Digital Revolution II

Topics

- Digital Revolution I Scale and Disruption
- Scale: Numbers Please
- Disrupting Business
- Disrupting Jobs
- Disrupting Politics
- Disruptive Internet?
- Platforms
- Peer-to-Peer strikes back?

Digital Revolution II - Developments

- Forces
- Algorithms
- Money
- Jobs
- The Second Machine Age
- Evolutionary Humanism
- Dataism
- Digital Revolution III Complexity and Dynamics: Making Sense
- The Big Picture
- Explanations (Cybernetics, System Theory, Network Theory, Chaos Theory, Cynefin Framework, Sustainability and Resilience)
- Change Factors
- How to think the future

Digital Revolution IV - Strategies

- Autarkism
- Micro-Nations
- Micro-Societies
- Economic Utopias
- Political Movements
- Realistic Utopias

Developments

Predictions II: The Inevitable? (K.Kelly)

- Becoming We will be in a constant state of change, of learning, of renewing, and of adapting. Will move from owning to subscribing. Perpetual newbies. (The IT-Nerd classic: always upgrading because everything will become better, WK)
- Cognifying Artificial intelligence will be everywhere and in everything and will change how things work, and how we work with things.
 - (must be autonomous and non-interactive)
- Flowing Flow of information, newly digitalised products, we will be able to dip in at anytime to access services from the data flow. The liquidity of products and services rendering them practically free. (Free information whenever and wherever I want)
- Screening Have you read The Circle?, the main character ended up with 9 screens on her desk, and at least two she wore on her body. We will negotiate our world via screens. On our person, our devices, and on our objects. Anything with a surface will have a screen.

(Alexa? Everything interactive?, full transparency?)

• Accessing – Anything will be available without owning it. Think music & Spotify, iTunes Radio, Kindle Prime, we no longer own what we wish to consume, we create our own use cases. Why own a car if a driverless one turns up whenever you want it? (because we can't afford possession

anymore? Or because it is pointless? Outsourcing, services in clouds, mobility instead of car ownership, use vs. Ownership, speed, TCO)

- Sharing Everything is shared for others to use and adapt. Collaboration on a mass scale. (values? Abundance? Safety?)
- Filtering We will need to create and curate personalisation filters for negotiating our universe to funnel in the data we want and need. (lots of work? Funnel out..)
- Remixing We can rap with products the way DJs rap with music, unbundling and rebuilding, it will create new uses, and new products. (better: maker scene)
- Interacting Machine learning, virtual reality, and augmented reality. Total immersion in technology, we will be able to see anything, and our objects will see us and respond. (AR key, digital divide)
- Tracking We will be tracked everywhere, and will track everything, and it will be accepted and constant. The data will become additional senses to inform our decisions. (connectivity and free flow of information, sensors and actors everywhere)
- Questioning A new communication requirement will be formed from the deluge of new questions arising out of the trends above. (Questions are more valuable than answers)
- Beginning A new system, a new economy, connecting humans and machines. (Homo Deus, evolutionary humanism)

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Brendan Brooks, HyperWeb, https://hyperweb.com.au/book-review-inevitable-understanding-12-technological-forces-will-shape-future-kevin-kelly/

Faster, limited lifetime, ondemand and now



Rare vs. abundant

Virtual capital

Attention

Demonetization

Algorithms





OH (from an awesome Lyft driver): "Today has been great. I've been blessed by the algorithm."

Immediately had an eerie feeling that this could become an increasingly common way to describe a day.

8:58 PM - 15 Mar 2018

https://twitter.com/kcoleman/status/ 974495158841499648

Algorithms

- High-Frequency Trading Alg.
- Market Algorithms
- Eventually Consistent Alg.
- Probabilistic Querying
- Quantum Algorithms
- Distributed Consensus crypto: Block-Chain
- Distributed Consensus classic (Paxos)
- Consistent Hashing, Cockoo Hashing
- Bloom Filters
- Deep Learning Nets with Memory
- Reinforcement Learning, Google Alpha
- Instant Learning (neuron. network pruning)
- Recommendation Alg.
- Large-scale Graph Mining
- Crime Prediction, PreCobs, SkyNet
- LMAX lock/waitfree Alg.
- Bots
- Swarm Computing (Intelligence)
- Emotions



Dimensions?

What Google likes: S. Lattanzi, V. Mirrokni, A Summary of the Google Zürich Algorithms & Optimization Workshop, Friday, February 23, 2018 https://research.googleblog.com/2018/02/a-summary-of-google-zurich-algorithms.html



After: Ricky Ho, BigTable Model with Cassandra and Hbase. The bloom filter checks, whether a key is in a SSTable. This is pretty fast and the lookup algorithm knows, that SSTables do not change later! Only if the bloom filter comes back with a negative, an expensive SSTable seek is performed. Bloom filters allow false positives though and you cannot remove an element later (which is anyway no issue here). See: http://spyced.blogspot.com/2009/01/all-you-ever-wanted-to-know-about.html by Jonathan Ellis. The filter works like this: A key is run through k different hash functions and the results are marked in a memory array. The hashes from the 3 elements X,Y,Z have been inserted into the array. A fourth one, W, is not contained in the array because one hash position is not marked (0). There are no false negatives – which is quite obvious, because inserting means marking the array!

