"Through a glass darkly"

Chris Wild
University of Auckland

Slides at **http://bit.ly/icots10**

What to expect

- Abstract promised *riffing* on a series of themes
  - It also promised music

"riff" – *a series of notes, chord patterns or musical phrases that are repeated*

- Musical analogy for this talk …
  improvisational jazz with Salvador Dalí

- Expect a kaleidoscope of metaphors, impressions and images rather than structured arguments

A game of two halves

- **Part I : Back to the Future**
- **Part II: "Oh Say, Can we See?"**

The (missing?) **Link**

"Through a glass darkly"

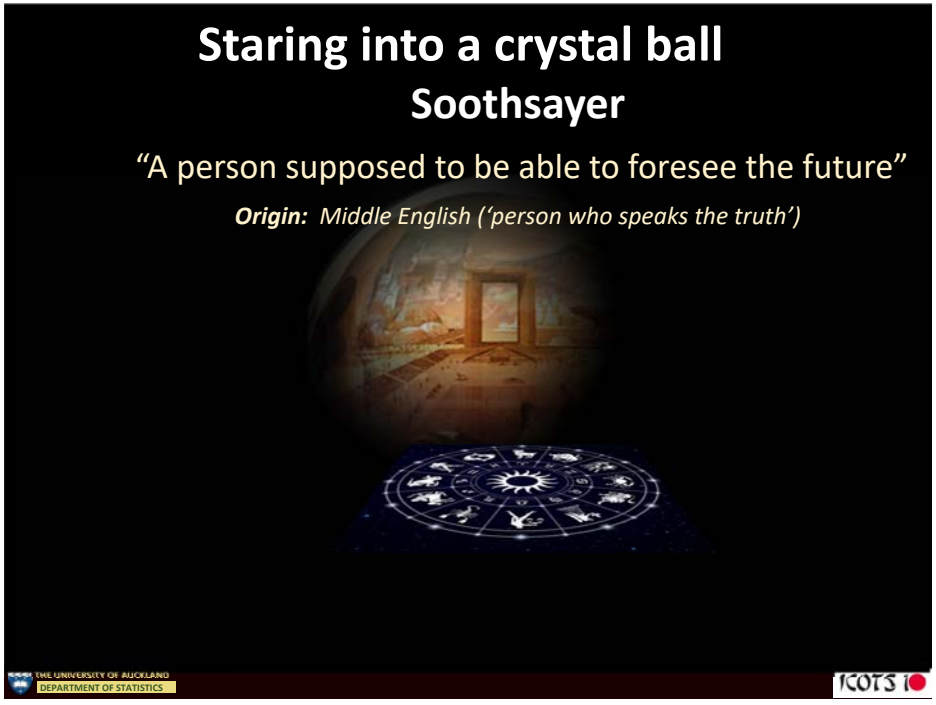
To see "through a glass darkly" is to have
an obscure or imperfect vision of reality
(*dictionary.com*)

Staring into a crystal ball

Soothsayer

"A person supposed to be able to foresee the future"

Origin: *Middle English ('person who speaks the truth')*



Forecasting …

is like driving when all you can see
is in the rear-view mirror

looking backwards to look forwards

So we shouldn't be surprised by the odd crash !

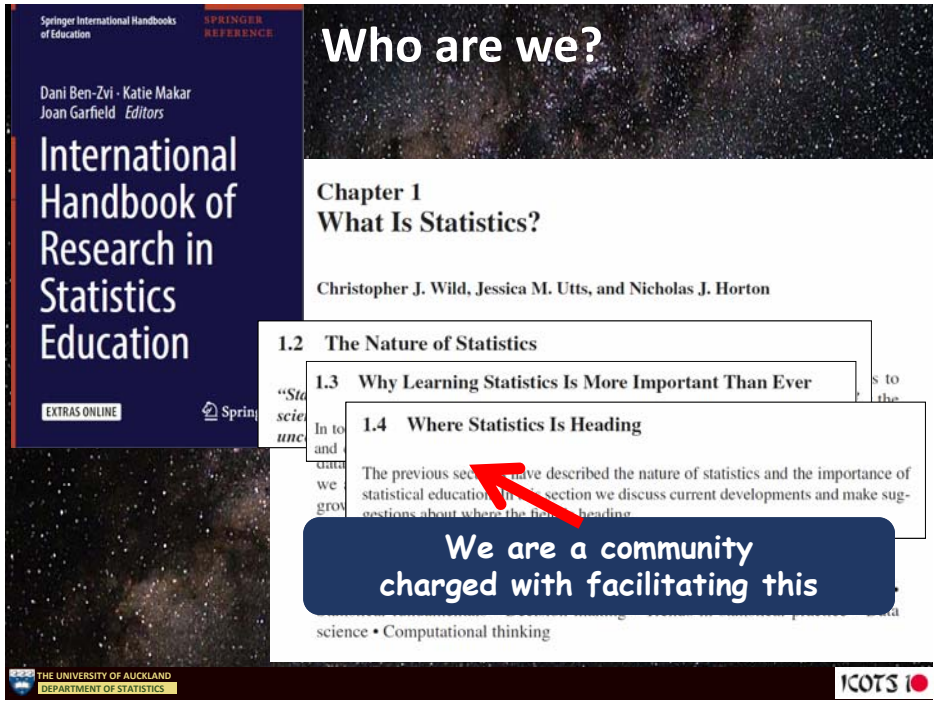
But ***Back to the Future …***

& how to get there?

