

Computing for Social Good

CSE 120 Winter 2020

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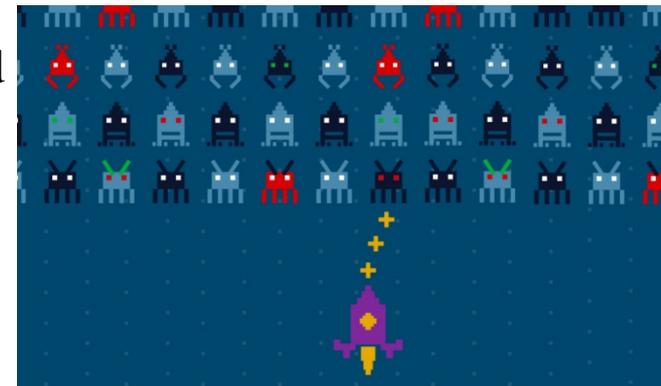
Erika Wolfe

The smart strategy that one LGBTQ forum uses to keep out trolls and bullies

“Turn it into a game, says technologist Esra’a Al Shafei. Thanks to features like a point system and a leaderboard, her small site for LGBTQ people in the Arab world is not only fun to use — it’s free from harassers.

“While many gay people in the Middle East have turned to social media and dating apps to find community and acceptance, those platforms are not always safe. In Egypt, for example, law enforcement regularly pose as LGBTQ users on dating apps like Grindr, Hornet and Growler to entrap and arrest people.”

- <https://ideas.ted.com/the-smart-strategy-that-one-lgbtq-forum-uses-to-keep-out-trolls-and-bullies/>



Administrivia

❖ See Piazza.

Why So Negative?

- ❖ Computing is amazing and has reshaped our society
 - The positives are usually more readily apparent
 - New innovations survive based on *adoption*; inventors and marketers must sell you on the benefits

- ❖ Today, want to focus on the ways computing can be used for social good
 - But we hope you'll still analyze each situation with an eye on the ethics and potential consequences
 - Change: <http://change.washington.edu>
 - “Explore the challenges of developing technology in the context of positive social change.”

Outline

- ❖ **Accessibility**
- ❖ Technology and the Developing World
- ❖ Crowdsourcing

Accessibility

- ❖ One definition:

“The ability for someone to use a service or tool.”

- This is *very* broad
- Often talked about in the context of **disabilities**, but access applies to *everyone* and *any* situation

Accessibility Benefits Example

❖ “Where Luxury Meets Accessibility”

- <https://www.nytimes.com/2019/02/08/realestate/where-luxury-meets-accessibility.html>
- “Even fully mobile residents might enjoy the spaciousness in the bathrooms. ‘It’s like we used one stone to kill two birds,’ he said, as ‘it also adds a sense of luxury.’ ”



1 in 5 Americans Have a Disability

- ❖ This really depends on how you define disability and ask the question
 - 1 in 5 comes from the US Census Bureau
 - <https://www.census.gov/newsroom/releases/archives/miscellaneous/cb12-134.html>
 - 1 in 7, 1 in 8 are other common answers, or 1 in 4 “adults”
 - 1 in 3 above the age of 65
 - https://disabilitycompendium.org/sites/default/files/user-uploads/2017_AnnualReport_2017_FINAL.pdf
- ❖ Disability is *situational*, by time and location
- ❖ **Bottom line:** it's a large number of people

Accessibility Needs are Situational

- ❖ Breaking a bone → limited mobility for a while
- ❖ Repetitive Stress Injuries (RSIs) can be intermittent
- ❖ Getting your pupils dilated
- ❖ Using GPS/Maps while driving (vs walking)
- ❖ Not being able to text easily because you're doing it under a desk/table

Broad Categories of Disabilities

- ❖ These do not cover all disabilities, but can help you think about users of your applications:
 - Auditory
 - Cognitive and neurological
 - Physical (motor control)
 - Speech
 - Visual (blind and low vision)