HyperLogLog



From the HyperLogLog Playground app: https://djhworld.github.io/hyperloglog/adding/ It is:

Fast

Memory efficient

Parallellisable

Commutative

It might not:

Give an accurate count the result could be +/- the actual value by a small margin.

https://djhworld.github.io/post/2018/03/29/using-hyperloglog-in-production-a-retrospective/

Bayesian Analysis and Prediction



Consensus Classic

The Paxos Algorithm time ACCEPT-REQUEST 6, 'cat' PREPARE 5 ACCEPT-REQUEST 5, 'cat' PREPARE 4 PREPARE 6 Proposer Proposer Learner Learner Acceptor ACCEPT 6, 'cat' ACCEPT 5, 'cat' **PROMISE 5** PROMISE 6 accepted 5, 'cat' *majority! consensus is 'cat'*

⇒ Proposer wants to propose a certain value: It sends PREPARE IDp to a majority (or all) of Acceptors. IDp must be unique, e.g. slotted timestamp in nanoseconds. e.g. Proposer 1 chooses IDs 1, 3, 5... Proposer 2 chooses IDs 2, 4, 6..., etc. Timeout? retry with a new (higher) IDp. ⇒ Acceptor receives a PREPARE message for IDp: Did it promise to ignore requests with this IDp? Yes -> then ignore Yes -> then ignore No -> Will promise to ignore any request lower than IDp. Has it ever accepted anything? (assume accepted ID=IDa) Yes ->Reply with PROMISE IDp accepted IDa, value. No -> Reply with PROMISE IDp. If a majority of acceptors promise, no ID<IDp can make it through.



Acceptor receives an ACCEPT-REQUEST message for IDp, value: Did it promise to ignore requests with this IDp?

No -> Reply with ACCEPT IDp, value. Also send it to all Learners.

If a majority of acceptors accept IDp, value, consensus is reached. Consensus is and will always be on value (not necessarily IDp).

Proposer or Learner get ACCEPT messages for IDp, value: If a proposer/learner gets majority of accept for a specific IDp, they know that consensus has been reached on value (not IDp).



A Google TechTalk, 2/2/18, presented by Luis Quesada Torres https://www.youtube.com/watch?v=d7nAGI_NZPk

Google

15:55 / 24:50

Byzantine Consensus: Blockchain



Figure 4: Overview of Blockstack's architecture. Blockchain records give (name, hash) mappings. Hashes are looked up in routing layer to discover routes to data. Data, signed by name owner's public-key, is stored in cloud storage.

Consistent Hashing





Why wasn't there a way to say "use consistent hashing, but please don't overload any servers"? As early as August 2015, I had tried to come up with an algorithm based on the power of two random choices that would do just that, but a bit of simulation said that it didn't work. Too many requests were sent to non-ideal servers to be worthwhile. I was disappointed, but rather than wasting time trying to rescue it, we went ahead with the least-connections and shared cache approach above.

Fast forward to August 2016. I noticed a URL that the inestimable Damian Gryski had tweeted, of an arXiv paper titled Consistent Hashing with Bounded Loads. I read the abstract, and it seemed to be exactly what I wanted: an algorithm that combined consistent hashing with an upper limit on any one server's load, relative to the average load of the whole pool. I read the paper, and the algorithm was remarkably simple.

A.Rodland, Vimeo

https://medium.com/vimeo-engineering-blog/improving-load-balancing-with-a-new-consistent-hashing-algorithm-9f1bd75709ed

$$\begin{split} \Pr[t \leq d < 2t] \leq &\Pr[t \leq d < 2t \land |I| \leq \ell(t)] \\ &+ \sum_{j=0}^{\lceil \log_2 c \rceil} \Pr[t \leq d < 2t \land 2^j \ell(t) < |I| \leq 2^{j+1} \ell(t)] \\ &+ \Pr[t \leq d < 2t \land c \ell(t) < |I|] \\ \leq &\Pr[A(t, \ell(t))] \\ &+ \sum_{j=0}^{\lceil \log_2 c \rceil} \Pr[A(t, 2^{j+1} \ell(t))] \Pr[B(2t, 2^j \ell(t))] \\ &+ \Pr[B(2t, c \ell(t))]. \end{split}$$

Consistent Hashing with Bounded Loads

Vahab Mirrokni, Mikkel Thorup, Morteza Zadimoghaddam

ML: Re-using C.Elegans "Brain"



By Courtesy: National Human Genome Research Institute (From http://www.genome.gov/10000570) [Public domain], via Wikimedia Commons

The Worm's Reflexive behaviour as Computer Code

"C. elegans has to get by with only 300 neurons. But they are enough to make sure that the worm can find its way, eat bacteria and react to certain external stimuli. It can, for example, react to a touch on its body. A reflexive response is triggered and the worm squirms away. [..] Mathias Lechner, Radu Grosu and Ramin Hasani wanted to find out, whether the neural system of C. elegans, uploaded to a computer, could solve this problem – without adding any nerve cells, just by tuning the strength of the synaptic connections. This basic idea (tuning the connections between nerve cells) is also the characteristic feature of any natural learning process."

https://www.tuwien.ac.at/en/news/news_detail/article/125597/



Figure 1: Illustration of the touch withdrawal reflex. A) Touching the worm's tail will excite the touch sensory neuron PLM, and correspondingly induces a forward locomotion command in the animal [1] (Hand is not drawn to scale!). B) Working principle of the introduced touch withdrawal inverted-pendulum controller. C) Tap Withdrawal neural circuit of *C. elegans*.