Starting point

Who are we?
&
Where do we come from?

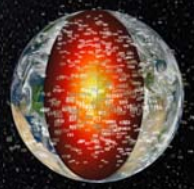
Who are we?



Who are we?

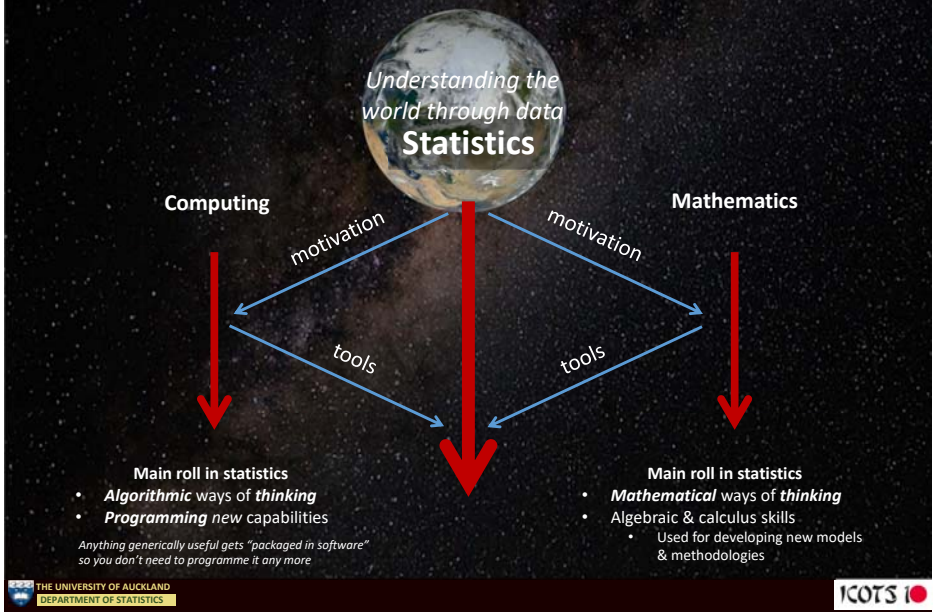
"Statistics is **the science of learning from data**, and of measuring, controlling and communicating uncertainty."

-- American Statistical Associatio



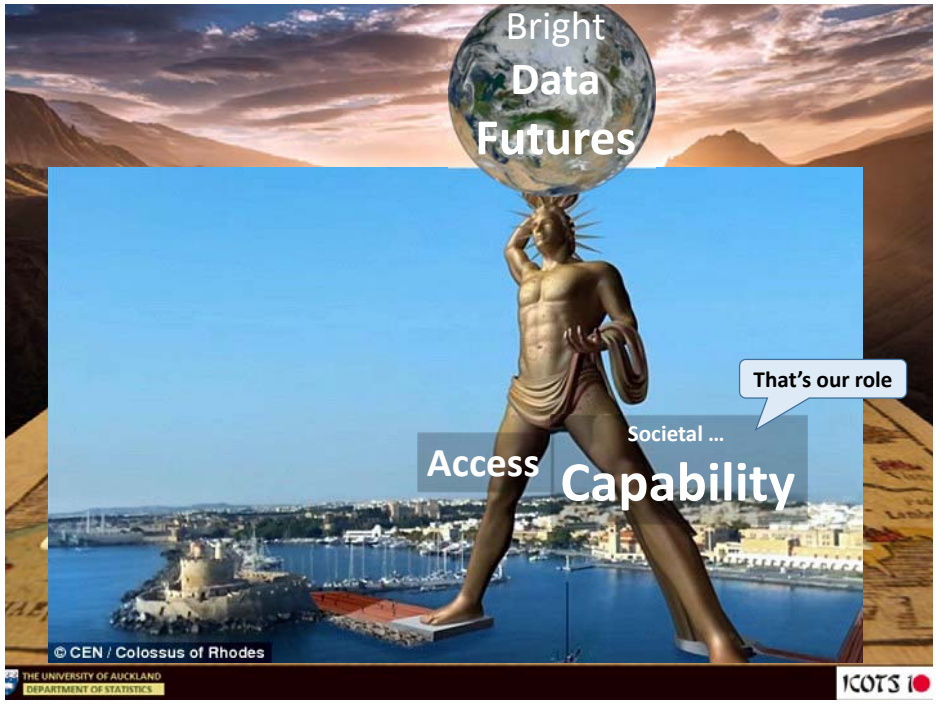
- The **focus** of statistics is:
  - **understanding the world through data**
- The **raw materials** for statistics are:
  - **real-world questions** and **data**
- The **tools** of statistics are
  - **statistical** ways of **thinking**
  - **& computer software**
    - often based on **mathematical models** and derivations

Who are we?



