Breaking Intuition
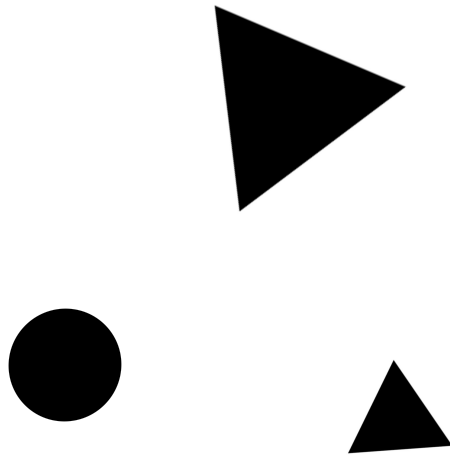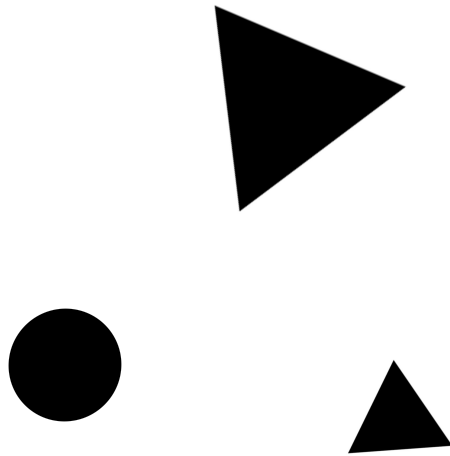
- The limits of human intuition
  - "Causal Stories"

- The limits of human intuition
  - "Causal Stories"
  - Human vs. Computing Minds

672 * 58 = 38,976

- The limits of human intuition
  - Practiced vs. Substitutive Intuition

- The limits of human intuition
  - Practiced vs. Substitutive Intuition
  - Halo Effects

Jeff Bezos' rocket lands safely after space flight - CNN Money
money.cnn.com/2015/11/24/.../jeff-bezos-rocket-landing/ ▾ CNNMoney ▾
7 days ago - Bezos' Blue Origin successfully flies its New Shepard rocket into outer space and then lands it ... Jeff Bezos launches a rocket...and lands it ...

- The limits of human intuition
  - Hindsight Bias

- The limits of human intuition
  - Hindsight Bias

6

- The limits of human intuition

  - Hindsight Bias

  - Reduction of system complexity (why you're sitting here)
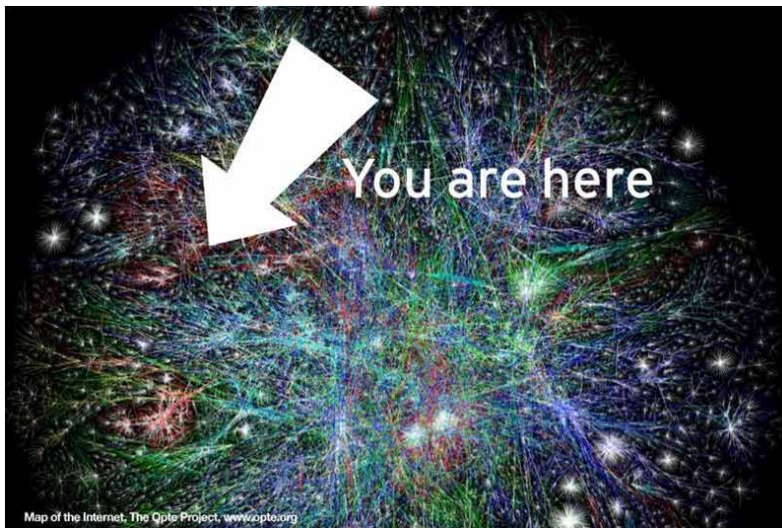
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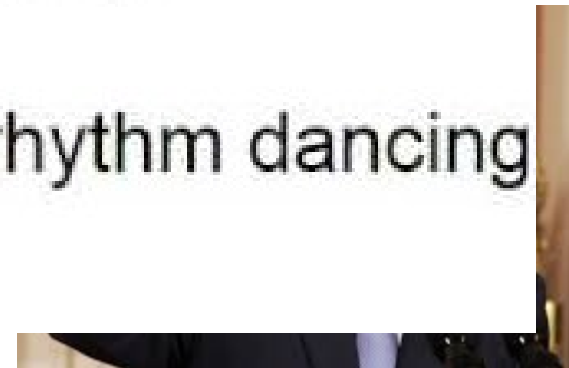 -   ing