M.Lechner, R.Grosu, R.M.Hasani, Worm-level Control through Search-based Reinforcement Learning, TU Wien, WNIP 2017

> Algorithm 1: Random Search with Decaying Objective Indicator **Input:** A stochastic objective indicator f, a starting parameter θ **Output:** Optimized parameter θ 1 $f_{\theta} \leftarrow f(\theta)$; **2** for $k \leftarrow 1$ to maximum iterations do $\theta' \leftarrow \theta + rand();$ 3 $f_{\theta'} \leftarrow f(\theta');$ 4 if $f_{\theta'} < f_{\theta}$ then 5 Set $\theta \leftarrow \theta'$: 6 $f_{\theta} \leftarrow f_{\theta'};$ 7 $i \leftarrow 0;$ 8 9 end $i \leftarrow i + 1;$ 10 if i > N then 11 $f_{\theta} \leftarrow f(\theta);$ 12 end 13 14 end 15 return θ :

https://www.edge.org/conversation/andrew_barron-the-connectomic-

Swarm Intelligence



2 Rules:

The first tells the ant that when it feels other ants walking on its back, it should freeze. "As long as someone walks over you, you stay put," When traffic over their backs is above a certain level, they hold in place, but when it dips below some threshold — perhaps because too many other ants are now occupied in bridge-building themselves — the ant unfreezes and rejoins the march. The second rule implements a trade-off between shortening a path and losing workers tied into bridge building.

After: Kevin Hartnett, The Simple Algorithm That Ants Use to Build Bridges

Even with no one in charge, army ants work collectively to build bridges out of their bodies. New research reveals the simple rules that lead to such complex group behavior.

https://www.quantamagazine.org/the-simple-algorithm-that-ants-use-to-build-bridges-20180226/

Original research: J.Gramham et.al., Optimal construction of army ant living bridges

By Geoff Gallice from Gainesville, FL, USA (Army ant bivouac) [CC BY 2.0 (http://creativecommons.org/licenses/by/2.0)], via Wikimedia Commons

Quantum Computing

Shlor's Algorithm to factor N

P = 2

Find period of a^k mod N by transforming a quantum state of sequences into a quantum state of a period

See: Peter W. Shor, Polynomial-Time Algorithms for Prime Factorization and Discrete Logarithms on a Quantum Computer (Discussed in the morning paper). Good explanation: scottaaronson.com, Shor, I'll do it. A QC is NOT a super-parallel regular computer. Need to define an algorithm that makes the solution the most probable quantum state!

Predictive Policing with Big Data



Krokodyl [GFDL (http://www.gnu.org/copyleft/fdl.html) or CC BY 3.0 (http://creativecommons.org/licenses/by/3.0)], via Wikimedia Commons

Nathan VanderKlippe, China using big data to detain people before crime is committed BEIJING Published February 27, 2018. This tries to prevent terrorist acts by Muslim Uyghur population. Suspicious activities lead to extended stays in re-education centers. USA: prediction of parole violations with racial parameters.

A Rubicon?

Nevertheless, we now stand just after that third inflection point. Any contention that pervasive sensors and big data-fueled machine learning do not constitute an artificial intelligence is immaterial insofar as either way converges to algorithms that are self-modifying. It is their self-modification that brings us to the crucial resolve—trust but verify—and its contrapositive: if an algorithm cannot be verified then do not trust it.

Daniel E. Geer, Jr., A Rubicon, Aegis Series Paper No. 1801

Emotions as Algorithms

"guilt is an emotion that allows other members of our tribe to see that we're sorry and to forgive us, if the tribe doesn't forgive then you're exiled and die." (Tomasello, Why we cooperate, cited from: https://news.ycombinator.com/item? id=14725447)

The nature and neural implementation of emotions is the subject of vigorous debate. Here, we use Bayesian decision theory to address key complexities in this field and conceptualize emotions in terms of their relationship to survival-relevant behavioural choices. Decision theory indicates which behaviours are optimal in a given situation; however, the calculations required are radically intractable. We therefore conjecture that the brain uses a range of pre-programmed algorithms that provide approximate solutions. These solutions seem to produce specific behavioural manifestations of emotions and can also be associated with core affective dimensions. We identify principles according to which these algorithms are implemented in the brain and illustrate our approach by considering decision making in the face of proximal threat.

Algorithms for survival: a comparative perspective on emotions Dominik R. Bach, & Peter Dayan, Nature Reviews Neuroscience volume 18, pages 311–319 (2017) doi:10.1038/nrn.2017.35

Substrate Independence



By Jamo spingal (Own work) [CC BY 3.0 (http://creativecommons.org/licenses/by/3.0)], via Wikimedia Commons



Carbon nanotubes (graphene), IBM https://www.cnet.com/news/life-after-silicon-how-the-chipindustry-will-find-a-new-future/

Intelligence is substrate independent

Is Conscience too?



https://groove.de/2015/03/06/biocomputer-music-wenn-schleimpilze-diemusik-machen/

The Control Revolution

Too many people look at the transition from the Industrial Revolution to the Algorithmic Revolution as a sea-change in perspective. But in reality, the current wave of reducing everything to a combination of "data & algorithm" and tackling every problem with more data and better algorithms is the logical end-point of the control revolution that started in the 19th century.

