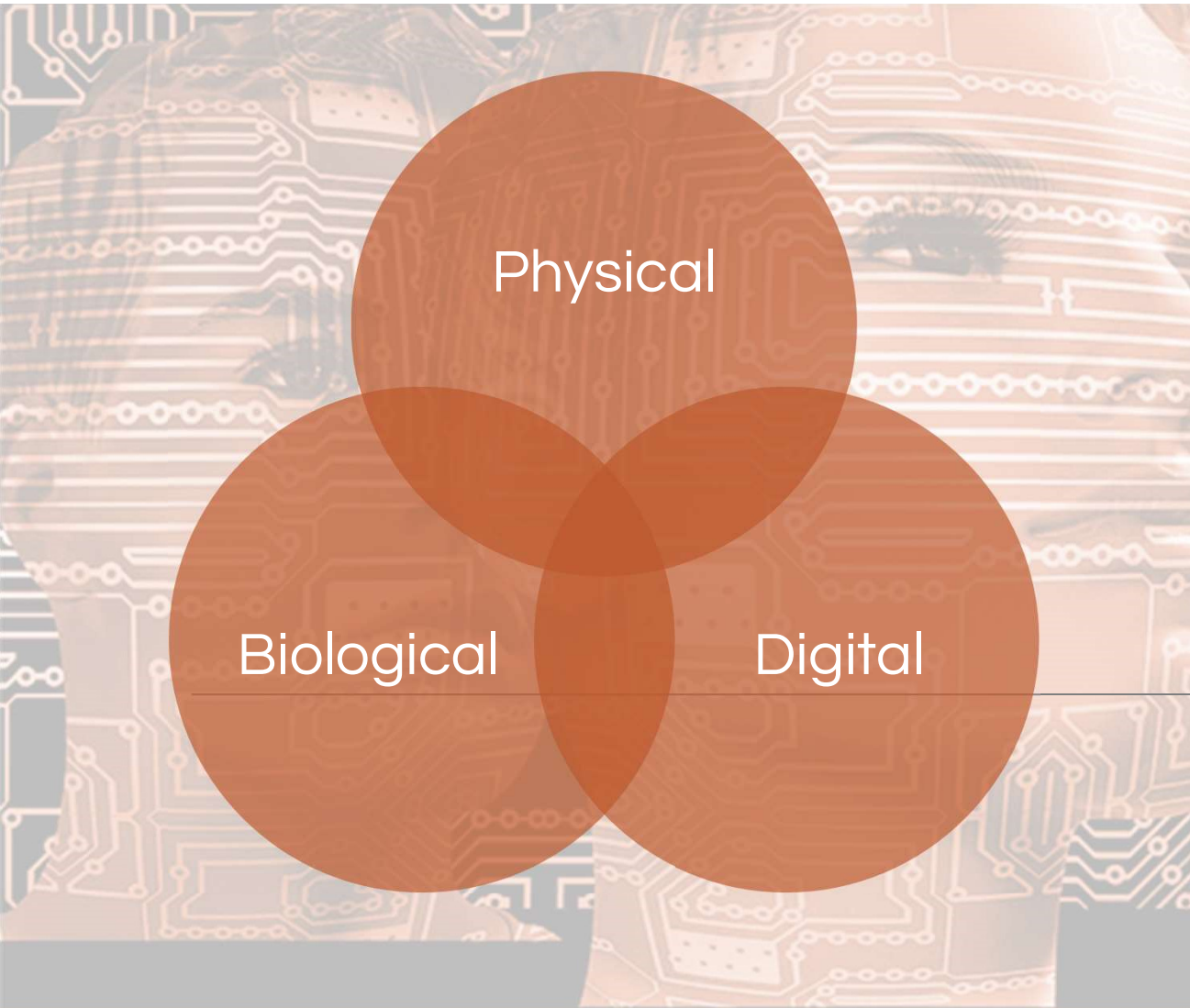




The Fourth Industrial Revolution The Cognitive ERA

Team Hogan Fall 2017



And the control lies with the digital*

*But can be overridden by the biological ... at least, today it can be

In the intersection of the three realms lies the next breakthroughs in human understanding

It's already begun ...