Three gerbils jumping up in rhythm dancing gerbils

Map of the Internet, The Opte Project, www.opte.org

- The limits of human intuition
    - What you see is all there is.

- The limits of human intuition
  - What you see is all there is.

William Dietrich II
Slow Hiker

Dorothea Puente
Wonderful Grandma

- The limits of human intuition
  - What you see is all there is.

William Dietrich II
Philanthropist

Dorothea Puente
Serial Killer

"We have unlimited capacity to ignore our own ignorance."

- The limits of human intuition
  - Associative Bias

- The limits of human intuition
  - Associative Bias
  - Mood Heuristics

- The limits of human intuition
  - Associative Bias
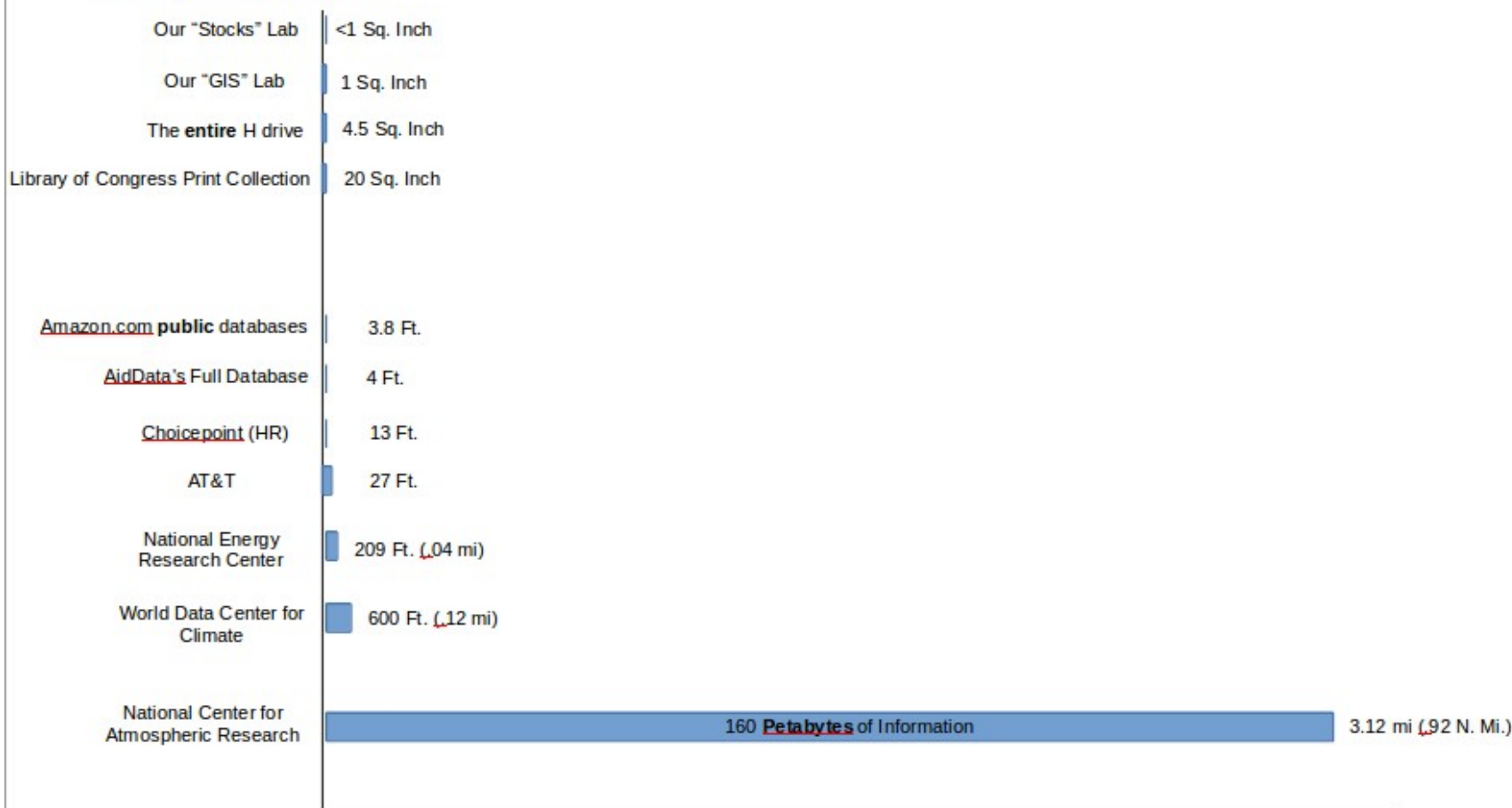 - Mood Heuristics
  - Anchoring