Ashwin Parameswaran, Www.macroresilience.com Control Revolution: James Beniger

The Moral of Algorithms

- Racial bias
- Gender bias
- Social Filtering
- Engagement control
- De-anonymization
- Dark Patterns
- Planned function abuse
- Profiling

2018: First Ethics track at Qcon London

The Moral of Algorithms

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2018: First Ethics track at Qcon London

Autotagging bei Flickr

Zu den Tags der User werden automatisch Tags hinzugefügt.

Dieses Bild wurde mit den Tags "ape" und "animal" versehen.

2015

VERNON PRATER BRISHA BORDEN Prior Offenses Prior Offenses 2 armed robberies 4 juvenile attempted armed misdemeanors rohherv Subsequent Offenses Subsequent Offenses None 1 grand theft LOW RISK 3 HIGH RISK **ERNON PRATER BRISHA BORDEN** 3 8 LOW RISK **HIGH RISK**

Google Hiring Diversity im Bereich 'Tech', Januar 2015

Natalie Bopp, Secure Systems Seminar 2016

Who is Responsible?

One could say, 'Oh, it's a computer,' I'm like, OK ... a computer built by whom? A computer designed by whom? A computer trained by whom?''

Natalie Bopp, Secure Systems Seminar 2016

Money

Market Cap Valuations-Internet vs. Platform Companies

Fortune 500 life expectancy 50 years ago: 75 years. Today: 15 years.

Valued At \$1B And Above

Total Number of Unicorn Companies: 151 Total Cumulative Valuation: \$531B

Updated in Real Time

Want to see the companies predicted to become unicorns? Our list here: https://www.cbinsights.com/research-future-unicorn-companies

		Enter your business email Get Our Unicorn Research For Free]
Company	Valuation (\$B)	Date Joined	Country	Industry	Select Investors
Uber	\$51	8/23/2013	United States	On-Demand	Lowercase Capital, Benchmark Capital, Google Ventures
Xiaomi	\$46	12/21/2011	China	Hardware	Digital Sky Technologies, QiMing Venture Partners, Qualcomm Ventures
Airbnb	\$25.5	7/26/2011	United States	eCommerce/Marketplace	General Catalyst Partners, Andreessen Horowitz, ENIAC Ventures
Palantir Technologies	\$20	5/5/2011	United States	Big Data	RRE Ventures, Founders Fund, In-Q-Tel
China Internet Plus Holding	\$18	12/22/2015	China	eCommerce/Marketplace	DST Global, Trustbridge Partners, Capital Today
Snapchat	\$16	12/11/2013	United States	Social	Benchmark Capital, General Catalyst Partners, Lightspeed Venture Partners
Flipkart	\$15	8/6/2012	India	eCommerce/Marketplace	Accel Partners, Digital Sky Technologies, Iconiq Capital
Didi Kuaidi	\$15	12/31/2014	China	On-Demand	Matrix Partners, Tiger Global Management, Softbank Corp.,
SpaceX	\$12	12/1/2012	United States	Other Transportation	Founders Fund, Draper Fisher Jurvetson, Rothenberg Ventures
Pinterest	\$11	5/19/2012	United States	Social	Andreessen Horowitz, Bessemer Venture Partners, Firstmark Capital
Dropbox	\$10	10/5/2011	United States	Internet Software & Services	Accel Partners, Greylock Partners, Index Ventures
Lufax	\$10	12/26/2014	China	Fintech	Ping An Insurance

Guess how many German companies?

Where do all the \$\$ come from?

Bubbles?

By Nathan47, CC BY-SA 4.0 https://commons.wikimedia .org/ By Santeri Viinamäki, CC BY-SA 4.0, https://commons. wikimedia.org/w/i ndex.php? curid=50262300

By Mike Cauldwell https://www.casascius.com/photos.aspx, Public Domain, https://commons.wikimedia.org/w/index.php? curid=22643968

Define: Value

© Raimond Spekking / CC BY-SA 4.0 (via Wikimedia Commons)

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By GeoTravellers, CC BY-SA 3.0, https://commons.wikimedia.org/w/index .php?curid=54635833

By Antonforever (Own work) [CC BY-SA 3.0 (https://creativecommons.org/licenses/by-sa/3.0)], via Wikimedia Commons

Demonetization?

Demonetizing Everything: A Post Capitalism World, Peter Diamandis: Renewables, Youtube, moocs, AI-Diagnostics, autonomous transport, fully automated banking/insurance, robotics. Look at the comments on Youtube: Most claims have been accepted, EXCEPT for HOUSING!!! What gets cheaper and what becomes extremely expensive in a digital world?

Work

Complexity and Multi-Paradigm

Periscope Technology Stack (from Todd Hoff):

Programming languages/frameworks: C++ (GO), HTML5/CSS3, Java, JavaScript (Node.js, React, RxJS, Restify, EmberJS, AngularJS, BackboneJS), Python, Ruby (Ruby on Rails).

