

**Anticipating...**



**...even larger elephants**

**Turning future shock into advantage**

**David Wood**

**@dw2**



[londonfuturists.com](http://londonfuturists.com)

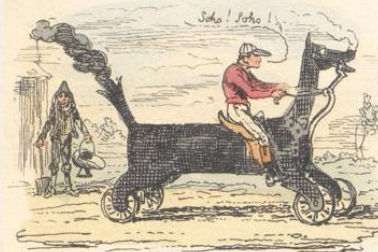


[deltawisdom.com](http://deltawisdom.com)

# The Horses, 'going to the Dogs' – Painted by George Cruikshank, 1829



**"A coach without horses!!!"**



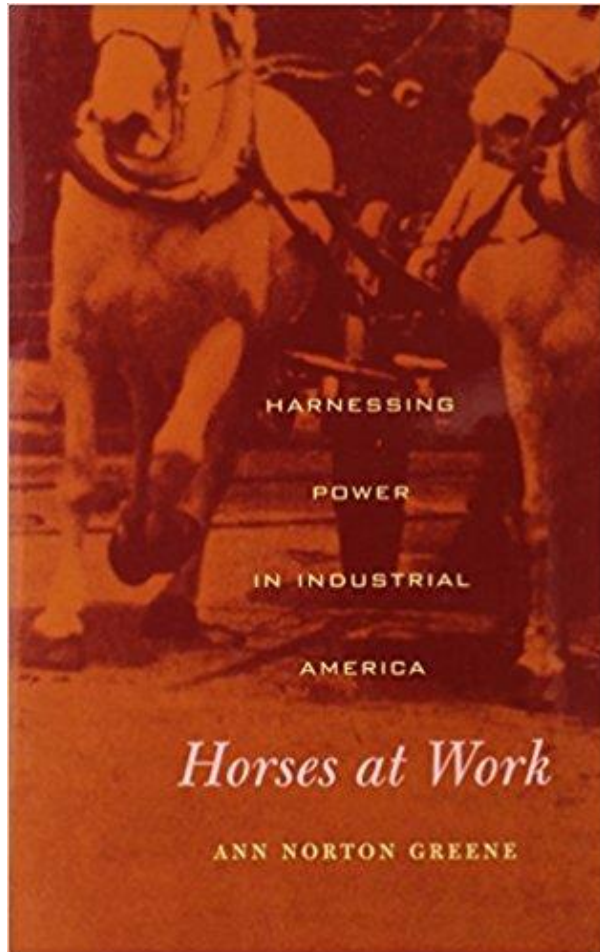
A Fiery Steed ~

**"A Fiery Steed"**

**"I think we shall soon have meat cheap enough!!"**

**Prediction: fewer jobs for horses**

<https://www.bl.uk/collection-items/the-horses-going-to-the-dogs-from-george-cruikshanks-scrap-and-sketches>



From 1840 to 1910, horses **increased** faster than people, their population rising from **4.3M** to **27.5M**

“Our dependence on the horse has grown almost *pari passu* with our dependence on steam. We have opened up great lines of steam communications all over the country, but **they have to be fed with goods and passengers by horses**. We have covered the ocean with great steamers, but **they can neither load nor discharge their cargoes without horses.**” – “The Nation”, 1872

“Disadvantages of steam engines within the narrow confines of cities included the ever-present danger of **fires** started by sparks, their **acid black smoke**, their deafening **noise**, and their **heavy weight**, which cracked street pavements.”

– Robert J. Gordon: *The Rise and Fall of American Growth*

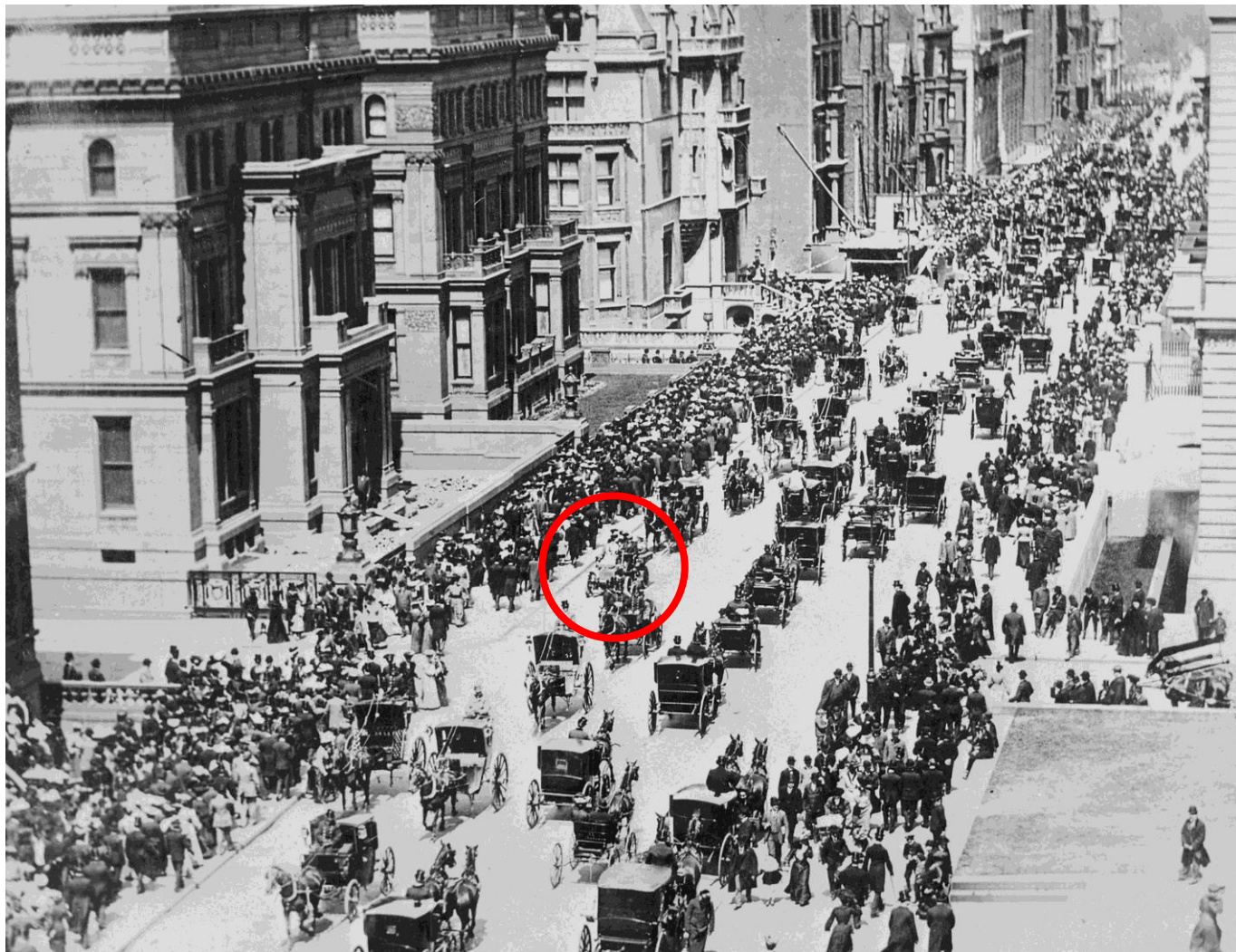
Fifth Avenue,  
New York City,  
Easter morning

1903

Photographer:  
William H. Zerbo  
N. Y. Tribune

<http://collections.mcny.org>

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5TH AVE. EASTER '13

Alterations are Completed  
The Building will be Occupied by  
**SPALDING & BROS.**  
at 25 West 42nd St.