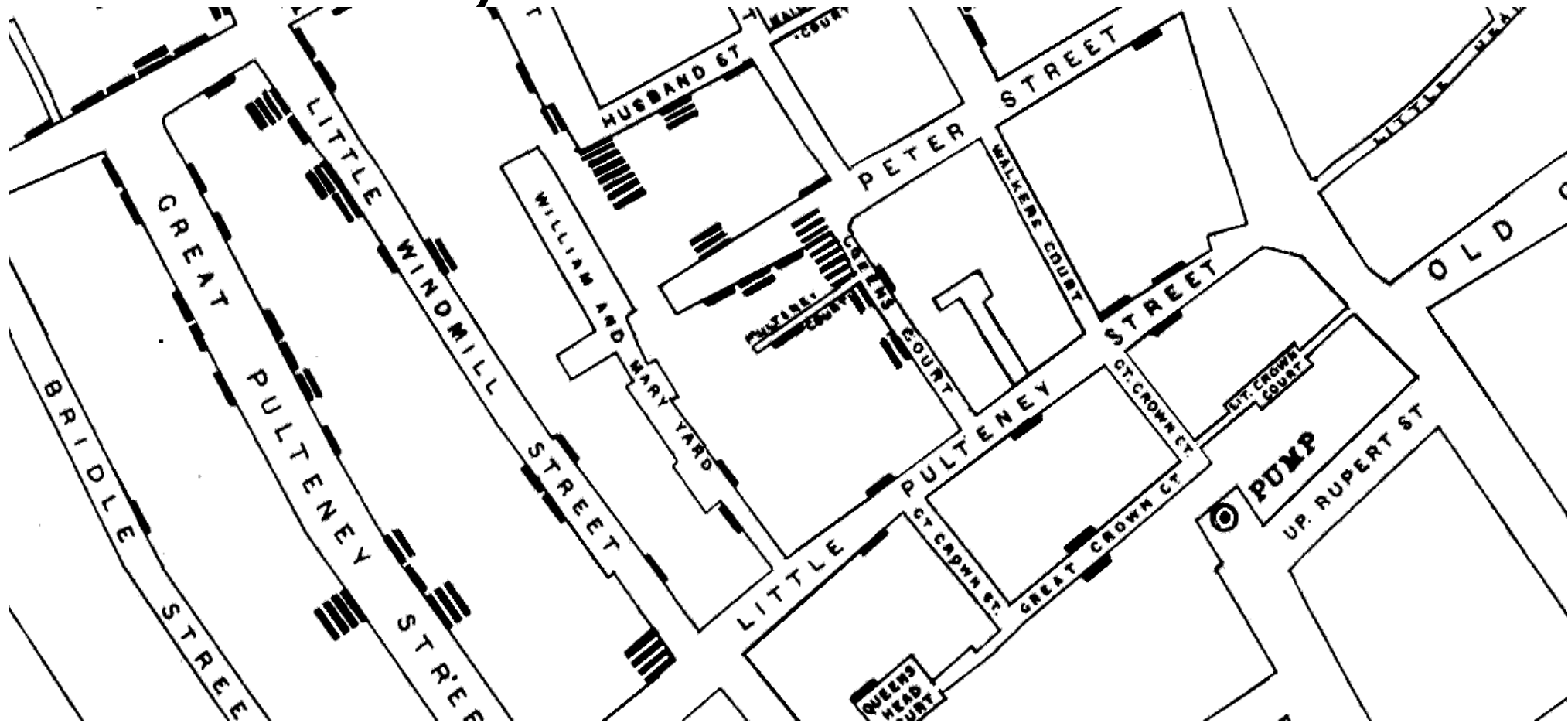**Elmo says there are at least...**

...ways the mind is fundamentally flawed.

Why does this matter?

Volume

Our "Stocks" Lab	<1 Sq. Inch
Our "GIS" Lab	1 Sq. Inch
The **entire** H drive	4.5 Sq. Inch
Library of Congress Print Collection	20 Sq. Inch
Amazon.com **public** databases	3.8 Ft.
AidData's Full Database	4 Ft.
Choicepoint (HR)	13 Ft.
AT&T	27 Ft.
