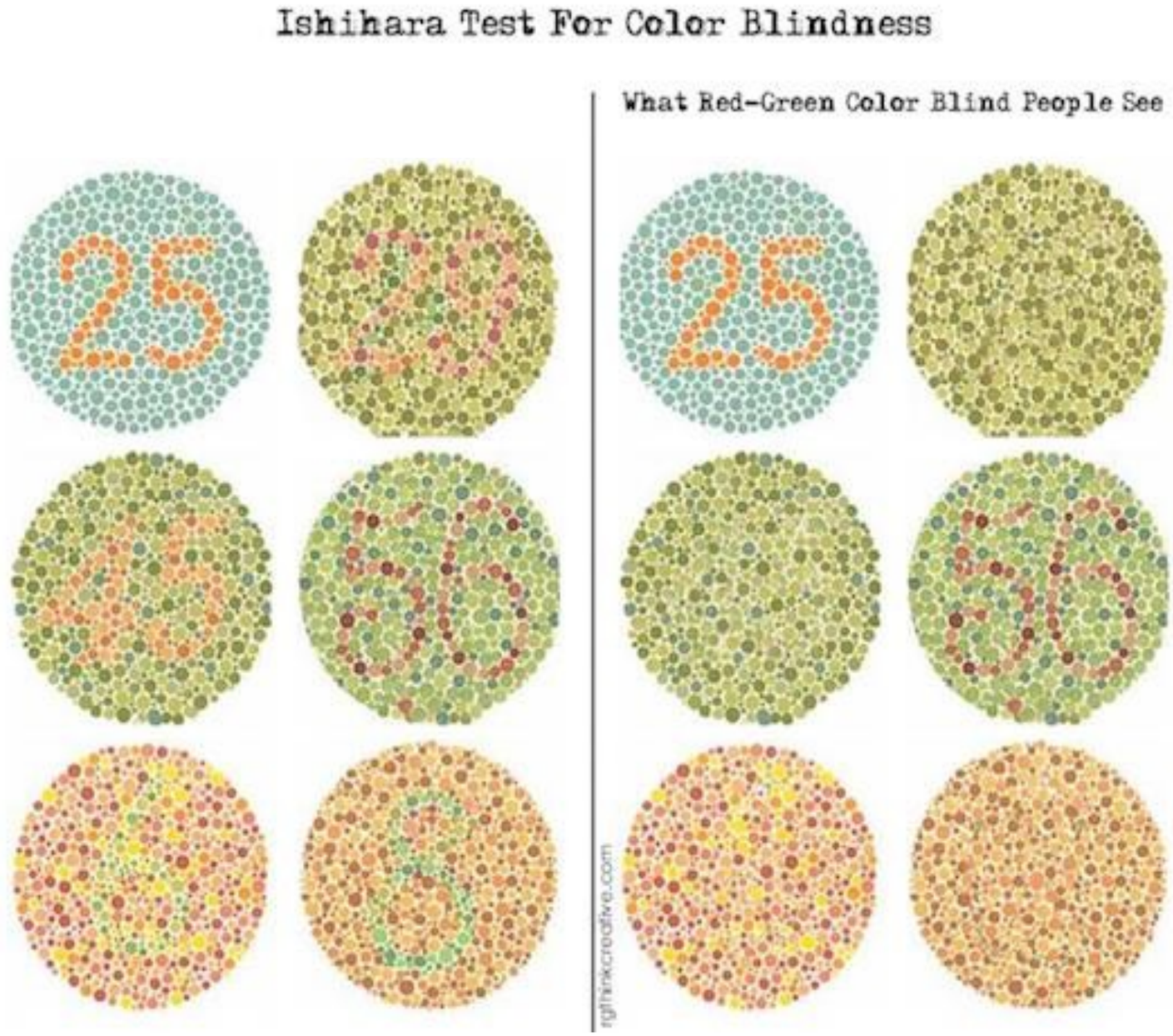
- Pure blue (#000FF) on white background has a contrast ratio of 8.6:1.
  I am blue text

- **Test all coloured elements for accessibility to the colourblind**

- **Allow colours to be changed through a preferences pane**

Examples of Guidelines: Contrast

- **Avoid these colour combos:**
  - Green & Red
  - Green & Brown
  - Blue & Purple
  - Green & Blue
  - Light Green & Yellow
  - Blue & Grey
  - Green & Grey
  - Green & Black



Examples of Guidelines: Contrast

Use patterns and textures to show contrast

Examples of Guidelines: Alt Text, Sounds

- **Provide descriptive text for all visual components**
  - E.g. ‘alt’ text in an image
  - Provide an option to hide the graphics entirely
  - Test with Microsoft Narrator, Apple VoiceOver, NVDA, JAWS (screen reading apps)

- **Allow users to configure the volume and frequencies of sounds**

Examples of Guidelines: Prompts

- **Descriptive prompts**
  - Provide useful, unique, and descriptive prompts that explain what is expected from the user as input.
  - These prompts allow screen readers to properly explain to users what they are expected to type as input to your application

Examples of Guidelines: Errors

- **Help with errors**
  - Provide descriptive text for error messages that includes how to resolve the problem, if possible.
  - Let users undo important actions, or require confirmation before they can continue.
    - For example, ask a user to confirm by typing yes/no if they want to run a program again, then continue.