- More: <https://www.w3.org/WAI/people-use-web/abilities-barriers/>

Broad Categories of Disabilities

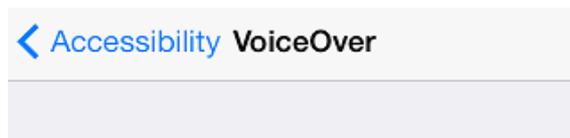
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Assistive Technology for Visual Impairment

- ❖ Screen readers – text-to-speech software
- ❖ Dictation programs – speech-to-text
- ❖ Braille displays



VoiceOver



Turn VoiceOver on/off

VoiceOver speaks items on the screen:

- Tap once to select an item
- Double-Tap to activate the selected item
- Swipe three fingers to scroll

How VoiceOver works

SPEAKING RATE

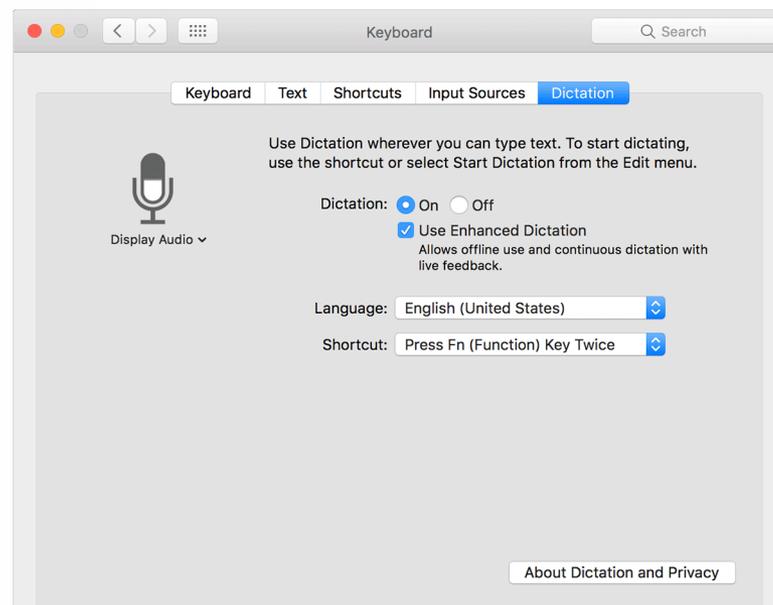


Configuration

Speak Hints



Use Pitch Change



Screen Reader Technology

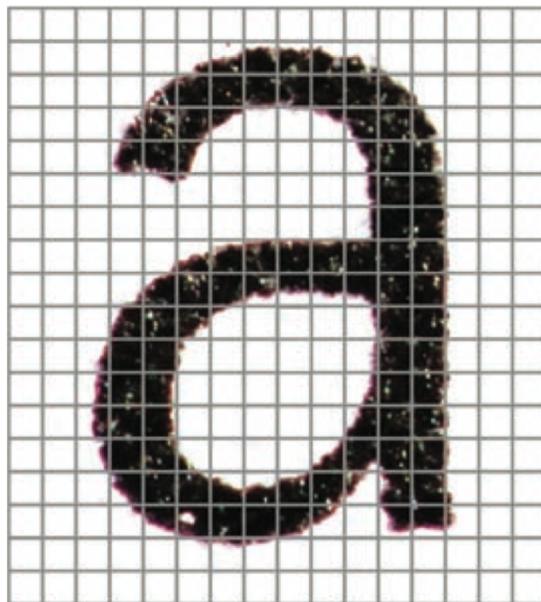
- ❖ What are the steps necessary to implement text-to-speech?
 - 1) High resolution scanning/imaging of documents
 - 2) Character recognition from bits (OCR)
 - 3) Word identification
 - 4) Speech synthesis