Who do we serve?

- Intending statistical/data science specialists
- Intending specialists in other areas that know their students need these skills
- **The wider society …**
  - by spreading valuable messages as widely as possible



Where do we live?

Where do we live?

In the galaxy of forming views about how the world around us operates …

Where do we live?

In the galaxy of forming views about how the world around us operates …

Where do we live?

In the galaxy of forming views about how the world around us operates …

statistical inquiry is a **tectonic plate** on the **planet "*Purposefully Finding Out*"**

From "On Locating Statistics in the World of Finding Out"

Where do we live?

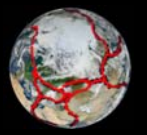
We share our planet (*Purposefully Finding Out*) with other tectonic plates

Some of our neighbours …

- consulting trusted others
- **qualitative research methods**
- data mining
- **machine learning**

From "On Locating Statistics in the World of Finding Out"

Where do we live?



*Leverage the **ability of humans to notice things** you'd never think to measure*

Where are we going?

- **"Data science"**
- Qualitative methods
- Stochastic modelling of real-world processes

Where is the world going?

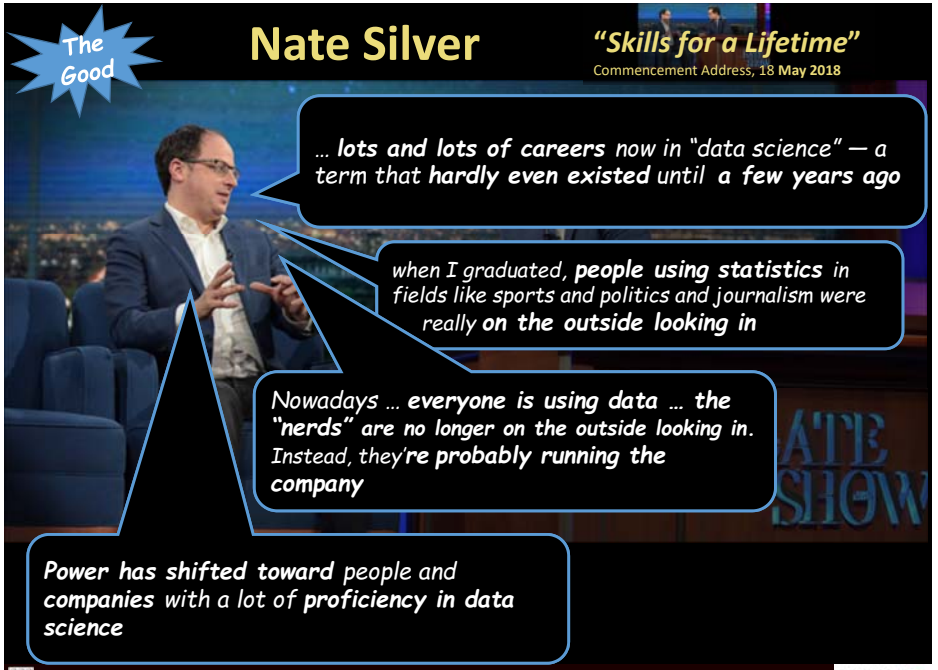
- Automation

Nate Silver

The Good

"Skills for a Lifetime"

Commencement Address, 18 May 2018



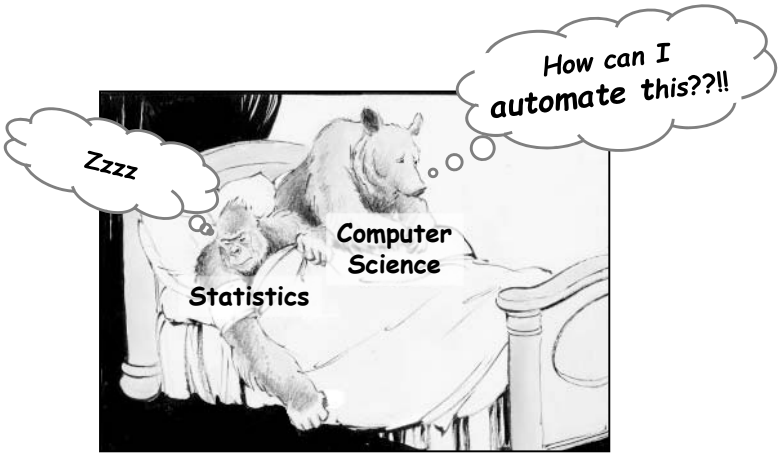
Where are we going?