National Energy Research Center	209 Ft. (.04 mi)
World Data Center for Climate	600 Ft. (.12 mi)
National Center for Atmospheric Research	160 **Petabytes** of Information — 3.12 mi (.92 N. Mi.)

Size of Data... in leagues (~3.4 miles).

.75 billion bits per square inch on a tape drive, or v. roughly 1 TB

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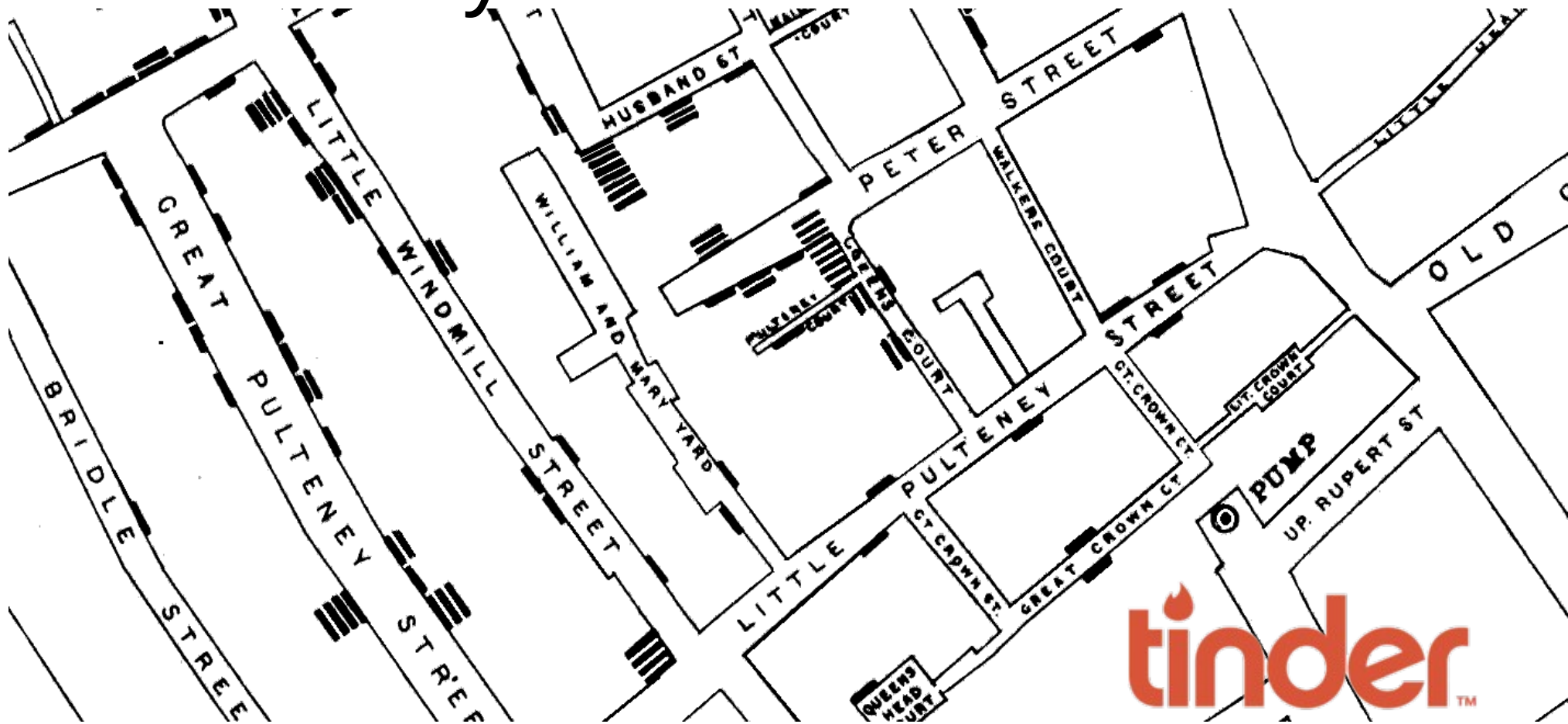
Weaponized Data*