Imaging of text

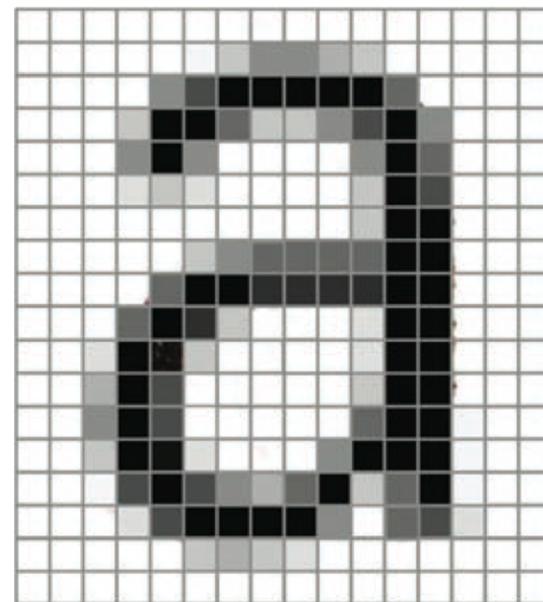
- ❖ A scanner produces an array of pixels:



Print on Paper



Scanner In



Scanner Out

- ❖ A photo (image) is already an array of pixels!

Optical Character Recognition (OCR)

- ❖ The identification of printed characters using photoelectric devices and computer software
 - A combination of pattern recognition, artificial intelligence, and computer vision
- ❖ This is really hard!
 - Typography is an art form, and font design is a creative field

g g g g g g g g g G g g g g

A sampling of the character 'g', all of which are 48 point size

Speech Synthesis

- ❖ Even after figuring out what the text is, saying it correctly is tough!
 - English is a particularly quirky language – **context matters!**
 - Heteronyms: *e.g.* “read”, “close”, “tear”
 - Proper nouns: *e.g.* “Job”
 - Acronyms: *e.g.* “eta” vs. “ETA”, “CAUSE”
 - Made-up words: *e.g.* “nyan cat”, “ghoti”

Kurzweil Reading Machine

- ❖ The first commercial reading machine built by Ray Kurzweil in 1975



Kurzweil Reading Machine

- ❖ The first commercial reading machine built by Ray Kurzweil in 1975
- ❖ “The Kurzweil Reading Machine was a breakthrough that changed my life. With the Kurzweil Reading Machine, I could read anything I wanted with complete privacy: music lyrics, letters from my children, the latest best sellers and magazines, memos from my business associates. It gave blind people the one thing that everyone treasures, which is independence.” – Stevie Wonder

Other Applications for Text-to-Speech

- ❖ Visual disability:
 - Have books or notes read to them

- ❖ Speech disability:
 - Can communicate “verbally” by typing

- ❖ No disability:
 - Hands-free text reading
 - Voice anonymization

Innovations from Accessible Development

- ❖ Technologies designed to assist the disabled in society usually turn out to be extremely useful to everyone

- It's the right thing to do AND everyone benefits! 😊

- ❖ Other Examples:

- Captions
 - Electric toothbrush
 - Curb cuts
 - <https://99percentinvisible.org/episode/curb-cuts/>



Accessible Technology at UW

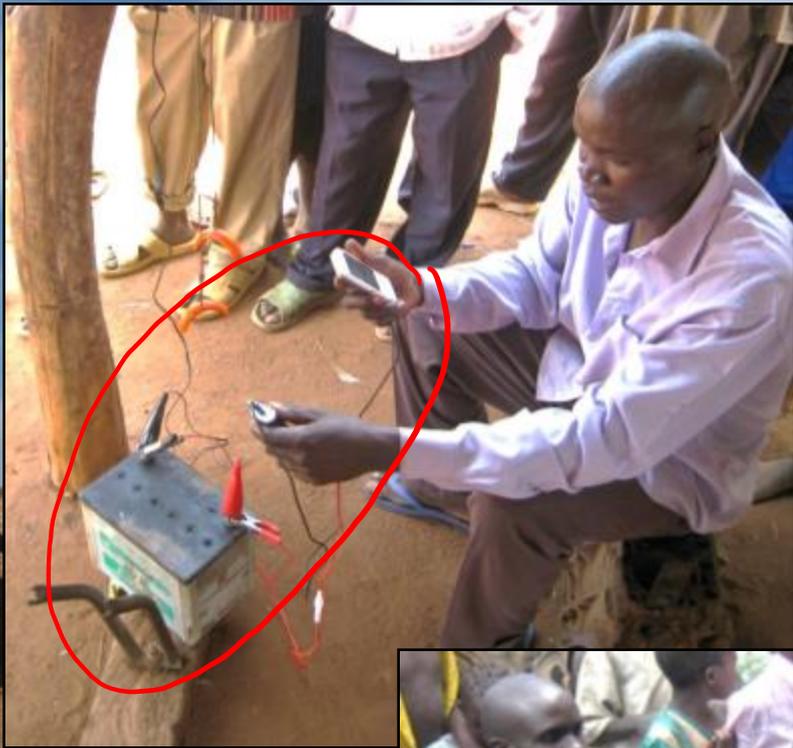
- ❖ Accessibility Technology Research in CSE
 - <http://www.cs.washington.edu/people/faculty/ladner/research>
- ❖ Taskar Center for Accessible Technology (TCAT)
 - <http://tcat.cs.washington.edu/>
- ❖ Mobile + Accessible Design (MAD)
 - <http://depts.washington.edu/madlab/>