Fifth Avenue,  
New York City,  
Easter morning

1913

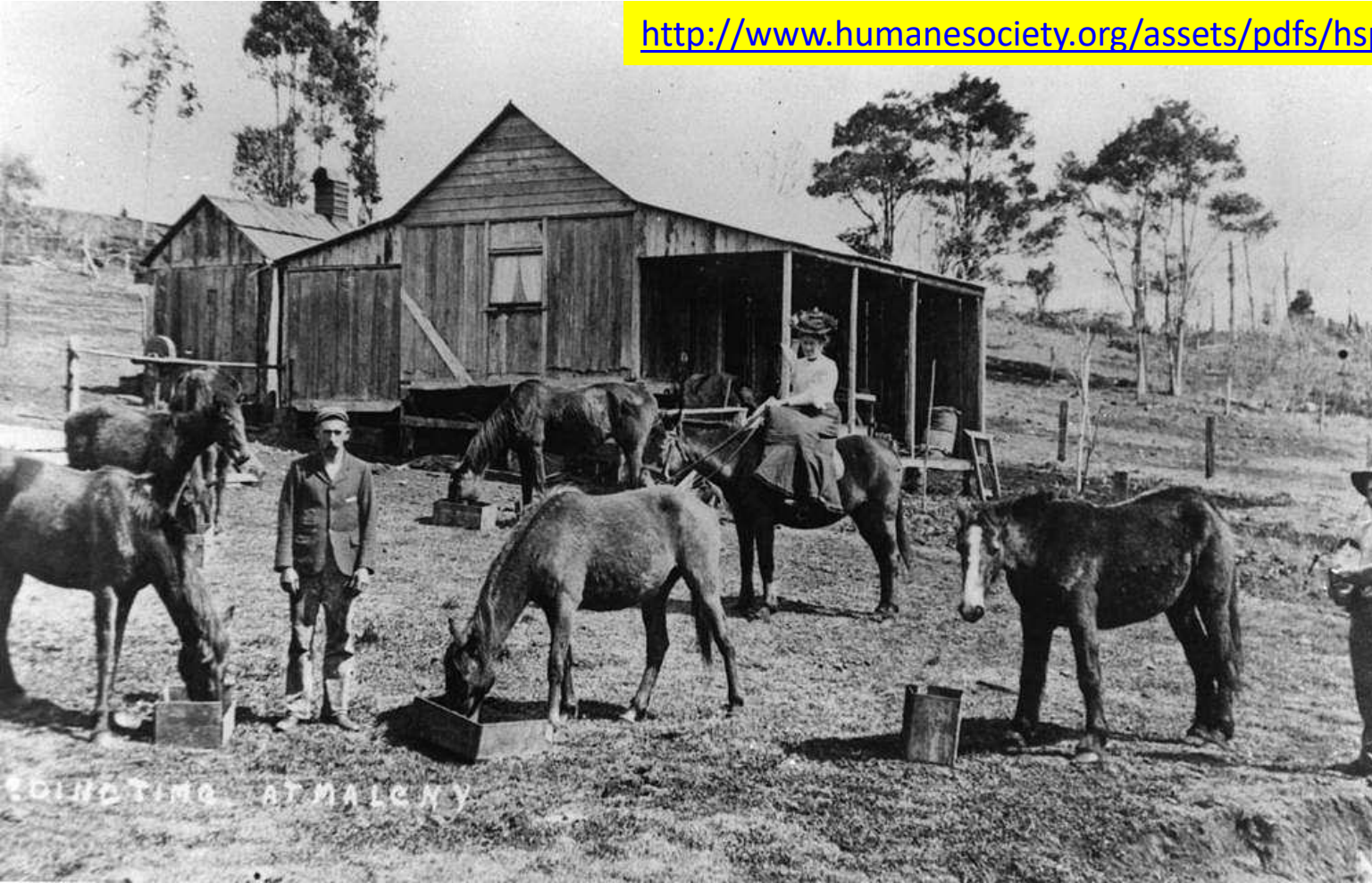
George Grantham Bain  
Collection

[http://www.loc.gov/  
pictures/collection/ggbain/  
item/ggb2005011116/](http://www.loc.gov/pictures/collection/ggbain/item/ggb2005011116/)

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@dw2

2529-9



1867: 8M

1900: 21M

1910: 27.5M

1935: 17M

1950: 8M

1960: 3M

*Technology  
displaced horses  
from more and  
more occupations*

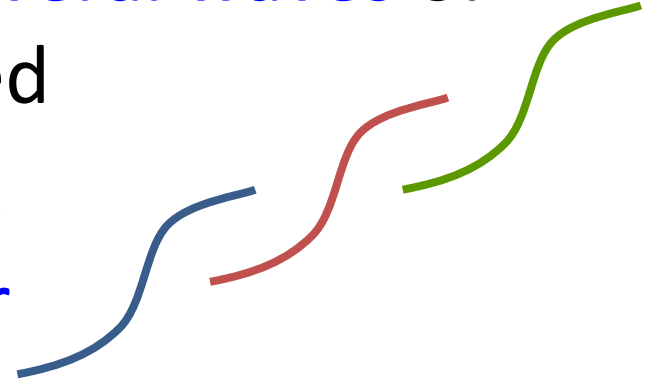
The same will  
likely happen to  
humans too

# Implications...?

1829 -> 1929



- When a futurist predicts that jobs will be replaced by automation...
- This prediction is for **100 years** in the future(?) **X**
- Yes, the prediction may take **several waves** of technology before being fulfilled
- But nowadays, **new tech waves** are coming ever faster



# Sandstorm: Winner of 2004 DARPA Grand Challenge



150 miles in  
the Mojave  
Desert region  
of the US

Completed <5%  
of the course

x



Frank Levy and Richard J. Murnane



## THE NEW DIVISION OF LABOR

How Computers are Creating  
the Next Job Market



Frank Levy  
MIT



Richard J. Murnane  
Harvard

2004

“Computerisation should have little effect on the percentage of the work force engaged in these tasks...

Examples include driving a truck...

“Non-routine manual tasks: physical tasks that cannot be well-described as following a set of If-Then-Else rules, because they require optical recognition and fine motion control that have proven extremely difficult for computers to carry out...”