- **"Data science"**
  - It's where the **demand** is
  - It's where the **investment** funding is (e.g. new/replacement positions)
- Qualitative methods
- Stochastic modelling of real-world processes

Where is the world going?

- Automation

Bed fellows in data science



The Bad

Nate Silver

"Skills for a Lifetime"
Commencement Address, 18 **May 2018**

*Companies and governments that are **capable of using data** in powerful ways **are also capable of abusing it***

*What **worries me** the most … is the **idea** that **using data science allows** one **to remove human judgment** from the equation*

*… **"machine learning"** appeals to people's notion of **a push-button solution** … the computer does all your thinking for you, **no human judgment required***

*a lot of **supposedly "objective,"** data- driven **algorithms** to determine criminal sentences **can encode and reinforce** racial **bias** based on how variables are chosen*

The Ugly?

Nate Silver

"Skills for a Lifetime"
Commencement Address, 18 **May 2018**

*the reality is that **working with data requires lots of judgment***

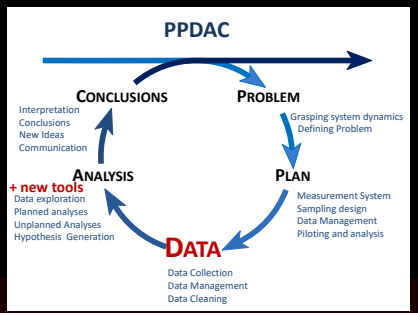
*it requires **moral judgment** in **deciding** what your **goals** are and in establishing **boundaries** for your work*

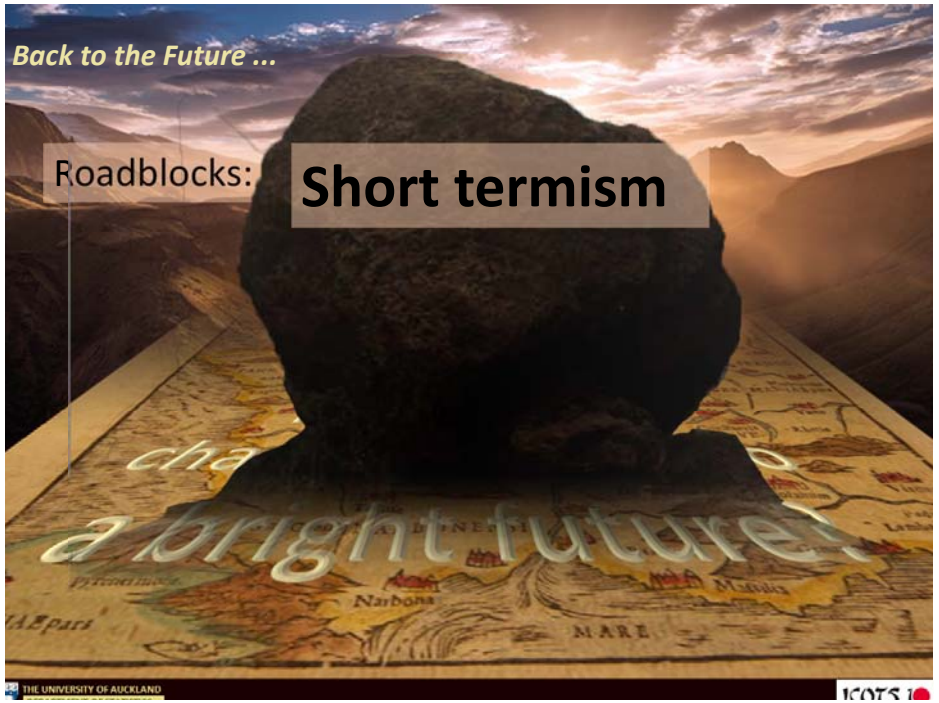
the correct interpretation** of the data is **rarely obvious**, and that **the obvious**-seeming interpretation **isn't always correct

*Sometimes **changing a single assumption** or a single line of code **can radically change your conclusion***

Where is "data science" sending us?