Outline

- ❖ Accessibility
- ❖ **Technology and the Developing World**
- ❖ Crowdsourcing







Information & Communication Technology for Development (ICTD)

- ❖ **Goal:** Improve the lives of **people** in developing regions through the use of technology
- ❖ An *interdisciplinary* field: public health, education, agriculture, business
- ❖ An active area of research in computing
 - UW CSE: <http://ictd.cs.washington.edu>
 - Research groups at universities & companies like Microsoft
 - Many conferences on this topic
 - e.g. <https://acmcompass.org>, <https://www.ictdx.org/>

Technology in the Developing World

- ❖ Health
 - Monitoring vaccines & vaccinations
- ❖ Education
 - Increasing access to high quality teachers in rural areas
- ❖ Agriculture
 - Teaching new & effective farming practices
- ❖ Business
 - Improving microfinance record keeping with cell phones in India



Photos: Open Data Kit

Designing Technology for Unfamiliar Environments

- ❖ Physical environment
 - Low cost
 - Low power
 - Low connectivity
- ❖ Users & cultural context
 - Illiteracy
 - Familiarity & trust of technology

Example:

- ❖ How can the lives of the billions of people who live on a few dollars a day be improved?
 - Many avenues for improvements: health, governance, education, poverty, food security, environment, infrastructure, civil strife

- ❖ Strong evidence that improving access to financial services can help people stay out of poverty
 - Poor pay more for services
 - Create new livelihood opportunities
 - Allow more *efficient* delivery (\$ and other services)
 - Savings provide a buffer against financial shocks

Example: Digital Financial Services (DFS)

- ❖ DFS can be a pathway out of poverty
- ❖ Financial Services for the Poor
 - Remittances
 - Savings accounts
 - Government payments
 - Digital payments
 - Insurance

Mobile Money

- ❖ Send money instantaneously via phone to remote locations
 - Must rely on basic phones (and SMS) – no Venmo ☹️
 - Users often don't have bank accounts
- ❖ <https://www.nytimes.com/2017/05/09/opinion/in-kenya-phones-replace-bank-tellers.html>



Digital Financial Services Challenges

- ❖ Security of mobile money
 - Android app security
 - Usability and resilience to poor infrastructure are key
- ❖ Usability
 - Simplification of process
 - Lack of trust is a deterrence to adoption
- ❖ Fraud detection
 - Transaction records to detect potentially fraudulent use
- ❖ Consumer Education
 - Understanding of basic financial instruments
- ❖ Integration of mobile money into broader services
 - Payment for services (*e.g.* school fees)

Outline

- ❖ Accessibility
- ❖ Technology and the Developing World
- ❖ **Crowdsourcing**

Crowdsourcing

- ❖ *Distributed* problem-solving and production technique
 - 1) Problems are **broadcast** to an unknown group of “solvers”
 - 2) Those solvers (the crowd) **submit solutions** that become the property of the broadcaster
 - 3) They are **compensated** in some form — money, prizes, community accolades, intellectual satisfaction, skill development, etc.