Data storage/management: Atlas-DB, Cassandra, MySQL, Oracle, PostgreSQL.

Cloud platforms: Amazon EC2/S3.

Analytics: Google Analytics, Hadoop, Hive, MixPanel, Mode, Parquet, Pig, Presto, Spark.

CDN: Amazon CloudFront, Cloudflare, Fastly, Open Connect.

Streaming protocols: Adobe HTTP Dynamic Streaming, Apple HTTP Live Streaming, M2TS, MPEG-DASH, Microsoft Smooth Streaming, RTMP.

Media formats: H.264. Media containers: FLV, MP4.

Media processing platform: Brightcove, Contus Vplay, DaCast, Flash Media Server, JW Live, Livestream, Muvi, Ustream, Vimeo PRO, Wowza Media Systems.

Geolocation: Google Maps, MapKit/Core Location (iOS).

Messaging: Firebase, PubNub, Twilio.

Not mentioned: monitoring, dev. And deployment tools, machine learning etc.
Organizing Work in the Past



Conway's Law: Do not align social separations along technical interfaces because there will be trouble at the borders! And complex layer dependencies will delay deployments considerably.

- Communication Problems
- → API Design Delays
- Cross-Project Dependencies
- Large Architectures
- → Standards, ITIL and the Plague

Organizing Work Today

Microservices !



Scaling Spotify, Henrik Kniberg & Anders Ivarsson Oct 2012

- Netflix Values: Freedom and Responsibility
- → Like FC Bayern Munich
- Only the Best
- No Process

Netflix CEO

- Google Experiences: Project Aristotle
- → Psychologically Safe Spaces
- → Right Team Norms
- Limits to Optimization

Charles Duhigg in NYT

- → Lean Organization:
- → Agile
- → Experiments
- Data Driven
- → DevOps

New Technical and Social Architecture

Independent Microservicses

DevOps

Cross Functional Teams

Continuous Integration, Delivery, Deployment

Experiments/ lean organization

Includes all parts of company

Agile and Test-Driven Development

Technical and social developments form a unique and consistent system that starts to include its environment as well. Business are organizing themselves arount Conway's law.

Two Kinds of Jobs

- McKinsey Global Institute: 50% of global work hours disappear till 2055 due to automisation
- PwC: 34% male and 26 % female jobs gone till 2035,
- Digitalverband Bitkom: Every 10th german job in the next 5 years.

T.Haberkorn, In den Maschinenfeierabend Die Post-Work-Bewegung möchte uns endlich von der Lohnarbeit erlösen. Es ist die letzte Utopie, zu der Industriegesellschaften noch fähig sind. http://www.zeit.de/kultur/2018-02/arbeit-zukunft-automatisierungdigitalisierung-utopie/komplettansicht

Human Plug-Ins



Process technology turned humans into "digital plug-ins" with little control over work. This trend will soon reach highly qualified employees too.

The future of work

- No relation with income anymore
- Basic income for everybody
- Spread of wealth becoming a core issue
- All non-digital assets show inflation
- Start-ups as a fuzzing approach
- "Post-work already for some PhDs and candidates with no real border between work and leisure time. Some small teaching jobs, always temporary, Gig-economy talks and consulting. Every private network is also a professional network, never without job and always looking for a job." T.Haberkorn, zeit.de

Postkapitalism

The transformation of the means of labour into machinery, and of living labour into a mere living accessory of this machinery, as the means of its action, also posits the absorption of the labour process in its material character as a mere moment of the realization process of capital. The increase of the productive force of labour and the greatest possible negation of necessary labour is the necessary tendency of capital, as we have seen. The transformation of the means of labour into machinery is the realization of this tendency. In machinery, objectified labour materially confronts living labour as a ruling power and as an active subsumption of the latter under itself, not only by appropriating it, but in the real production process itself;

[694]

The Fragment on Machines, Karl Marx – from The Grundrisse (pp. 690-712, http://thenewobjectivity.com/pdf/marx.pdf

Stephen Hawking's AMA

I'm rather late to the question-asking party, but I'll ask anyway and hope. Have you thought about the possibility of technological unemployment, where we develop automated processes that ultimately cause large unemployment by performing jobs faster and/or cheaper than people can perform them? Some compare this thought to the thoughts of the Luddites, whose revolt was caused in part by perceived technological unemployment over 100 years ago. In particular, do you foresee a world where people work less because so much work is automated? Do you think people will always either find work or manufacture more work to be done? Thank you for your time and your contributions. I've found research to be a largely social endeavor, and you've been an inspiration to so many.

Answer:

If machines produce everything we need, the outcome will depend on how things are distributed. Everyone can enjoy a life of luxurious leisure if the machine-produced wealth is shared, or most people can end up miserably poor if the machine-owners successfully lobby against wealth redistribution. So far, the trend seems to be toward the second option, with technology driving ever-increasing inequality.

https://www.reddit.com/r/science/comments/3nyn5i/ science_ama_series_stephen_hawking_ama_answers/

The Second Machine Age

Living in Exponential Times (the second half of the chessboard)

From the Second Machine Age

FIGURE 3.3 The Many Dimensions of Moore's Law





Graphic from The Singularity Is Near demonstrating "Law of Accelerating Returns" in the field of computation.