- The illusion of objectivity.

- The delusion of validity.

- The assumption of generalizability.

- The danger of simplification.

Another Recap

- Intro Lab – Basic downloading of data, entering it into R
- Why W&M – Basic manipulation of data, visualization
- QGIS / Building a Villa – Basic manipulation of [real!] satellite data, maps, spatial data (GIS)
- Business Analytics – real-time stock-data downloading, basic analysis
- Social Networks – basics of how to use data to visualize and analyze data from social networks
- Climate Change & Urban Growth – how to retrieve and manipulate temporal data, create and use interactive websites using data.
- Final – real-world social network (Twitter) data analysis

Putting it together

- Human Intuition & It's Limits
  - Critical thinking skills to understand what's possible / feasible with data across a wide variety of disciplines.
  - Red flags for when you might be taken advantage of others – or when you can use data to take advantage!
- Basic "Data Science" Skills
  - Basic skills so you can either have a leg-up if you want to do CS yourself, or so you can communicate to more technically-inclined folk your working with!

Now, let's tie this up nicely

- Life as a Story
- The Future of Algorithms
- Why these things are connected.

Think Back.. a long, long time ago...

- To Monday.
  - Did you have a good day, overall? Rank it from 0 to 6 (6 being the best day *ever*). Write this down.

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  - What did you do? Think about it like scenes in a movie. Write down at least 4, and indicate roughly how long they were.
  - Rank them from 0 to 6 in terms of two feelings: engagement (6 being very engaged) and anger (6 being *really angry*).

Life as a Story

- Just like a computer hard drive, our mind has all sorts of technical issues with how it records events.
  - Duration Neglect
  - Peak-end effects
- This is *in addition* to the many limitations we've discussed throughout this course.
  - Poor system 2 barely has a chance.

Intuition is Broken: Computers and Data to the Rescue?

- Hopefully by now you well and truly believe our minds are flawed in many important ways.

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- Everything we believe we know is effectively poorly-remembered stories – frequently reduced in complexity – that allow us to feel comfortable in the world.

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- Everything we believe we know is effectively poorly-remembered stories – frequently reduced in complexity – that allow us to feel comfortable in the world.

- Computers don't have any of these limitations – but they certainly have their own!

Breaking Computers

- Amazon.com price wars
- Lack of Creativity

Breaking Computers

- Difficulty of interpretation (where is a bird vs. what is the animal in this picture?)