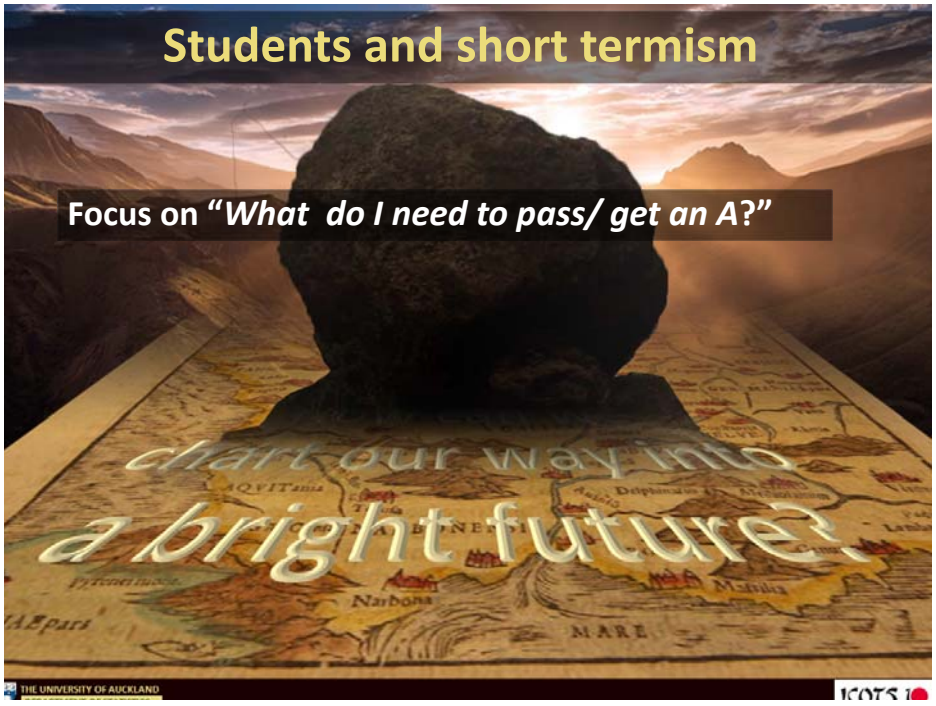
- **Into new-*for-us* areas …**
  - Harvesting & assembly of data from electronic sources
    - e.g. databases & websites via apis or scraping
  - Data wrangling (getting data into shape for analysis)
  - New data types (e.g. "big data", text, images, sound files)
  - More visualisation, CS paradigms for prediction, …
- New emphasis on coding (programming)






"As Rappaport keeps on speaking out for the realities surrounding investment and speculation, our society will profit as it builds on his keen insights."
FROM THE FOREWORD BY JOHN C. BOGLE
FOUNDER OF THE VANGUARD GROUP
SAVING CAPITALISM FROM SHORT-TERMISM
HOW TO BUILD LONG-TERM VALUE AND TAKE BACK OUR FINANCIAL FUTURE
ALFRED RAPPAPORT
BESTSELLING AUTHOR OF CREATING SHAREHOLDER VALUE
What is short-termism?
focus on short-term results at the expense of long-term interests.
York Times: the I-B-G-Y-B-G syndrome, "I'll be gone; you'll be gone" before anyone will have to answer for the toxic mortgage securities building up on bank balance sheets.
Terrible, isn't it ??!!
THE UNIVERSITY OF AUCKLAND


BILL PROUD
"Our long-term plan is to find another short-term plan"


Students and short termism
Focus on "What do I need to pass/ get an A?"
chart our way into a bright future?
THE UNIVERSITY OF AUCKLAND


Qualifications vs capabilities
SUCCESS!
Capabilities
What you can do ...
Qualifications
What you (can) have ...
THE UNIVERSITY OF AUCKLAND

Students and short termism

- Focus on "*What do I need to pass/ get an A*?"

And when they want help, you know they're thinking …

- "*Just give me the answer!*"
  - or at least a simple recipe!
- ***Anything but*** tell me ***"I actually have to think"***!

Terrible, isn't it ??!!

Qualifications vs capabilities

SUCCESS!

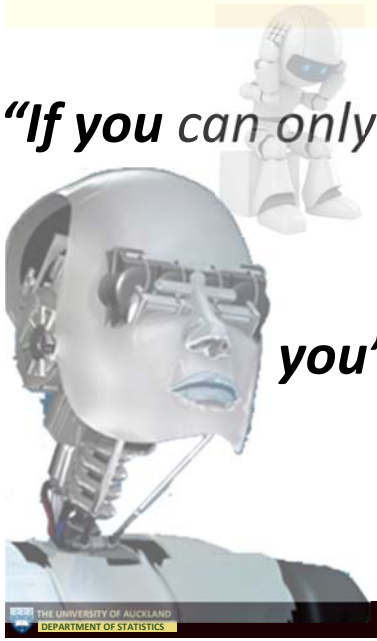
Capabilities

Incl. **how well you can think**

Qualifications

What you (can) have …

"If you** can only **think like a robot …



you'll be replaced by one!"

– Andrew Balemi

But actually, *It's not just them* !