# Sandstorm: Winner of 2004 DARPA Grand Challenge



150 miles in  
the Mojave  
Desert region  
of the US

Completed <5%  
of the course

✘

2005 Challenge:

Five vehicles  
completed whole  
course

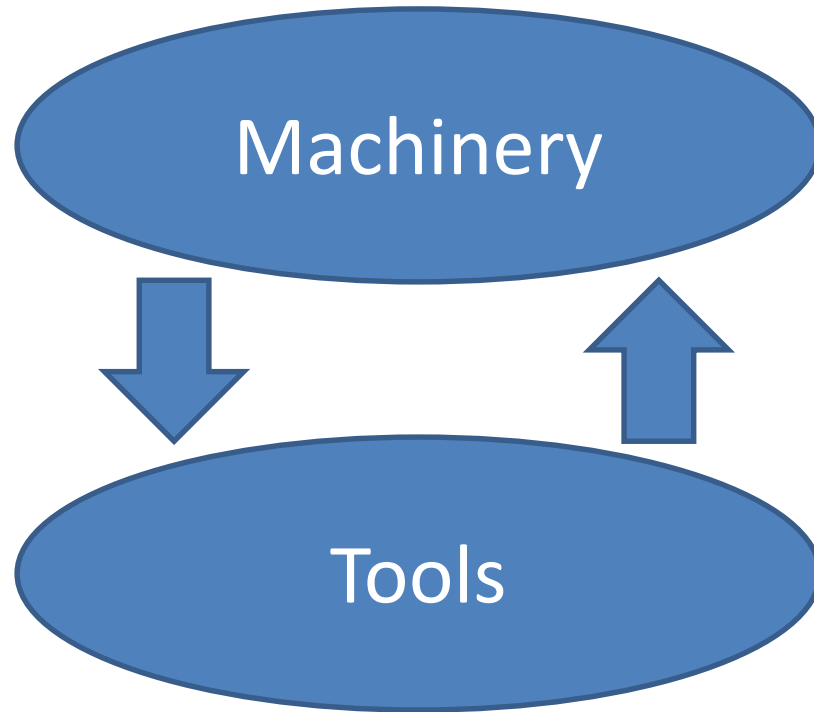
✔

**“Uber’s Self-Driving  
Truck Makes Its First  
Delivery: 50,000 Beers”**

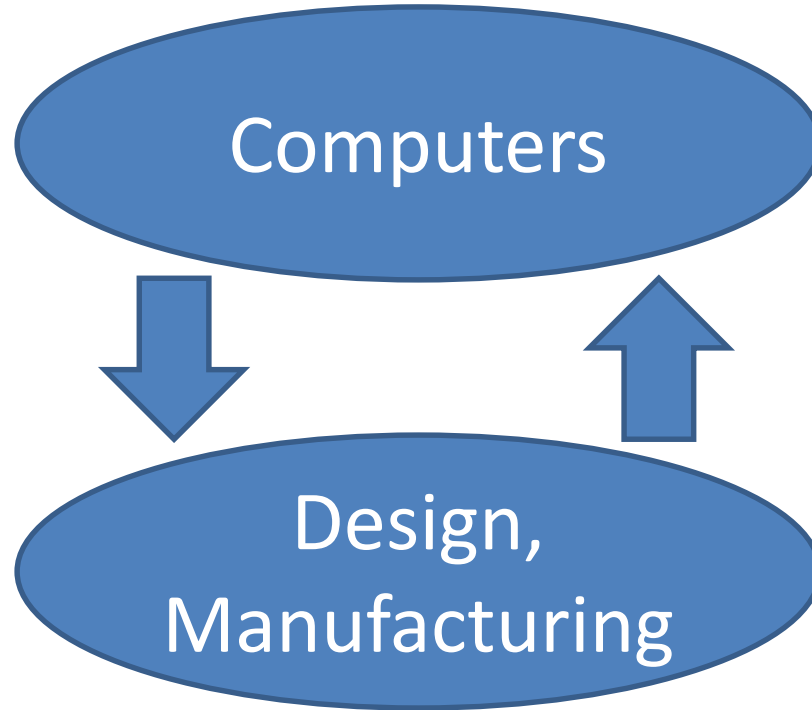


<https://www.wired.com/2016/10/ubers-self-driving-truck-makes-first-delivery-50000-beers/>