2020

4
BILLION

Connected People



\$4
TRILLION

Revenue Opportunity



25+
MILLION

Apps



25+
BILLION

Embedded and
Intelligent Systems



50
TRILLION

GBs of Data

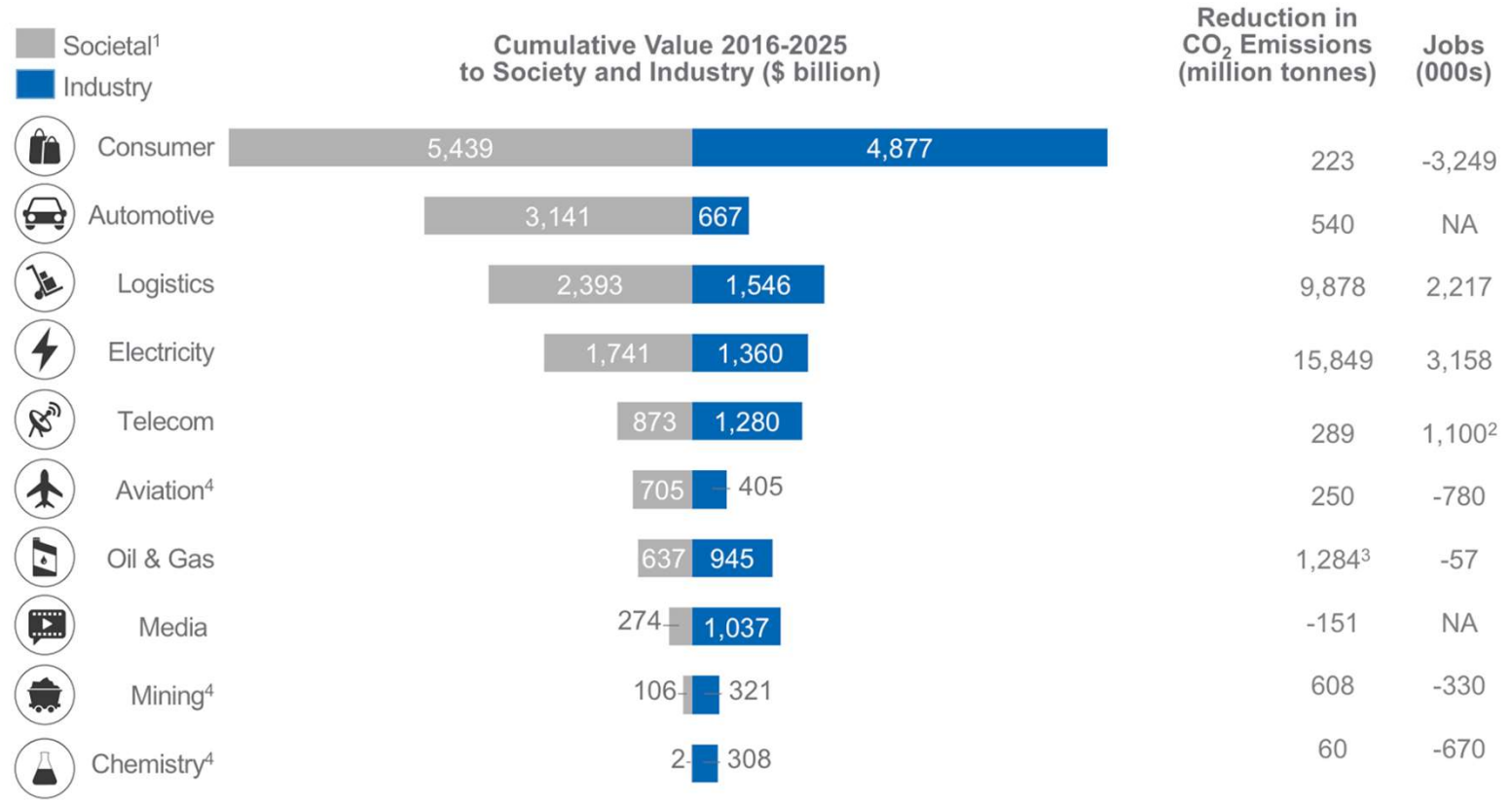


Source: Mario Morales, IDC

UNLOCKING \$100 TRILLION FOR BUSINESS AND SOCIETY FROM DIGITAL TRANSFORMATION



Across 10 industries, the value-at-stake methodology identifies trillions of dollars in value for both society and industry. Scaled up across all industries, and including externalities, the estimated net benefits will be greater than \$100 trillion over the decade to 2025.