- **We're all short-termists too**
  - The reward systems we work under reinforce that
    - *Get it done*
    - *Not-too-bad evaluations*
    - *Go on to something that counts more*

- ***But that shouldn't entirely define us …***
    - "the greater good" often comes from considering the longer term

The Future of Work

The Future of Work …

The Future of Work …

- ***What do we want for our students?***

The ability to do things machines can't do!

The Future of Work …

Theorem:

- Just about the only constant will be change
  - and the ***pace of change is accelerating***
    - ***"the only constant is change"***

– Heraclitus, 500 BC

Corollary:

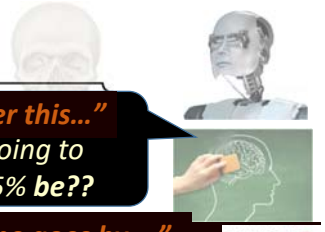
- ***Everyone*** will have to be ***a life-long learner***

For this …

- **Big-picture conceptions …**

  have **long-term value**

- **Details** are **death dated**



Question: ***"… You must remember this…"***
If only 5% of what you "teach" is going to stick long-term, ***what should that*** *5%* ***be??***

"… the fundamental things apply as time goes by …"

The ability to operate …

a ***recipe*** / ***procedure*** / ***algorithm*** … has **long-term value**

The ability to operate …

any particular ***recipe*** / ***procedure*** / ***algorithm*** …

is **death dated**

The ability to …

code (program) **…**

has **long-term value**

The ability to …

code (program) **…**

anything particular *(in any particular language)*

is **death dated**

"Today's complex programming task is tomorrow's mouse click"
-- Lucid Dreams about the Future

Anything generically useful gets wrapped up in a software module

However, the ability to <u>devise</u> …

recipes
procedures **…**
algorithms

has **HUGE long-term value**

Software, technologies

- Best approached as:
  - ***Automaters*** of mechanical processes
  - ***Aids to human thinking*** & problem solving
- We need to …
  - ***Identify*** *and emphasize* ***the key decision points*** where ***human insights add value***
  - Think in terms of the rest being automated
    - Except for those who will be tool makers rather than tool users
- The most important ***human intervention points***
  - are around ***goal setting*** and ***critique***
    - e.g. of assumptions

And what do we know about any assumption? …

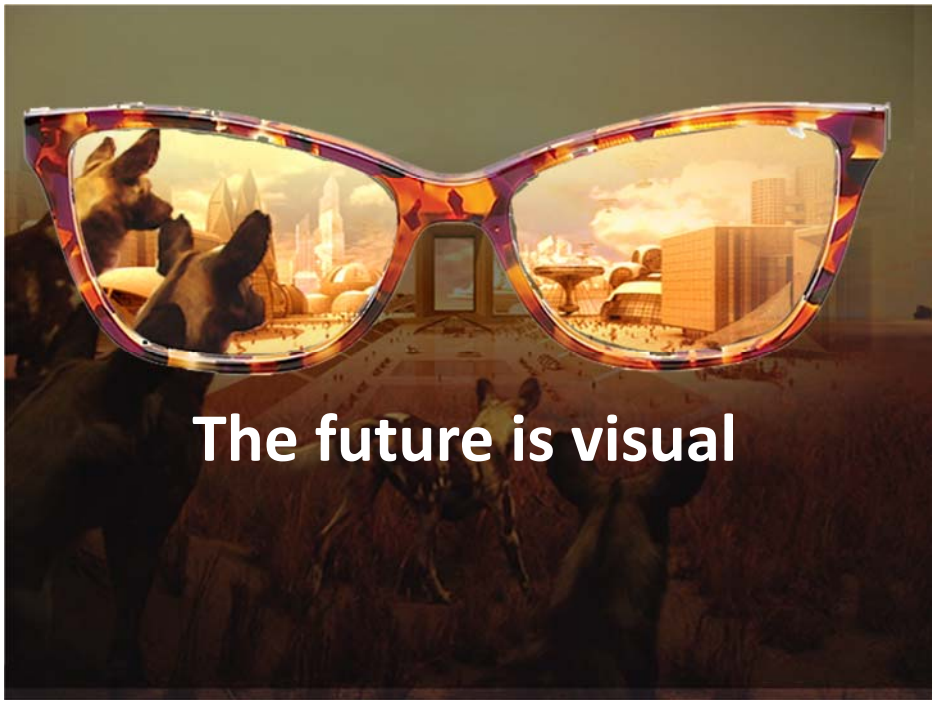
"It ain't necessarily so. Oh yeah it ain't necessarily so"

What else helps life-long learning?