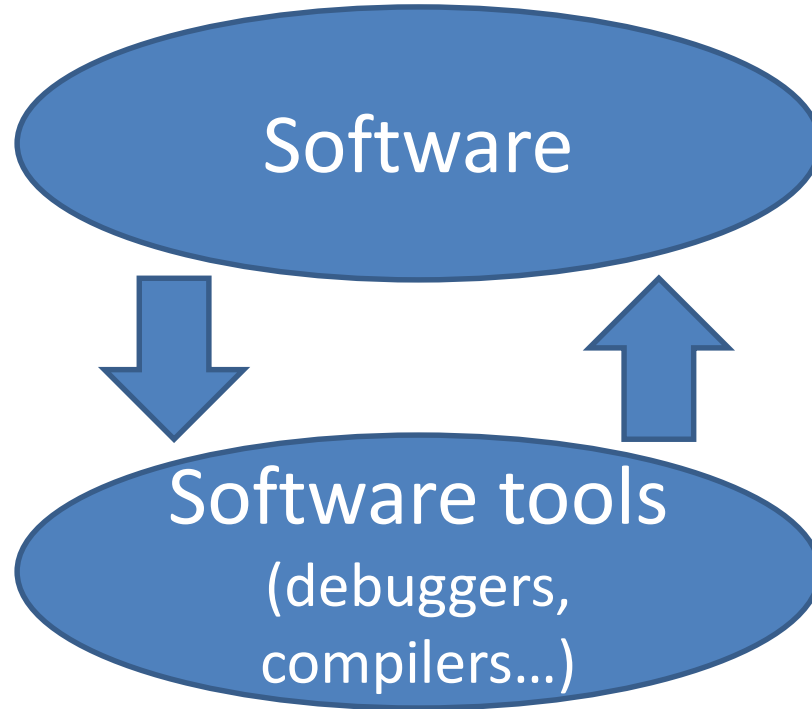
# Positive feedback cycles



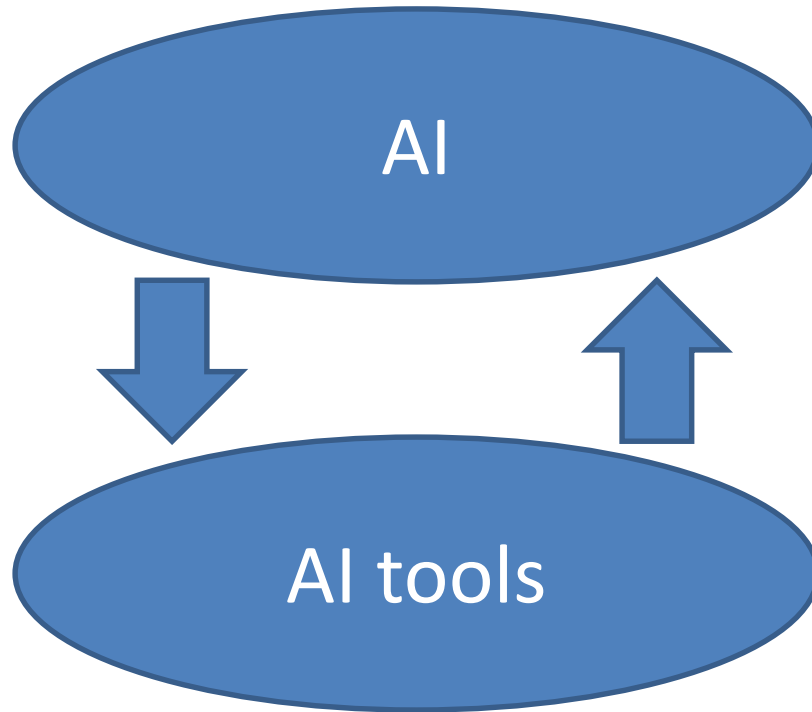
# Positive feedback cycles



# Positive feedback cycles



# Positive feedback cycles



# “Google’s DeepMind AI can lip-read TV shows better than a pro”: **46.8%** words correct vs. **12.4%**



This resulted only after the **training data** had been improved by another AI



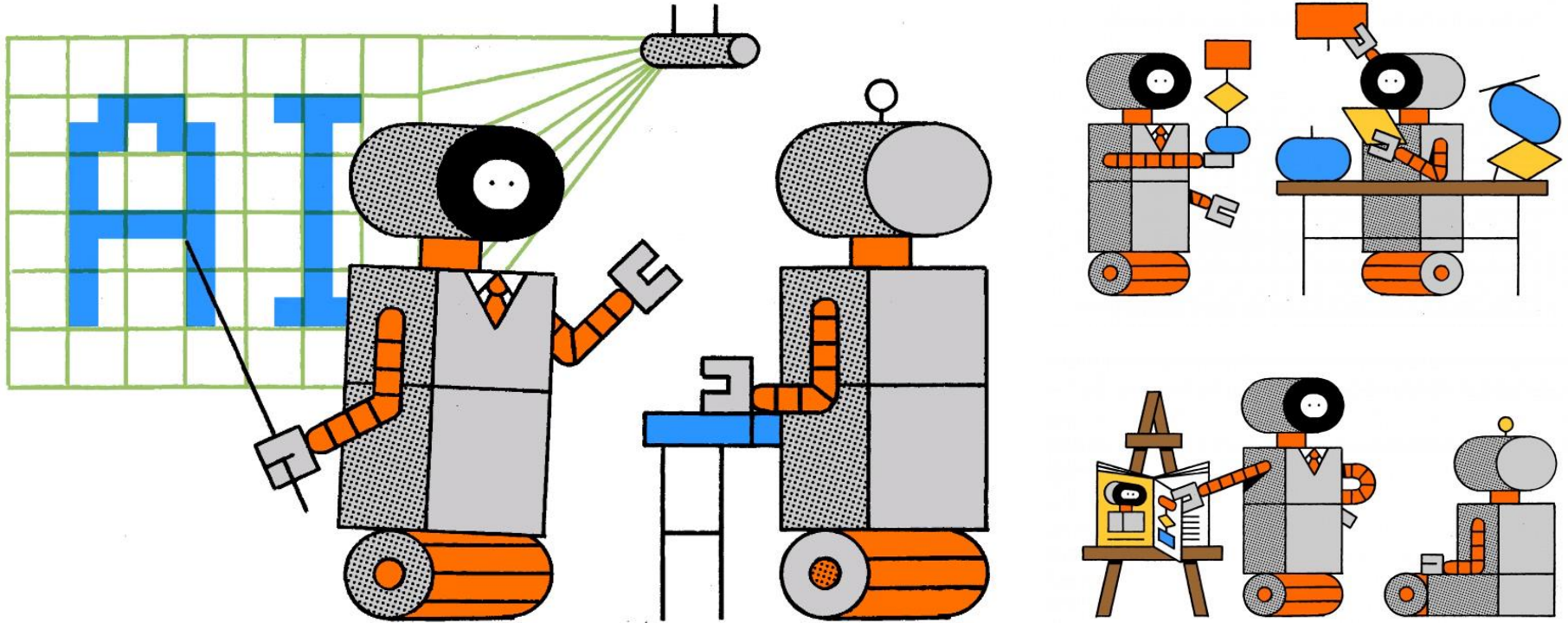
BBC data set contains nearly 17,500 unique words

<https://www.newscientist.com/article/2113299-googles-deepmind-ai-can-lip-read-tv-shows-better-than-a-pro/>



# “AI Algorithms Are Starting to Teach AI Algorithms”

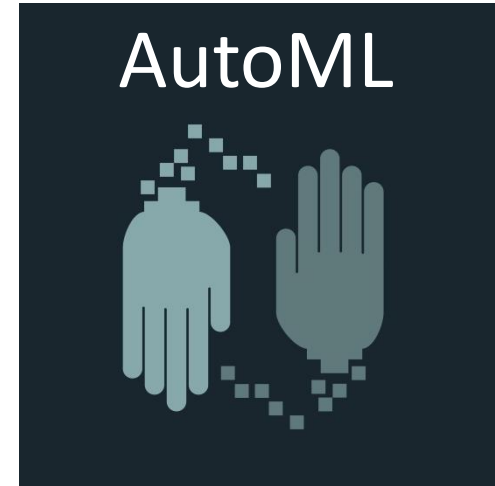
Automating machine learning will make the technology more accessible to non-AI experts