There has never
been a time of
greater
promise, or
greater peril

Professor Klaus Schwab
Founder and Executive Chairman
of the World Economic Forum



Everything
will be
observed and
controlled ...
eventually



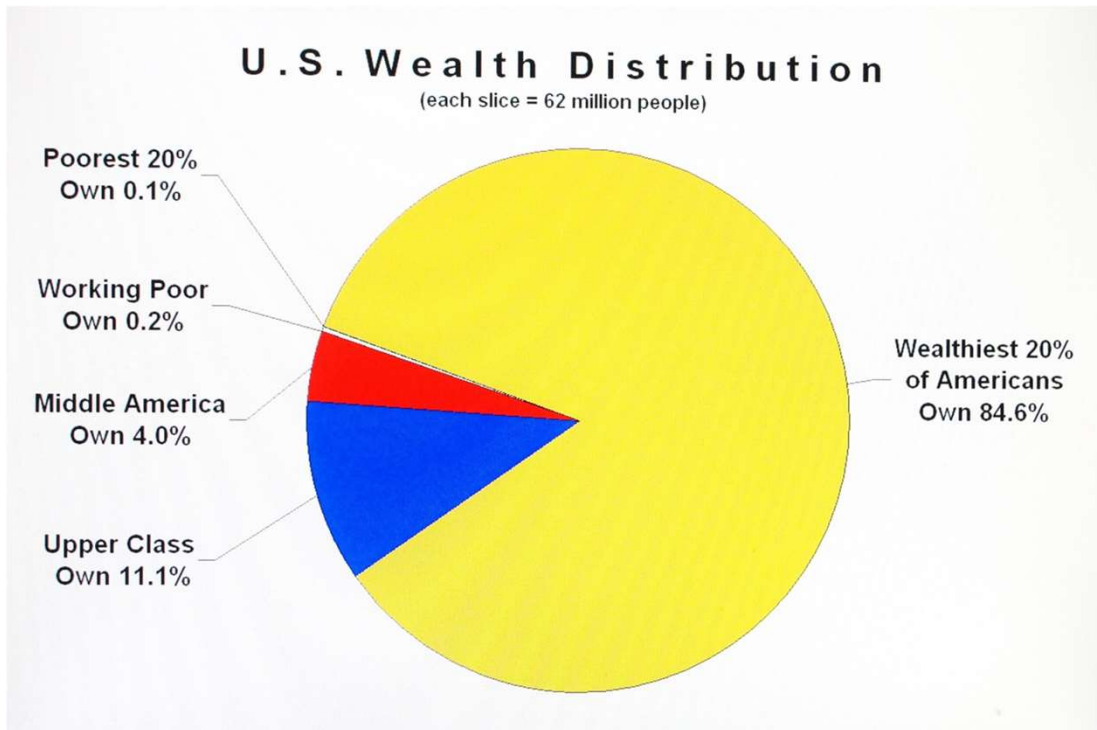
Employment Outlook

Job changes in 1000s between 2015-2020

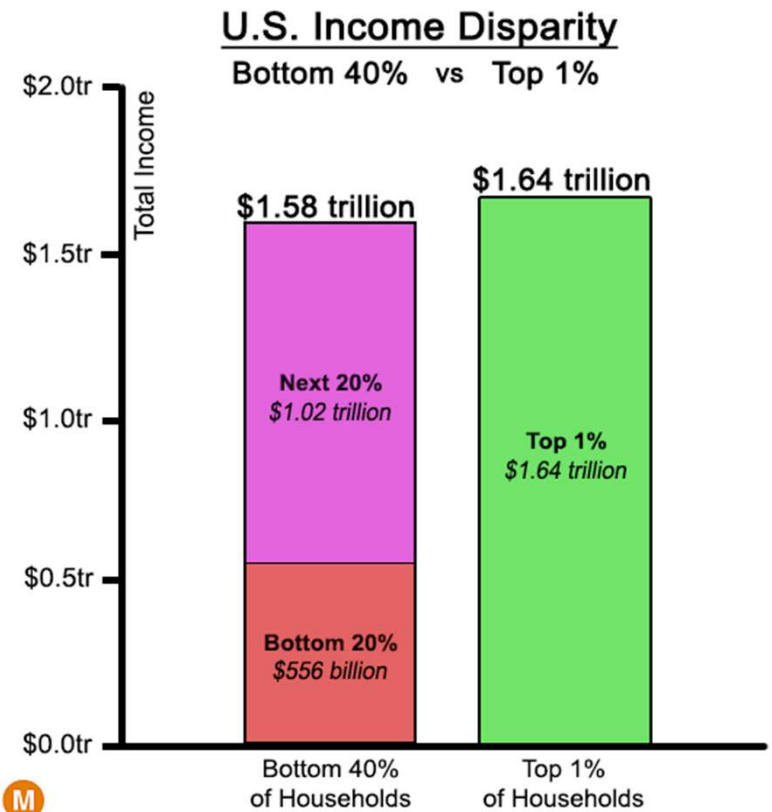




Inequality of Wealth in America



Source: <https://datadrivenviewpoints.com>



Source: <http://metrocosm.com/wealth-vs-income-inequality/>

Which sector do you think is most likely to benefit from the Fourth Industrial Revolution?