Intimations of what's **around the next bend …**

or just over the horizon …

Intimations of ***what just might be possible***



The future is visual

The biggest hope for increasing the capabilities of a broad cross-section of society

- to better understand data
- To better understand data-related concepts

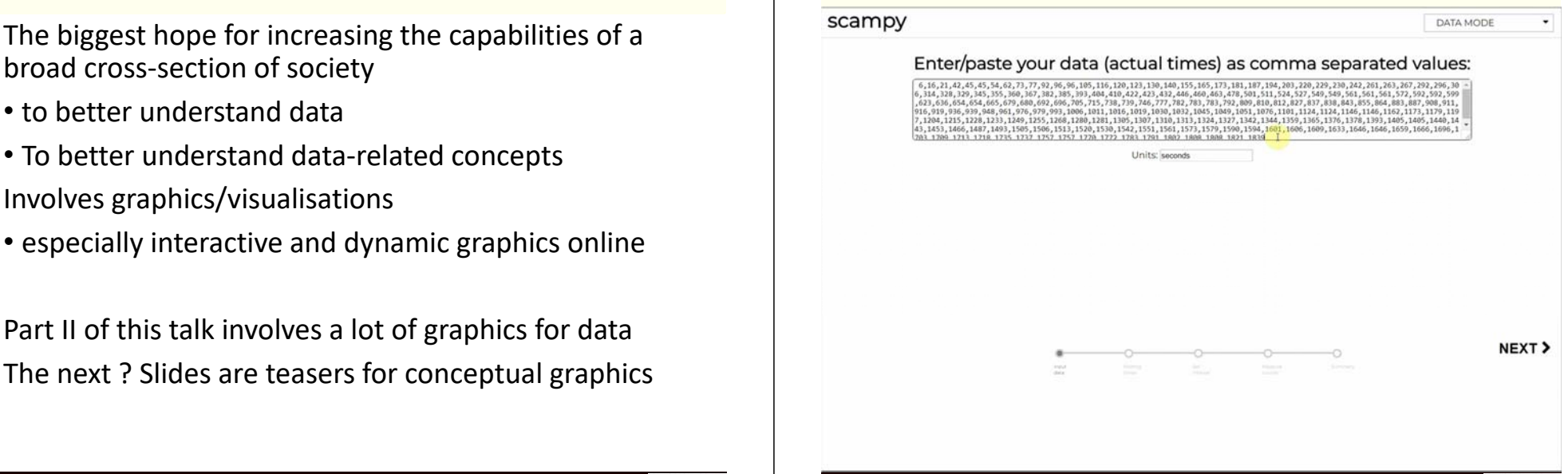
Involves graphics/visualisations

- especially interactive and dynamic graphics online

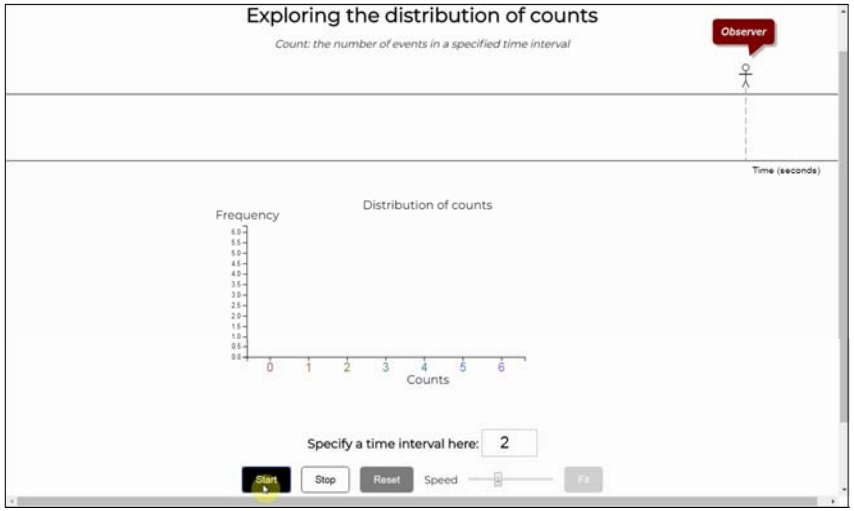
Part II of this talk involves a lot of graphics for data