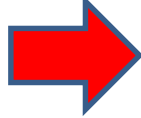


# “Google’s learning software learns to write learning software”

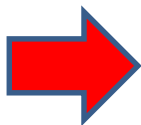
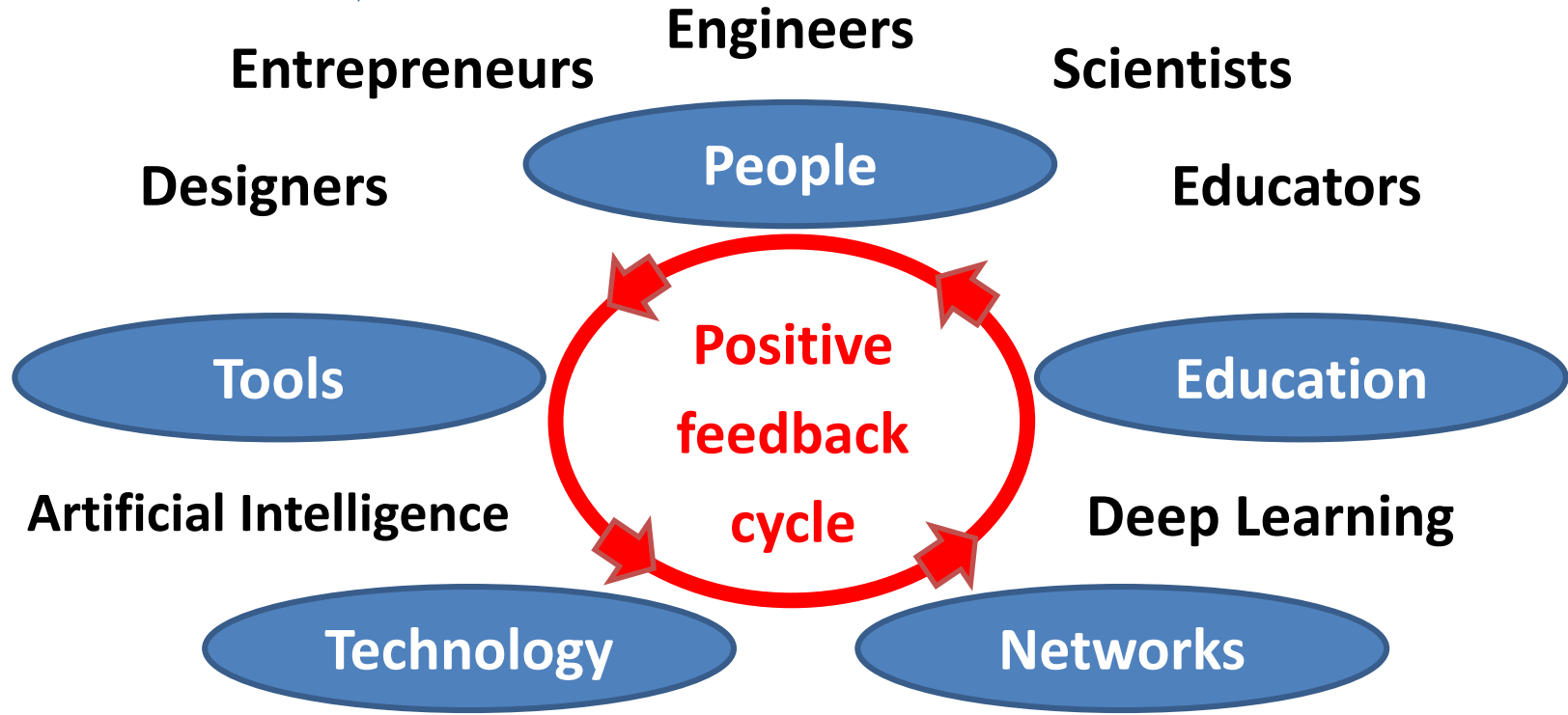
“Google’s researchers have taught machine-learning software to build machine-learning software...

“In some instances, what it comes up with is **more powerful and efficient** than the best systems the researchers themselves can design.”





The acceleration of *disruption*



The acceleration of technology

# Motivations to improve AI

- AI for financial trading algorithms
- AI for virtual characters inside games
- AI for customer support agents
- AI for improved interaction design
- AI for faster healthcare research & development
- AI for new creative directions in music / art
- AI for developing theories of science / engineering
- AI for anti-malware software (and for malware)
- AI for improved autonomous weaponry

=> Expect  
even faster  
progress

# “China’s Artificial-Intelligence Boom”



“The U.S. no longer leads the world in journal articles on Deep Learning. **Now China leads.**”

“The velocity of work is **much faster in China** than in most of Silicon Valley,” says **Andrew Ng**, chief scientist at Baidu.



Dec 2013: "We are 20 years away..."



ALPHAGO  
00:00:49



LEE SEDOL  
00:01:00

March 2016

AlphaGo 4,  
Lee Sedol 1



## AlphaGo “Lee”

Fed huge numbers of games played by human experts

Two intertwined deep learning networks (“policy” and “value”)

Improved over nearly a year

Games won in match: 0

Hardware: 48 TPUs

## AlphaGo Zero

Tabula rasa (blank slate)

A single combined deep learning system

Taught itself in three days

Games won in match: 100

Hardware: 4 TPUs

<https://deepmind.com/blog/alphago-zero-learning-scratch/>



# Organisations should split their focus across **three perspectives** in parallel



**Present-day  
activities**

*Operational excellence*

**Fulfilling  
commitments**



**Foreseeable  
future**

*Incremental pipeline*

**Search for  
growth**



**Game-changed  
future**

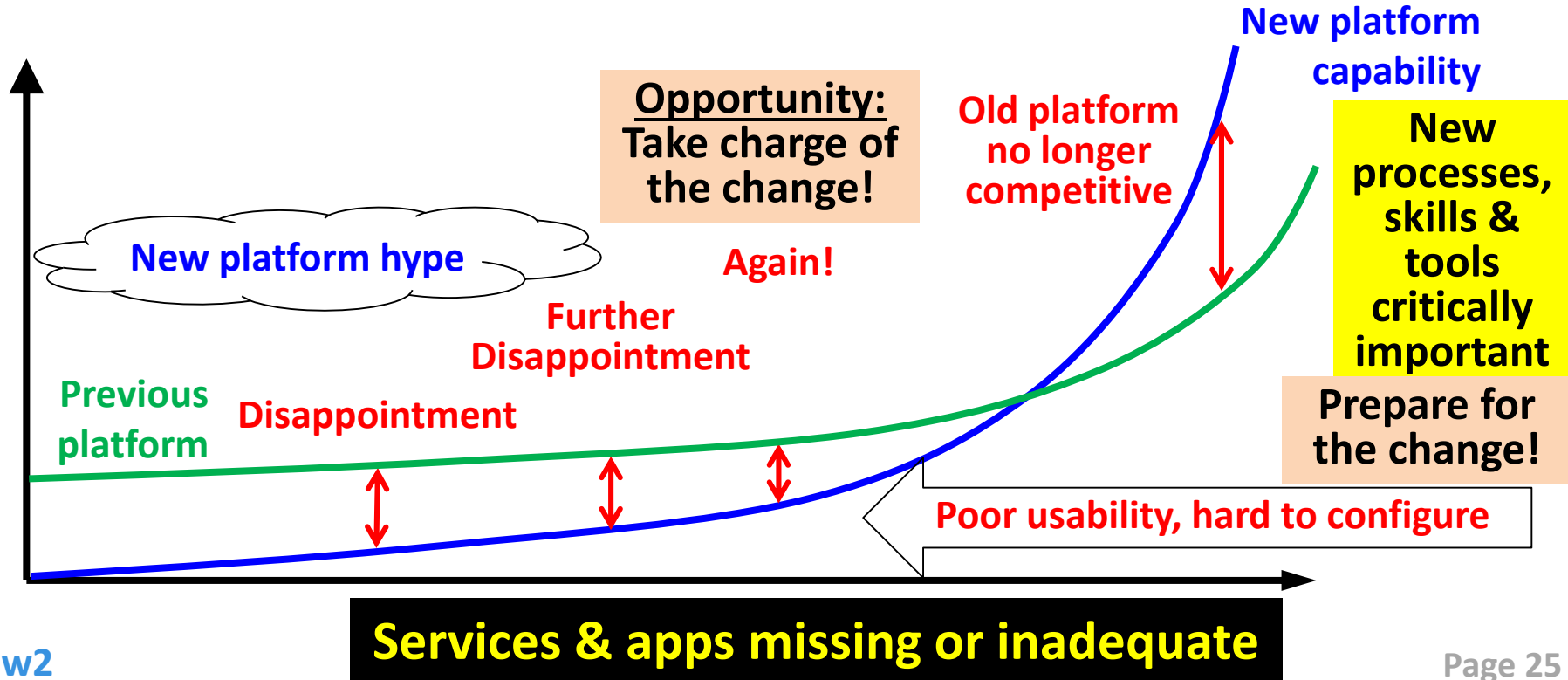
*Disruptive change*

**Creating a  
new future**



# Disruptions can take a long time in gestation

Even though they may eventually seem to blossom quickly



# Today's elephants and tomorrow's

- AI systems replacing expert assessment
- Drones replacing human inspectors
- Blockchain bypassing centralised control
- Desktop -> mobile first  
-> glasses first