Healthcare

45%



Education

11%



Finance

15%



Infrastructure

14%



Energy

15%

Source: The Economist Intelligence Unit Flash poll, January 2016





education = \$


```
...c.prototype.activate=function(b,d,e){func
...>.active).removeClass("active").end().find('[data-toggle="tab"]').attr("aria-expanded",!1),
...ia-expanded",!0),h?(b[0].offsetWidth,b.addClass("in")):b.removeClass("fade"),b.parent(".dropdow
...).find('[data-toggle="tab"]').attr("aria-expanded",!0)}var g=d.find("> .active"),h=e&&
...de")||!d.find("> .fade").length);g.length&&h?g.one("bsTransitionEnd",f).emulateTransitionEnd
...;var d=a.fn.tab;a.fn.tab=b,a.fn.tab.Constructor=c;conflict=function(){return a.fn.t
...show");a(document).on("click.bs.tab.data-api", ".top", "[data-toggle="tab"]',e).on("click.bs.tab.data
...se strict";function b(b){return this.each(function(i,j){var c=this,d=d.data("bs.affix"),f="ob
...typeof b&&e[b]()}})var c=function(b,d){this.options=b||{};c.DEFAULTS,d),this.$target=a
...a.proxy(this.checkPosition,this)).on("click.bs.affix.data-api",a.proxy(this.checkPositionWi
...null,this.pinnedOffset=null,this.checkPosition());c.VERSION="3.3.7",c.RESET="affix affix-top
...tState=function(a,b,c,d){var e=this.$target.scrollTop(),f=this.$element.offset(),g=this.$targ
...bottom"==this.affixed)return null!=c?!(e+this.unpin<=f.top)&&"bottom":!(e+g<=a-d)&&"bottom"
...!=c&&e<=c?"top":null!=d&&i+j>=a-d&&"bottom"},c.prototype.getPinnedOffset=function(){if(this
...RESET).addClass("affix");var a=this.$target.scrollTop(),b=this.$element.offset();return
...WithEventLoop=function(){setTimeout(a.proxy(this.checkPosition,this),1)}
...ent.height(),d=this.options.offset,e=d.top,f=d.bottom
...eof e&&(e=d.top(this.$element))
...ent.css("top","")
```



Low power is no longer sufficient, we have to think about energy conservation





HEALTHCARE

Neurosyntek
Amida Tech
DelineoDX
CellMax
Theranos



EDUCATION

Class Central
XQ - Oxford Day
Academy
Vocareum
Portable Cloud



SECURITY

Amida Tech



ENERGY

Aggios
SureCore
Sonics

Every age needs it's set of tools



Industrial Revolution 0.0 to 4.0

0.0 (circa 10,000 BC), the prehistoric transition from hunting and gathering to settled agriculture

1.0 (circa 1784), through the introduction of mechanical production facilities with help of water and steam power

2.0 (circa 1870), the first electricity powered assembly line was built in 1870. The era of mass production has began

3.0 (circa 1969), the first programmable logistic controller (PLC) was built. It enabled production automation through the use of electronic and IT systems.

4.0 (circa NOW), through the use of cyber-physical systems. It means that physical systems such as machines and robotics will be controlled by automation systems equipped with machine learning algorithms. Minimal input from human operators will be needed.

0.0 Agricultural

1.0 Mechanical

2.0 Electrical

3.0 Electronic

4.0 Cognitive

CRUNCHING THROUGH CANCER

Beijing's 21 million residents live in a toxic fog, mainly caused by factories and

GO THROUGH EACH IMAGE

Cancer has become the leading cause of death in

the city and throughout the country

TRAIN CL



Lung image Database Consortium (LIDC)