  – Our brain uses associative intuition here – it has feathers and a beak, we've seen something that looks like that before, thus it must be a bird.
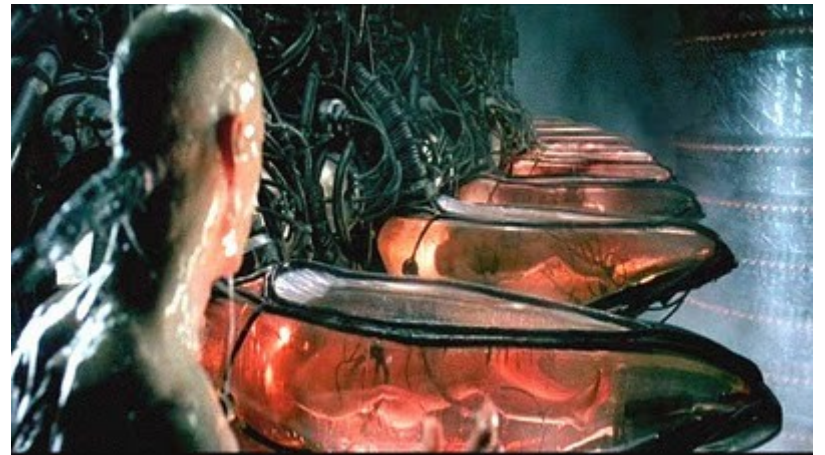
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- Expensive (brains are relatively cheap by processing power)

Breaking Computers

- Data-dependent (unwilling/able to go outside the bounds of available information).

- Programmed by flawed humans.

Alright, great.. so we're all broken

- The future of algorithms
    - Computers fail in many of the places humans succeed
    - Humans fail in many of the places computers succeed.
- Think to your Twitter lab
    - Could the computer have decided that you need to search for "Donald Trump" to contrast to Hillary Clinton? Maybe, but it would be very hard.
    - Could you have read every tweet you downloaded and built word clouds and social networks of those tweets? Figured out the general sentiment? Maybe, but it would be very hard.

GLΛSS

GLASS

60°
60°F / 46°F
Mission Ter...

12

6

I'M HALF

MACHINE

quickmeme.com

What humans are just about to do

- Patterns of speech and power
  - Analyze millions of email chains to figure out who's in charge, social networks, "followers" vs. "followed". Target marketing at the leaders. Based on words used and the general tendency for word usage to (over time) replicate your bosses.

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  - Intuitive answers to who runs the show (Obama) vs. who has more measurable influence (Obama's Uncle).
  - Computer would never dream to ask these questions; they would be impossible for a human to answer due to the volume of data required for analysis.

What humans are just about to do

- Art in the Machine
  - Think about spotify, google music, songza. How are songs selected? How does that drive the future of human art forms?
  - Computers can't make (very good) music. But they can control what it's future looks like.

What humans are just about to do

- Dozens of Industries are on the Brink of a Revolution by overcoming limitations of minds and machines...
  - Automated Cars
  - Medical Diagnostics
  - Law – automated penalties for common offenses; Legal discovery
    - The chance you'll go to *prison*, determined by algorithms (Real company – Blackstone Discovery)
  - Writing
    - Narrative Science – automatically take statistics and write story's out of them. Big Ten used automated software like this.
    - "Wisconsin appears to be in the driver's seat en route to a win, as it leads 51-10 after the third quarter."

BLACKSTONE
DISCOVERY
Information. Innovation. Impact

"Technological Unemployment"

- Warning from the 1920s – John Maynard Keynes.
- "Math-science death march" - Dr. David Goldberg
  - We're very good at keeping students engaged in science and math in High School, and then send them through three semesters of "weed out" math, science, chemistry, CS.
  - Then, we wonder why we aren't graduating enough engineers.

"There's going to be a lot of work in the future for those who can write code.

If you can also conceive intricate algorithms, all the better – you may just be able to take over the world.

That is, if a bot doesn't do it first."

-Christopher Steiner, Automate This