- AI dealing with human messiness
- AI for creativity
- Artificial emotional intelligence  
(Affective Computing)
- Mind-hacking  
("stealing fire")



# “Human Poker Pros Are Getting Trounced By an AI”

Heads-Up, No-Limit Texas Hold'em poker  
“The bot gets better and better every day”





“Computers will have developed ‘common sense’ within a decade and we could be counting them among our friends not long afterwards”

**Geoffrey Hinton**

University of Toronto and Google

<http://www.macleans.ca/society/science/the-meaning-of-alphago-the-ai-program-that-beat-a-go-champ/>

<https://www.theguardian.com/science/2015/may/21/google-a-step-closer-to-developing-machines-with-human-like-intelligence>

# AI creating music as good as... Bach



**Prof David Cope**

University of California at Santa Cruz

“Musical Turing test” at University of Oregon

“wonderful... the music touched my innermost being”

The image shows the cover of a CD titled "Bach by Design". The cover features the text "Bach by Design", "Computer Composed Music", and "David Cope -- Experiments in Musical Intelligence". There is a red square logo with a white horse and the word "CENTAUR" in red. Below the text, there is a musical score with black notes on a white background, overlaid with blue binary code (0s and 1s). The CD number "CRC 2184" is visible in the top right corner.

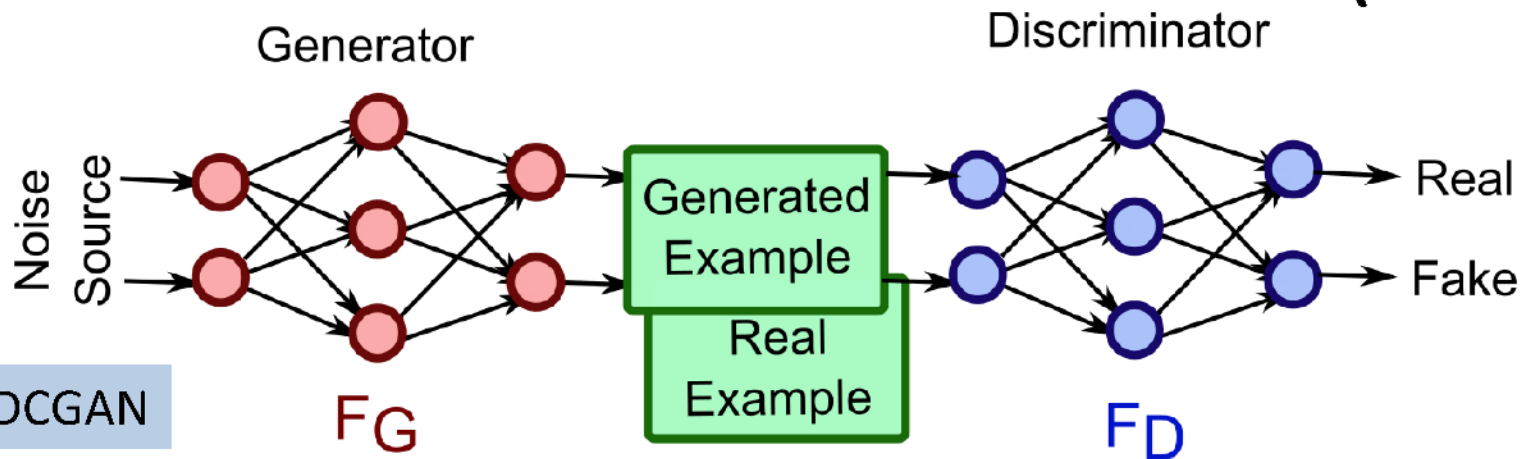
*Bach by Design*  
Computer Composed Music  
David Cope -- Experiments in Musical Intelligence

CENTAUR  
CRC 2184

LOAD 'BACH-FUGUES)  
PATTERN-MATCH 'BACH-FUGUES)  
COMPOSE 'NEW-BACH-FUGUE)

(04 50 62 64) (525 67 781) (84 140 45 78 1  
1712 69 156 1 64) (18 25 1 64) (203 64 56 1 6  
324) (55 2 64) (210 64) (636 6 1 6  
543 67 65 1 64) (594 55 156 1 64) (6072 781 1 6  
3906 50 156 1 64) (4062 48 156 1 64) (421 50 156 1 6  
5312 78 66 1 64) (812 32 312 1 64) (5469 72 156 1 6  
5675 58 1 64) (3 1 156 1 64) (5938 65 156 1 6  
875 43 62 1 64) (103 56 1 64) (118 6 1 64) (1  
44 6 56 1 64) (5 3 2 1 64) (8594 64 156 1