The next ? Slides are teasers for conceptual graphics

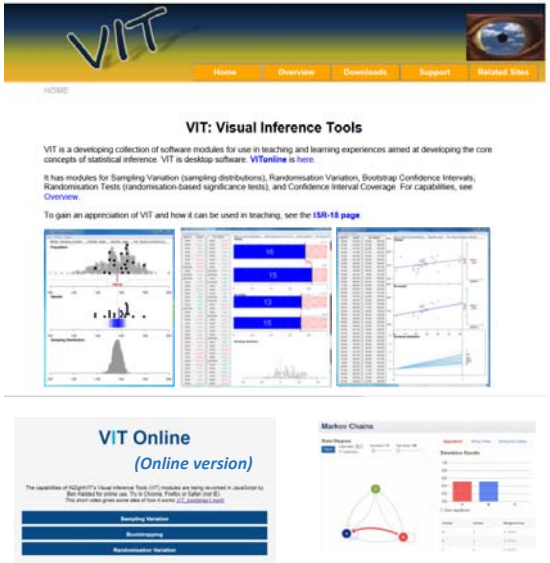
Conceptual graphics – *Teasers*

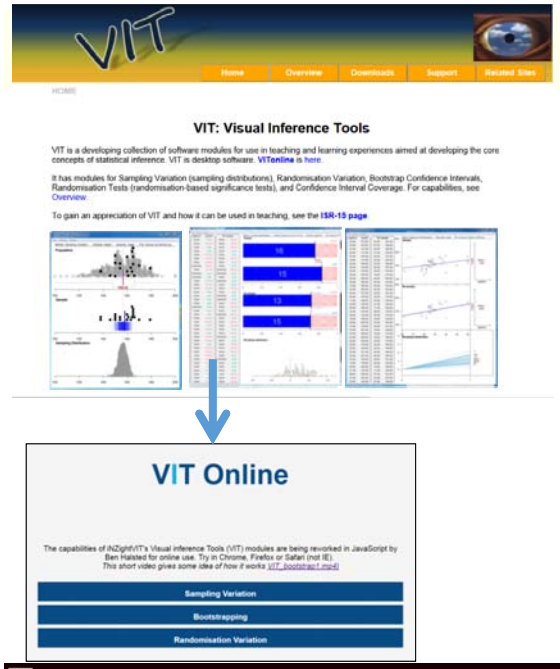


Conceptual graphics – *Teasers*



Conceptual graphics – *Teasers*





Why Animate?

- To convey nature of problems
- To show how processes work
- To convey "randomness"
- The key:
  Carefully connecting all the conceptual dots as a process develops

"Data science" given us something new

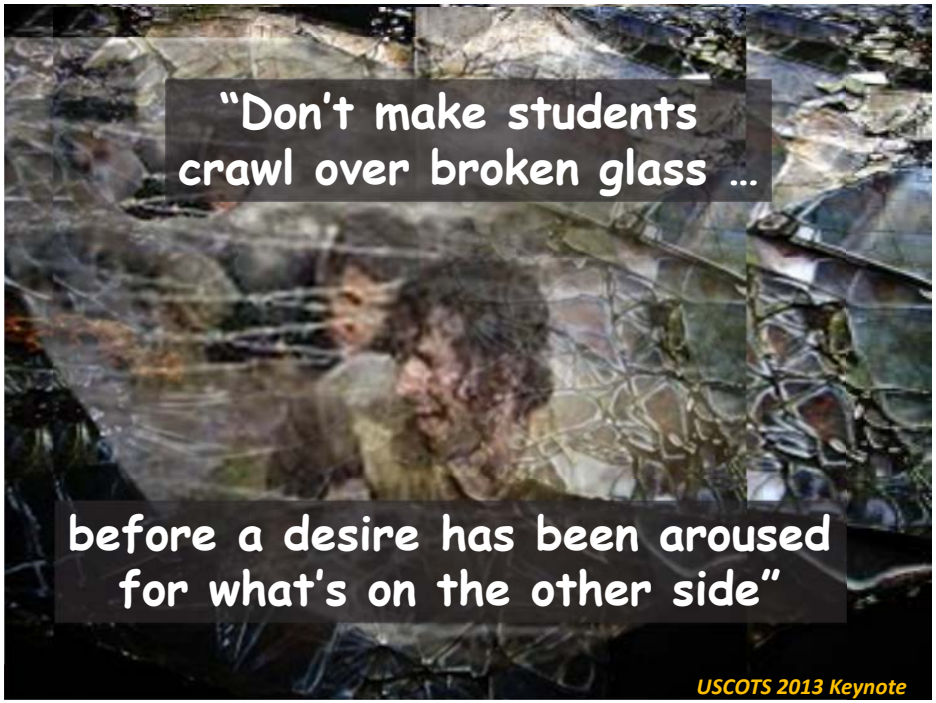
- a growing cadre of undergrad students so allured by a career in "data science" that we can get close to …

"Jump!" "*How high*?"

But for the rest …

- the broad cross-section we need to reach to impact the wider society …

this adage still applies …



We need **the "3 E's" of stats-ed**

- **E**ntice
- **E**xcite
- **E**mpower

What is *the single best thing*

we can do for our students?

Two Challenges

How can we trigger ...

"This data world could light up my life" **?**

Or how can we make ...

intro stat like Speed Dating ?

"Give me a call sometime. We'll go speed dating ..."

(Hint: For most I don't think it's grinding out code)

Enough "hard thinking" for one talk!!