Examples of Guidelines: Prompts

- **Example of <u>non-descriptive</u> prompts**

```
height = float(input("Enter a number:"))
```

- **Example of <u>descriptive</u> prompts**

```
height = float(input("Enter your height in inches:"))
word = input("Enter a word with up to 10 characters: ")
num = int(input("Enter a whole number between 10 and 100"))
```

Examples of Guidelines: Fonts

- **Fonts and Sizes**
  - Select basic, simple, easily-readable fonts
  - Avoid small font sizes
  - Ensure sufficient contrast between the text and the background.

Examples of Guidelines: Fonts

- **Fonts and Sizes**
  - Fonts are categorized into "families" based on their characteristics. The most common font families are
    - serif
    - sans-serif
    - cursive
    - fantasy
    - monospace
- From among these, **serif** and **sans-serif** fonts are by far the most common.

Examples of Guidelines: Fonts

- **Fonts Size**
  - Base font sizes should be set to at least 14px
  - Limit the use of font variations such as italic, bold, ALL CAPS or other styling methods that may make the content difficult to read.
  - Do not use underlines for items that are not links

- **Allow increasing font and image size**, and changes to font
  - Also allow for zooming in / magnifying

- **Enable easy return of settings to defaults**
  - Needed if fonts have been set to “small”

Examples of Guidelines: History/Memory

- **Provide undo**
  - Make it easy to try, try and try again
- **Reduce memory load**
  - Allow taking notes, multiple clipboards, etc.
  - Rely on recognition, not recall

Examples of Guidelines: Keyboard & Mouse

- **Provide easy keyboard access to everything**
  - Some users have trouble with the mouse
  - Ensure the user can tab around all elements in a logical
  - order
  - Provide a way around the need to hold down multiple keys at once
  - For keyboard shortcuts, given precedence to keys where ‘control/command’ and a letter key can be held together without too much reaching
  - Ensure there is always an alternative to **drag and drop**

- **Don’t make mouse targets too small**
  - Allow a preference to make them larger

- **Don’t rely on mousing to get popup info**

Examples of Guidelines: Blinking and Animation

- **Use animation and movement with care**
  - Flashing and blinking or repeated animation can bring on seizures or migraines
    - 2-55 Hz is the problem range
    - If some form of blink is needed, do it in a small area only
- **Using blinking is not a recommended way to attract attention**
    - Other related problems:
      - ‘Shaky camera’ videos
      - Certain PowerPoint like ‘transitions’
    - Allow all movement to be turned off
      - Provide alternatives (e.g. text)

Examples of Guidelines: Timing

- **Don't rely on timing**
  - Automated slide shows
    - Some people read too slowly
  - Timeouts after no interaction detected
    - Some people write too slowly
  - Automated scrolling
    - Extremely difficult for some people to control

Accessible User Stories and Acceptance Criteria

There are two methods for including accessibility in your user stories and acceptance criteria:

1. Create specific accessibility acceptance criteria (A11yAC) based on existing user stories that do not focus on disability
2. Write a generic user story to cover a variety of disabilitiesUser stories should appropriately represent diversity of expected users

Ideally, when you write user stories, many differing needs and abilities should be represented and considered.

And remember, even people with the same disability may use technology differently.

From *Indiana University's University Information Technology Services*

Accessible User Stories

Your Acceptance Criteria can be documented in the **list** format or using the **scenario** format.

The **scenario** format usually follows the pattern **Given – When – Then.**

As an example:

Scenario: [situation]

Given I am [a specific user type],
When [situation occurs],
Then [expectation exists],
And [additional expectation exists].

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Example: A11yAC added to user story

User Story: As a user who is receiving search results, I want to know how many results there are so that I can change my search terms if needed.

A11yAC (in list format)

- Search, filters, and results can be navigated using keyboard only.
- User is aware when results appear if using a screen reader.
- User is aware of the number of results if using a screen reader.
- User is aware when results appear if using screen magnification.
- User is aware of the number of results if using screen magnification.
- Text should have a contrast ratio of at least 4.5:1.

Example: Disability informed user story

User Story: As a non-sighted screen reader user, I need informative images to include descriptive alt text, so that my screen reader can communicate the information I need to play the game.

A11yAC scenario for user story

Given I am a non-sighted screen reader user and I come across an image that contains information,
When I navigate to the image,
Then I hear the image role,
And I hear the alt text describing the image.

Accessibility Testing

- **Test with a variety of third party accessibility software:**
  - Screen magnifiers
  - Screen readers (Narrator, JAWS, VoiceOver)
  - Braille displays
  - Eye-tracking applications
  - Head wands
  - Mouth sticks

Accessibility Testing

Many different accessibility testing tools are available online and can be used to test websites, like:

- WAVE—evaluates the overall level of accessibility for any given website.

Companies exist to assess all kinds of software for its accessibility, like:

- Fable (https://makeitfable.com/), a Toronto based company that businesses use to engage people with disabilities in user-testing and direct consultations.

Remember, users are people; no automated tools can beat testing software for accessibility with real users. It's also a great opportunity to conduct user research on a wider scale with those facing accessibility problems. Using the data can improve your design for *everyone,* not just those facing certain challenges.

Illustration of accessibility features in use

Accessing YouTube & Twitter on the iPhone as a non-sighted user