- ❖ Computers are a perfect agent for this!

Wikipedia – Crowdsourced Knowledge



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Byte

From Wikipedia, the free encyclopedia

Not to be confused with [Bite](#) or [Bight](#). This article , other uses, see [Byte \(disambiguation\)](#).

The **byte** /ˈbaɪt/ is a [unit of digital information](#) in [comp](#) most commonly consists of eight [bits](#). Historically, the encode a single [character](#) of text in a computer^{[1][2]} an [addressable](#) unit of [memory](#) in many [computer archite](#) historically been hardware dependent and no definitiv the size. The *de facto* standard of eight bits is a conv

Crowdfunding – Crowdsourced Money

- ❖ The practice of funding a project or venture by raising small amounts of money from a large number of people, typically via the Internet



Crowdsourced Digitization

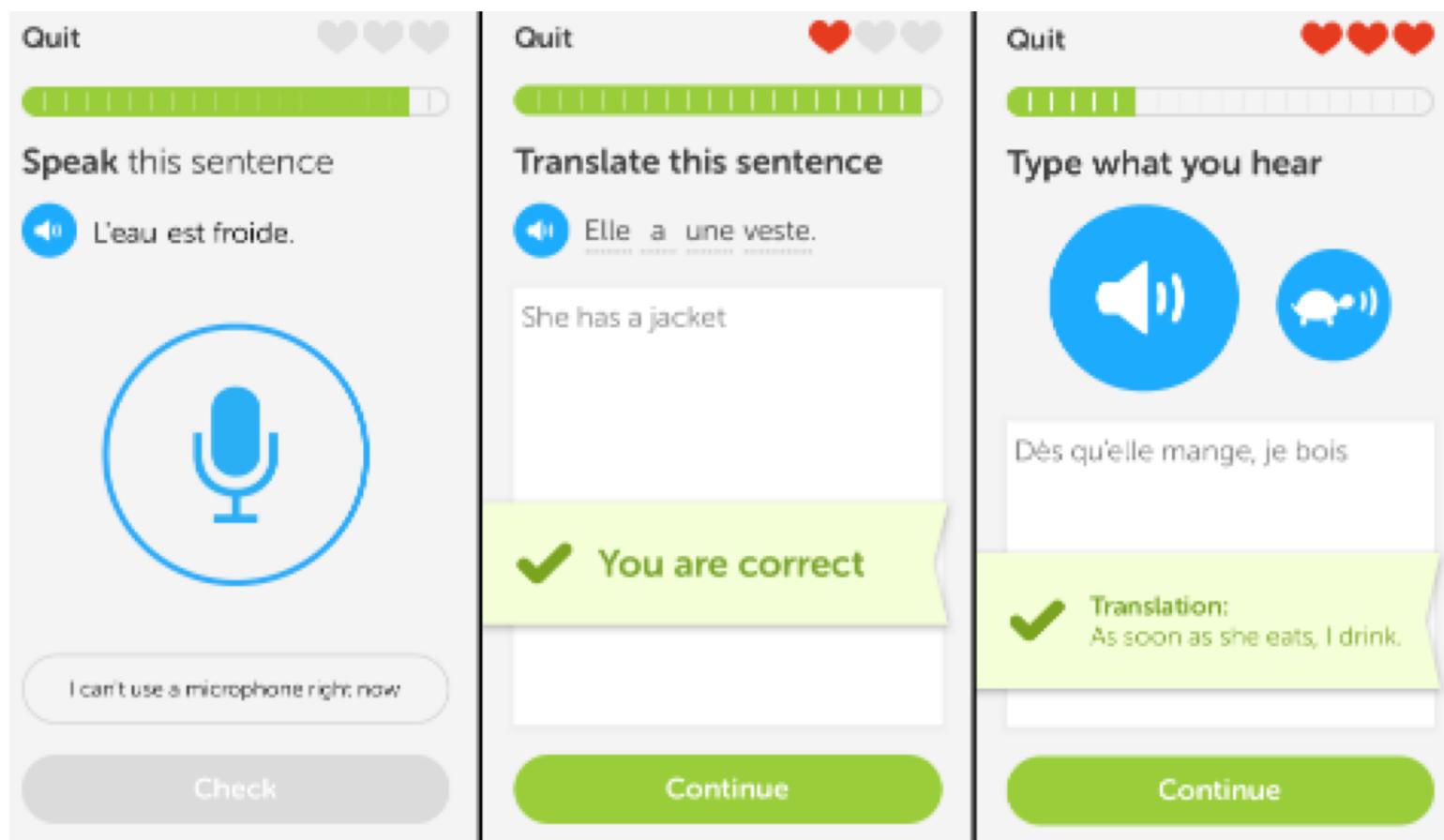
- ❖ **CAPTCHA** stands for “**completely automated public Turing test to tell computers and humans apart**”
 - User must decipher distorted characters
 - Criticized, especially by those with disabilities
 - Prevent spam, protect registration, hide email addresses