# Generative Adversarial Networks (GANs)

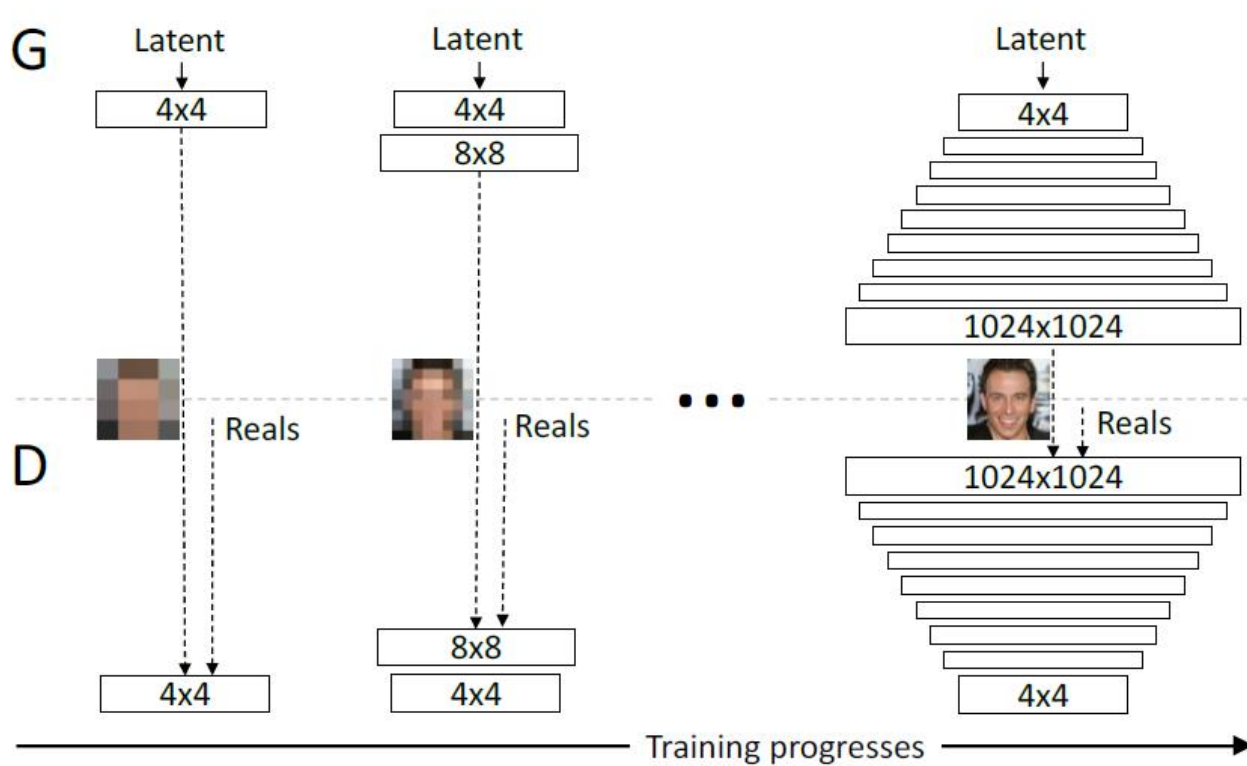


GAN -> DCGAN

“GAN... is the most interesting idea in the last 10 years in Machine Learning”  
– Yann LeCun

- Two “adversarial” networks
  - One network (“G”) generates “forgeries”
  - Another network (“D”) learns to discriminate the fakes (forgeries) from “real” examples
- Both networks get better and better over time
  - Via this arms race

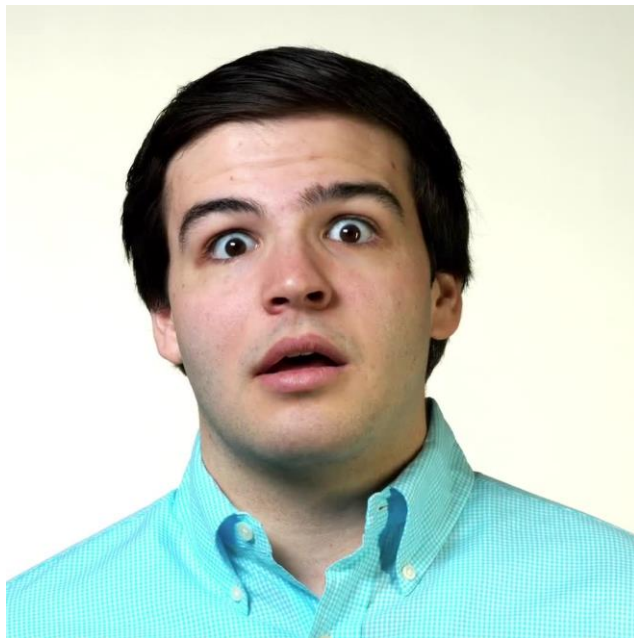
# Generative Adversarial Networks (GANs)



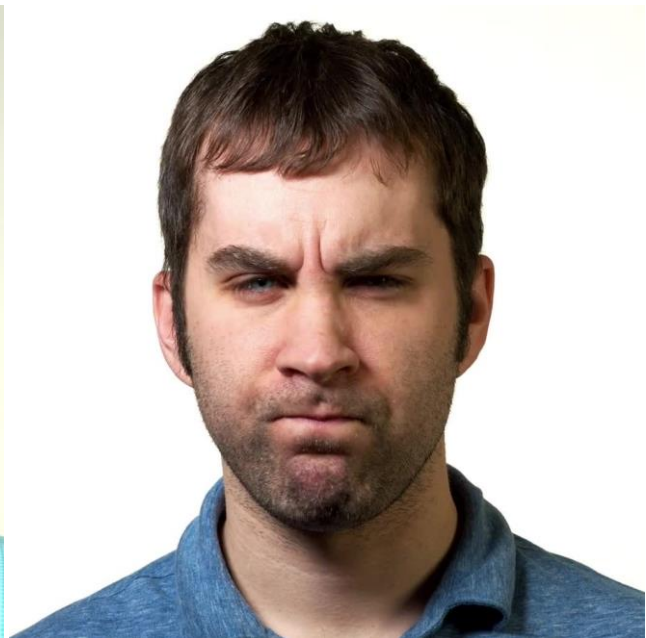
# Affective Computing



**Joy**



**Surprise**



**Anger**



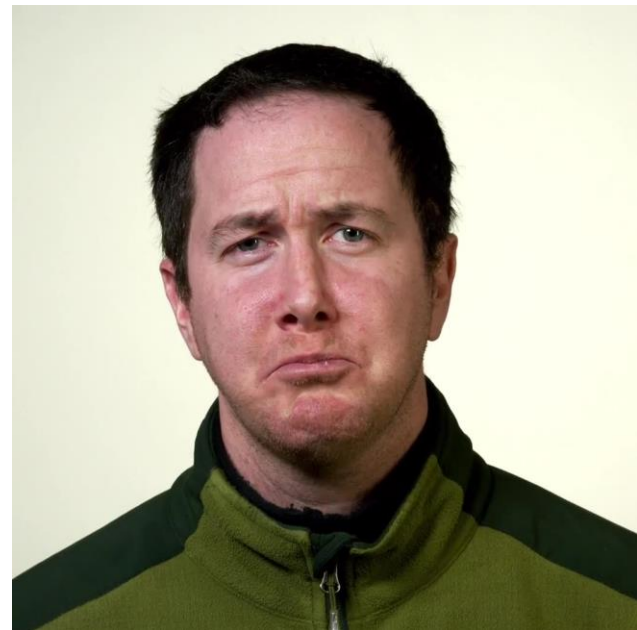
# Affective Computing



**Disgust**



**Fear**



**Sadness**



“I imagine a future in which all our devices have an **emotion chip**, very much like GPS in our devices today. With this emotion chip, technology will be able to **sense our mood** and adapt to it, helping us lead **healthier and more productive lives.**”