Core Features

- The past is no longer a reliable indicator of the future
- The potential of computer technology is massively understated
- Capacities grow exponentially
- Slow and continuous development gets replaced by a big jump.

Eric Brynjolfsson, Andrew McAfee, The Second Machine Age, MIT 1) The First Age: Steam/Water, Mechanical Production Equipment (railroads/trains)

2) The Second Age: Division of Labor, Electricity, Mass Production (assembly line/cars)

3) The Third Age: Electronics, IT, Automated Production – (PC/smartphones/transistors)

4) The Fourth Age: Human/Cyber Systems, AI (wearables, bots, connected cars, supply chain automation)

So you're probably asking, *why should I care about the this new coming of age?* The rise of the machines (don't worry, no one is building Skynet), will eventually **reorganize the global workforce**. Think about it for a second:



HCI selfexperiment 2015



Dating in 2040: all senses digital experience. Augmented with big data matching algorithms and behavioral analysis.

Amazon Go



By SounderBruce (Own work) [CC BY-SA 4.0 (https://creativecommons.org/licenses/by-sa/4.0)], via Wikimedia Commons

IoT, Reference Architecture



IoT Consumer View

- Increasing TCO and maintenance
- Loss of control (right to repair?)
- Increasing complexity across age groups
- Users are bad monitors
- Planned obsolescence possible
- Short guarantees, unclear future service
- Compatibility issues now and in future
- Frequently unclear technical issues (house tech)

Intelligence needs Context

- The data economy approach is doomed!
- IoT devices of different vendors need to share context
- Context includes social relations
- Strict control of context leads to new monopolies

What makes context less critical?

Kai Fu Lee

Essentially, we're looking to a future where everything about us, online and offline, will become profiles, will be used to give us convenience. It will be the next big step towards trading privacy for convenience. Some people won't be comfortable with it, but it's an eventuality that probably cannot be avoided. Social networks will also grow to be more real name tractable and accountable, and also the data from it will generate a lot of value.

All of this is going towards people and devices getting connected, data being extracted to create intelligence. That intelligence will deliver convenience and value to the user. Those of us who want that convenience will need to trade our privacy. This is an interesting question, but I don't think most people can say no to it.

SUPER-**P W E R S** CHINA. SILICON VALLEY. NEW WORLD ORDER KAI-FU LEE

https://www.edge.org/conversation/kai_fu_lee-we-are-here-tocreate

Integration, Automation and Work



By Ein Dahmer (Own work) [CC BY-SA 4.0 (https://creativecommons.org/licenses/by-sa/4.0)], via Wikimedia Commons

The ARGE F125 consortium admits that the integrated nature of the frigates' IT systems, coupled with their strict reliability requirements, has made it difficult to debug hardware and software defects. A consortium spokesperson stated that the "defects are often found at the interfaces between subsystems, which makes their analysis more difficult."

In addition to the IT troubles, the ship reportedly has issues with its radar and the fireproof coating of its fuel tanks—and it's overweight.

90 percent of the components on the ship are new and necessarily technologically complex in order to meet the very ambitious German naval mission requirements.

https://spectrum.ieee.org/riskfactor/computing/it/new-german-frigate-fails-tests

"Crew sizes on most new ship classes have grown over time as anticipated workload reductions from new technologies have not materialized." "They really should have started with a rowboat MVP and then iterated with continuous incremental releases until a warship popped out." (T.Hoff)

-U.S. Government Accountability Office

Royal Navy, Destroyer Daring Class: The ship, built by BAE Systems, needed repairing again in Bahrain in 2012 after another engine failure. The first warning signs emerged in 2009 when the Commons defence committee warned that "persistent overoptimism and underestimation of the technical challenges combined with inappropriate commercial arrangements" would lead to rising costs.

The navy wanted 12 ships but ended up with six. The Type 45 has an integrated electric propulsion system that powers everything on board. The ships are vulnerable to "total electric failures", according to one naval officer in an email. That leaves the ships without propulsion or weapons systems. https://www.theguardian.com/uk-news/2016/jun/07/destroyers-will-break-down-if-sent-to-middle-east-admits-royal-navy

In 2016, the Navy cancelled the procurement of the Long Range Land-Attack Projectile ammunition [pdf] for the ships' Advanced Gun System because it was too expensive. Each shell cost more than US \$800,000, a price due in part to its sophistication and in part to the inability of the three ships in the class to provide sufficient demand to reach any sort of economies of scale.

Is it costs, project management or a design problem?

Drone-catching Drones



(provided by Pyeongchang Olympics anti-Terrorism and Safety Headquarters)

Certain automatisms still apply ...

Autonomous Agents (Bots)

- Play Games, become Game Stars (?)
- Participate in Social Media
- Actors in Movies (Idoru)
- Substitutes in Human Care
- Social Regulators (Police, Security)
- Soldiers
- Sex-Partners

What are the things bots won't do? What becomes more or less valuable with bots? Which ones will be hardware, which ones software only?