- ❖ reCAPTCHA uses CAPTCHAs to digitize books
 - Original slogan was “Stop Spam, Read Books.”
 - Has since introduced different systems

Duolingo – Crowdsourced Translation

- ❖ https://www.ted.com/talks/luis_von_ahn_massive_scale_online_collaboration?language=en#t-679097



fold.it



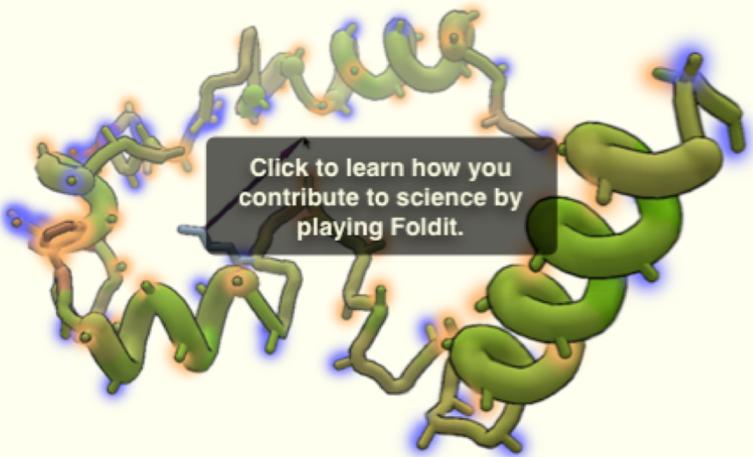
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BETA

Solve Puzzles
for Science

20:09:04 GMT

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What's New RSS

Vote for a short documentary on Foldit!

A short documentary on Foldit is a semi-finalist for the FOCUS FORWARD Filmmaker Competition! You can help it win the Audience Favorite award by voting for it online. The video is here, and the "VOTE" button is in the top-right of the video.

<http://vimeo.com/focusforwardfilms/semifinalists/51888393>

(Thu, 11/15/2012 - 16:24 | **0** comments)

GET STARTED: DOWNLOAD

 Win Beta <small>Windows (XP/Vista/7)</small>	 Mac Beta <small>OSX (Intel 10.4 or later)</small>	 Linux Beta <small>Linux (64-bit)</small>
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SEARCH