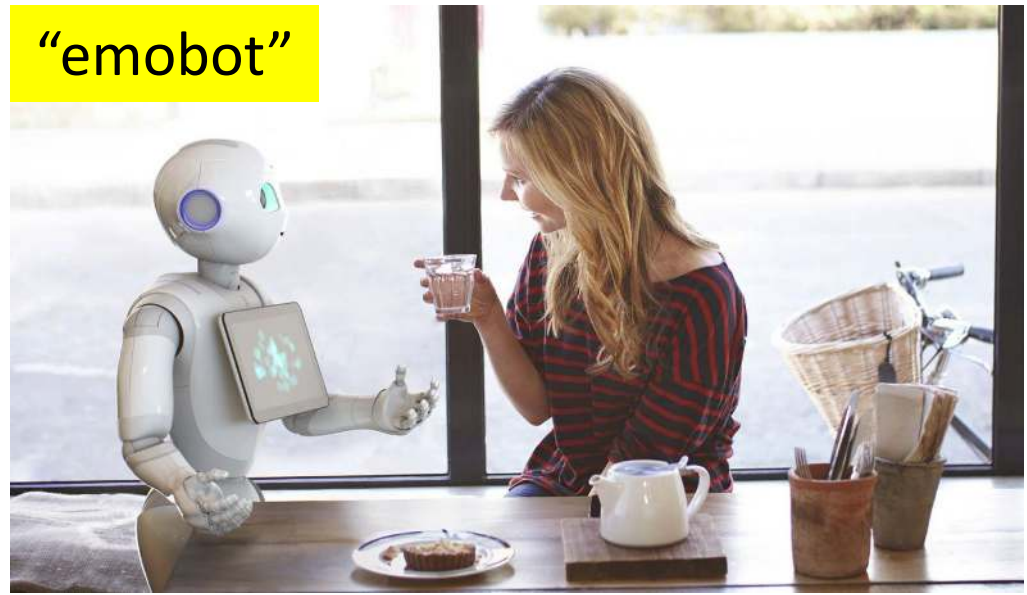
Rana el Kaliouby  
Chief Science Officer  
**:) Affectiva**

<https://venturefizz.com/blog/digitizing-emotion-mit-startup-affectiva-delivers-new-level-analytics-and-real-time-interaction>



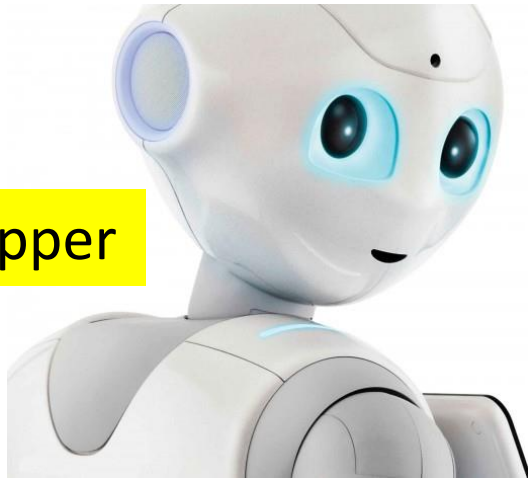
Paro

“emobot”



“Robots in Japan now have emotions”

Pepper



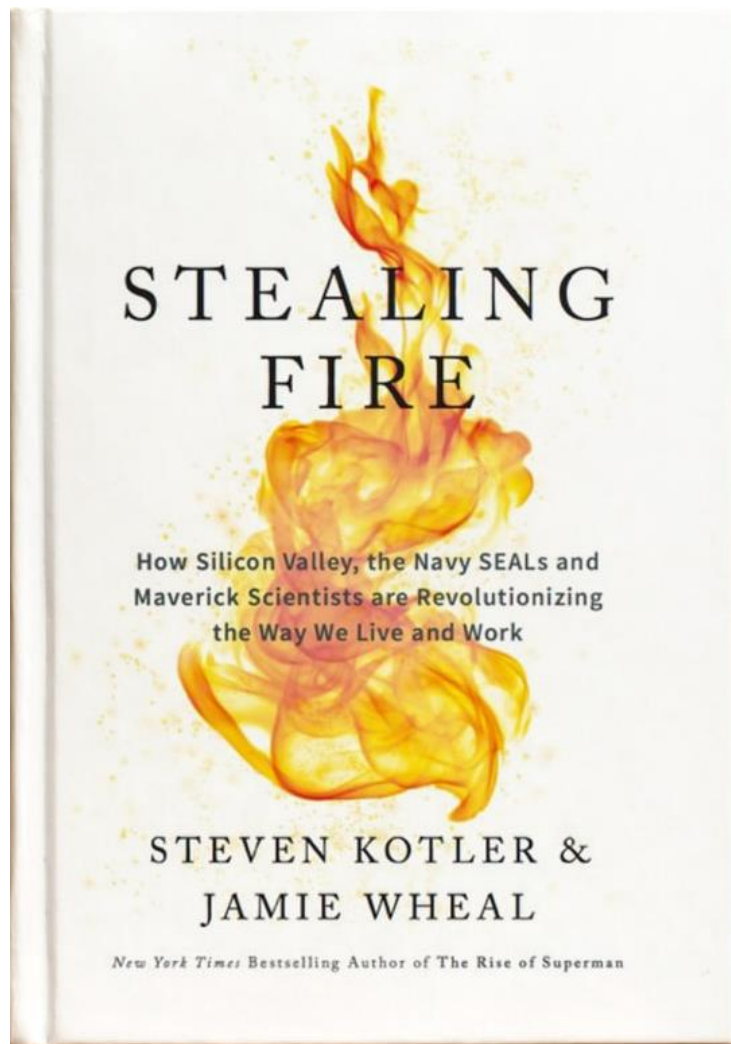
“AI Robots Can Now Read Human Emotions”

- noticing human facial expressions
- deciphering mood based upon their tone of voice

<http://www.glitch.news/2016-02-10-ai-robots-can-now-read-human-emotions.html>

# Mind-hacking

“How Silicon Valley, the Navy SEALs and Maverick Scientists are Revolutionizing the Way We Live and Work”



- Non-Ordinary States of Consciousness
- Flow – “In the zone”
- Group Flow

Techniques include

- NOT grit, better habits, or 10,000 hours...
- VR
- Biofeedback devices
- Electrical stimulation of the skull
- Smart drugs
- Burning Man, extreme sports...

# The futurist mindset

## Embrace uncertainty

- Fail fast, fail forward
- Collect feedback
- Pivot to new sprint

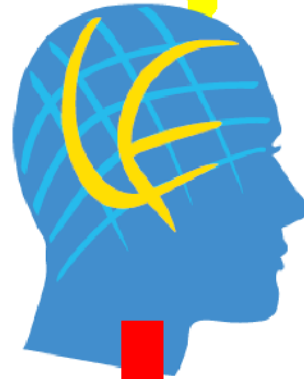
## Emotional intelligence

- Don't fear failure
- Growth mentality

## Learn how to learn

- Intelligence Augmentation (IA) *Mind-hacking*
- Collaborate with tech

Conceive and  
evaluate  
scenarios

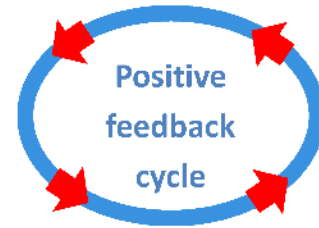


Conceive and  
achieve  
scenarios

## Imagination

## Research

- Technology
- Human (Design)
- Social/Political



## Collaboration

- Partnerships
- Community



Better  
foresight

Better  
agility