DNA Storage



https://www.microsoft.com/en-us/research/wp-content/uploads/2016/04/dnastorage-asplos16.pdf

To move 300EB into the box in a year takes 76Gb/s, which is no problem over 100G Ethernet. But then we need to turn the 2.4*1021 bits into 1.2*1024 bases, including the 3 orders of magnitude overhead. So each box needs to synthesize 3.8*1016 base/sec. Last year Rob Carlson estimated the DNA synthesis industry's output for 2016 was about 5*1012 bases, so the 4U box has to synthesize 7,600 times as much every second as the entire industry did in 2016.

D.Rosenthal, DNA's Niche in the Storage Market, https://blog.dshr.org/2018/02/dnas-niche-instorage-market.html

Tell me what will NOT be stored!

Predictions III



The combinatorial effects are way beyond our understanding (e.g. 2000 new chemicals/year, National Toxicology Program, https://ntp.niehs.nih.gov/about/)

The big Unknown: Infrastructures

- Mobility: Trains still a viable option?
- Production: Factories where? China still global workbench?
- Production, Government: Labor or machine intelligence?
- Education: Educating people for a work process which may never come?
- Age: Nurses or Robots for old people?
- Migration: Immigration or closed door?
- Health: large scale hospitals or genetic engineering?
- Regions: Smart cities or smart regions?
- Transportation: Individual cars or (free) public transit?
- Communication: Give up on landline communications?
- Energy: renewable of course, but which type?
- Finance: "Quantitative easing" or real value currency?

How far into the future are you looking and how much weight are you giving certain developments? How will key technologies evolve in 5 or 10 years? What are their combinatorial effects? Is waiting a better approach?

Rage against the Machine

- Chess
- Go
- Jeopardy
- Driving
- ???

What can humans do BETTER than machines? Does the world champion in GO still like to play? Is human vs. Machine a useful concept?

Evolutionary Humanism -Transhumanism

From Fun to Science



image from screencaps of the NBC Olympics stream, available at http://stream.nbcolympics.com/ snowboarding-womens-halfpip e-final

In effect, each athlete now controls his or her own clock, determining when it stops and starts and, increasingly, carrying it along the way. Speed skaters wear transponders on their ankles that mark their location, speed, and running time at every moment along their path; alpine skiers have them on their boots. Many of the temporal innovations this year have less to do with timing, per se, than with its permutations: the real-time acceleration rate and brake speed of speed skaters and alpine skiers; the takeoff and landing speeds of snowboarders; g-forces in the bobsleigh. It's a continuous stream of entertaining data, but it can also be fed back into the training process, helping athletes to understand where they gained or lost time.

From Healing to Upgrade

Viagra: Impotence ----- longer Sex

Doping: Muscle, Bone Problems - better at Sports

Prothesis: substituting missing parts – enhancing power

Ritalin: AHDS ----- better Exams

Sapiens x.0



By James atmos (Own work) [CC BY-SA 3.0 (https://creativecommons.org/licenses/by-sa/3.0) or GFDL (http://www.gnu.org/copyleft/fdl.html)], via Wikimedia Commons

Bio-Hacking



Aaron Traywick, Screenshot facebook, https://www.heise.de/tr/artikel/Live-Spritze-mit-Herpes-DNA-3964102.html

I am sure many people will try and dismiss this as unscientific or how clinical trials will need to be run. The problem is that old world is dead. It died long ago and biohackers are creating a new one in its place. This is a world where the only important outcome is the one intended by the user. The FDA is meant to allow the creation of mass market drugs that companies can profit off of. It was never meant to regulate the genetics of individuals.

What could be more of a human right than to be able to decide what genes create you?

Josiah Zayner,

http://www.ifyoudontknownowyaknow.com/201 7/10/the-first-human-to-attempt-crisprgene.html



Freeman Dyson

Predictions V

"This is the paradox of historical knowledge. Knowledge that does not change behaviour is useless. But knowledge that changes behaviour quickly loses its relevance. The more data we have and the better we understand history, the faster history alters its course, and the faster our knowledge becomes outdated."

"In 1016 it was relatively easy to predict how Europe would look in 1050. Sure, dynasties might fall, unknown raiders might invade, and natural disasters might strike; yet it was clear that in 1050 Europe would still be ruled by kings and priests, that it would be an agricultural society, that most of its inhabitants would be peasants, and that it would continue to suffer greatly from famines, plagues and wars. In contrast, in 2016 we have no idea how Europe will look in 2050. We cannot say what kind of political system it will have, how its job market will be structured, or even what kind of bodies its inhabitants will possess."

— Yuval Noah Harari, Homo Deus: A Brief History of Tomorrow

Future: Immortality, Happiness, divine power



The end of the humanist period and the begin of the dataist period:

- organisms are algorithm
- · life is data processing
- intelligence is different from conscience (do wie need the latter?)
- algorithms know us better than we know ourselves (no more politics, decisions etc.)

From: Yuval Noah Harari, Homo Deus, pg. 462. The concept of evolutionary humanism.

Dataism
History of Privacy



Internal Walls (c.1500 A.D.)

Most homes didn't have walls separating rooms until the development of the brick chimney, which needed support beams.

Silent Reading (c.1215)

Silent reading was not popular until the Church mandated confessions for the masses; the concept of private salvation ushered in a new habit of silent learning and contemplation. Silent reading would become popular with non-elites ~500 years later when books were cheap enough for individual ownership.

Solo Beds (c.1700)

Beds used to be extraordinarily expensive; many homes only had a single large bed that was shared with the entire family and guests. Sex with others in the room was common.