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RECOMMEND FOLDIT

USER LOGIN

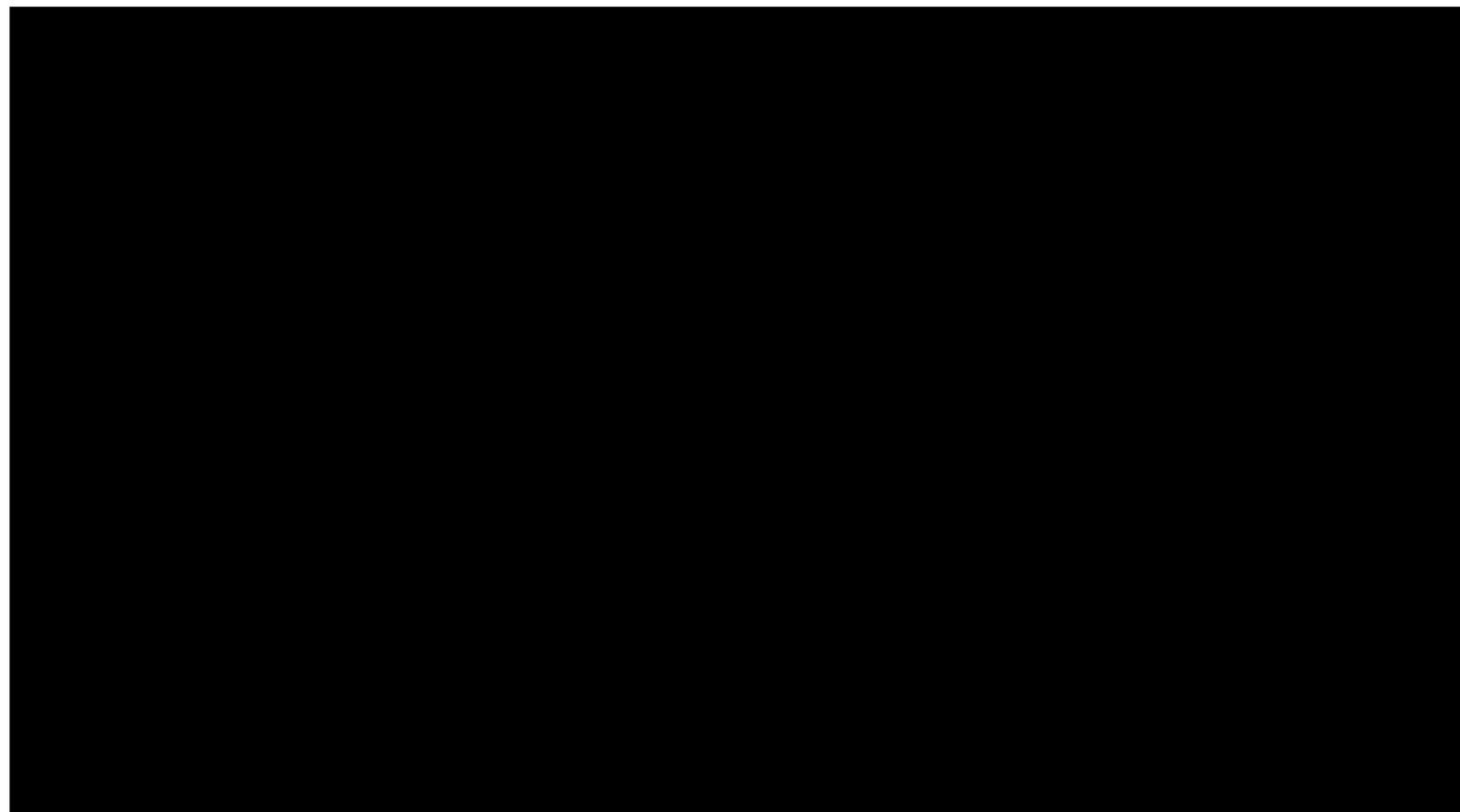
Username: *

Password: *

- Create new account
- Request new password

fold.it

❖ <https://vimeo.com/51888393>



Why Does Crowdsourcing Work?

- ❖ People bring a variety of skills to the problem
 - Gamers may be better at 3D visualization than people with medical research knowledge
 - Collective intelligence can sometimes trump a few smart people
- ❖ Motivated “solvers”
 - Large supply of workers with time to spare
 - Participating in something new is fun

Computing for Social Good

- ❖ Computing (and the Internet) allow us to affect the lives of a much wider range of people than ever before
 - We still need to be aware of the needs of our users and take **accessibility** into account to not exclude subsets of the population
 - Designing **technology for the developing world** must take the environment and culture into account
 - **Crowdsourcing** can harness some of the power and reach of the Internet towards shared goals

- ❖ Lots of other ways to promote social good!