🛄 Info Privacy (1900s)

Information about citizens was often public, including the first American census. Even though the post office had introduced the first information privacy laws in the 19th century, postcards (without envelopes) were cheaper, and therefore often more popular. "The Right to Privacy" was coined in 1890, inspired by fears of the camera.

Voluntary Web Tracking (2015)

When AT&T offered a \$30 premium service that allowed users to opt-out of browser tracking for ad targeting, few users took it. This portends a future where most people will increasingly choose ever more invasive tracking in exchange for money, health advice, and entertainment.

Privacy

If history is a guide, the costs and convenience of radical transparency will once again take us back to our roots as a species that could not even conceive of a world with privacy.

It's hard to know whether complete and utter transparency will realize a techno-utopia of a more honest and innovative future. But, given that privacy has only existed for a sliver of human history, it's disappearance is unlikely to doom mankind. Indeed, transparency is humanity's natural state.

*For more chapters from this book and stories from the Ferenstein Wire,

Medical Privacy?

- Health trackers
- Movement trackers
- Life-Blogging
- Insurance requirements
- Aggregate data of low frequency
- A long and healthy life

Total Transparency

- Public Officials: no more secret lobbying
- Bank accounts: no more tax withholding
- Government actions: no more secret contracts
- Re-use of digital artifacts
- Less crime



Conectivity and free Information Flow

"The case for optimism lies not in sci-fi gadgets or holograms, but in the check that technology and connectivity bring against the abuses, suffering and destruction in our world. []The best thing anyone can do to improve the quality of life around the world is to drive connectivity and technological opportunity. When given the access, people will do the rest."

Eric Schmidt, Jared Cohen, The New Digital Age – Reshaping the Future of People, Nations and Businesses, pg. 257

The Ferenstein Wire Follow Y ()





"There's a particular religion that we all represent, and it goes something like this: 'if you take a large number of people and you empower them with communication tools and opportunities to be created, society gets better'. ... the combination of empowerment, innovation, and creativity will be our solution, but that is a religion in-of-itself"

~ Eric Schimdt, Alphabet (Google) Chairman

Intelligence without Conscience

Failures of emotional algorithms:

- Risk assessment
- Decision making (System 1)
- Drugs
- Speed of modern vehicles

Advantages of Dataism:

- Silicone based algorithms
- Based on huge amounts of data
- Based on latest scientific know-how
- Rational, statistics based

Is disruption possible or even necessary in a dataistic world?

"Data is the new Oil"



"The biggest economic story in the world right now is not the DJIA hitting 26,000 or falling by 0.5% in a day... it's that China, Russia, Saudi Arabia, and Iran are now trading oil denominated in rubles, yuan, and SDRs".

http://www.michaelnygard.com/blog/2018/03/data-is-the-new-oil/

National Archives Archeological Site [Public domain], via Wikimedia Commons

"Just as oil production led to new uses of oil that reshaped everything from consumer products to food production to hygiene, I fully expect datafueled ML models to reshape this century. Moreover, we will see demand for ever-greater data production from our homes, workplaces, and devices. This will cause tension and conflict about data use just as happened with land-use, wateruse, and mineral rights. That will lead to new legal regimes and doctrines. In extreme cases, it may lead to revolutions similar to the Revolutions of 1848 in Europe."



AWS "Snowmobile" data transporter

But EXACTLY WHY?

- Business decisions are based on data.
- Machines need data to function
- Humans want personalized services
- Surveillance in complex grey world zones
- The new algorithms need data

Literature

Erik Brynjolfsson, Andrew McAfee: The Second Machine Age. Plassen, Kulmbach 2014. 400 Seiten, Fr. 32.90, E-Book 25.-.

Nick Bostrom: Superintelligenz. Szenarien einer kommenden Revolution. Suhrkamp, Berlin 2014 (erscheint 8.11.). 480 Seiten, Fr. 41.90.

Kevin Kelly, The Inevitable. Understanding 12 Technological Forces That Will Shape Our Future

A Montuori, Systems Approach California Institute of Integral Studies, San Francisco, CA, USA

A. Maurits van der Veen, The Dutch Tulip Mania: The Social Foundations of a Financial Bubble, October 2012

Scaling Agile @ Spotify with Tribes, Squads, Chapters & Guilds Henrik Kniberg & Anders Ivarsson What Google Learned From Its Quest to Build the Perfect Team New research reveals surprising truths about why some work groups thrive and others falter. By CHARLES DUHIGG Illustrations by JAMES GRAHAM FEB. 25, 2016 https://www.nytimes.com/2016/02/28/magazine/what-google-learned-from-its-quest-to-build-the-perfect-team.html?rref=collection %2Fbyline%2Fcharlesduhigg&action=click&contentCollection=undefined®ion=stream&module=stream_unit&version=search&contentPlacement=1&pgtyp e=collection

Peter, Demonetization of everything

The Venus Project – Resource Based Economy

Demonetizing Everything: A Post Capitalism World | Peter Diamandis | Exponential Finance,

https://www.youtube.com/watch?v=3cXPWyP0BBs

http://basicincome.org/research/research-depository/

https://www.heise.de/autos/artikel/Klartext-Elektrische-Landlust-3968651.html