Loaded 4 terabytes of data on the Amazon cloud for \$25



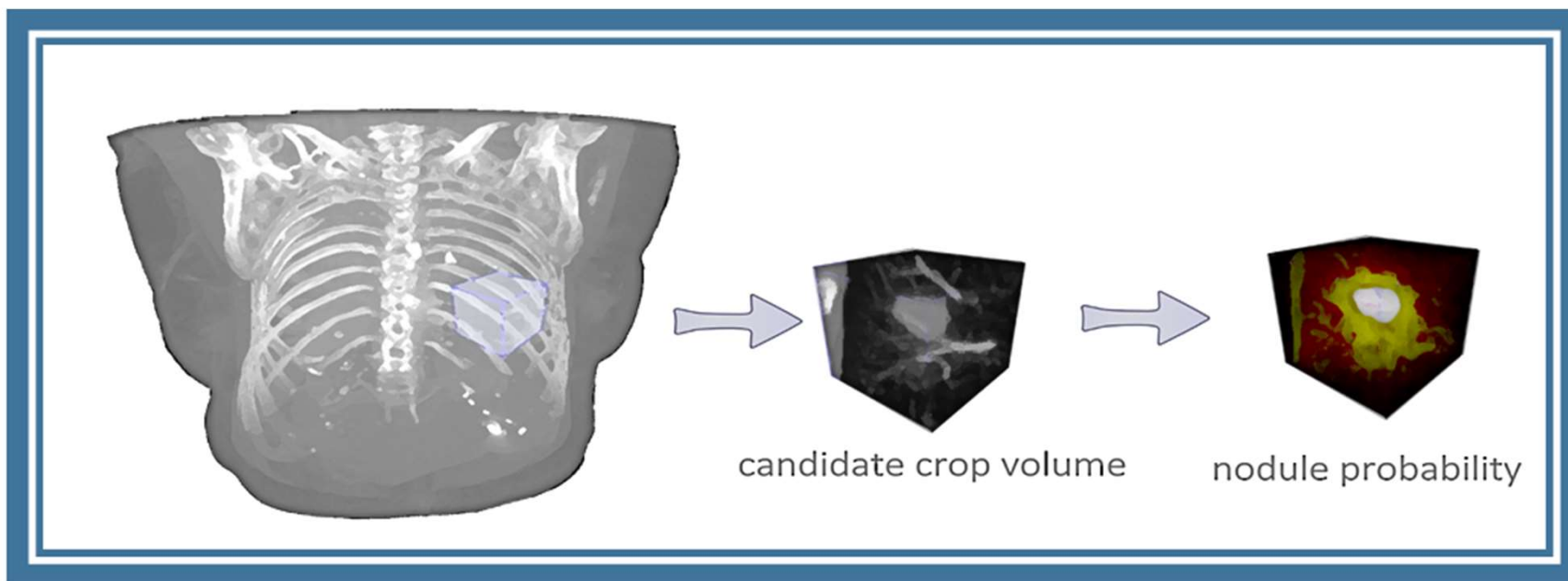
Calculated and saved relevant features across thousands of processors



were given by a radiologist



sicular growth



- Full-scale:** Process streams of CT lung volumes on a voxel-level
- Interpret:** Detect likely nodule tissue and visualize its probability in 3D
- Interact:** Allow radiologists to explore and unlock their data.
- Learn:** Combat false-positives by incorporating the radiologists' Knowledge
- Intelligence:** Visualize important and discriminating tissue features

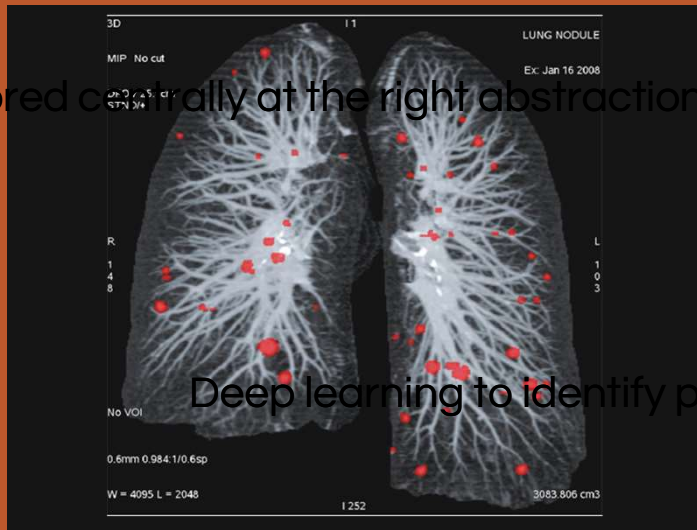
COGNITIVE INTELLIGENCE

Measured at the source

Edge, Cloud, Learning and all that ...

Measured centrally at the right abstraction for "learning" with unlimited computing

Deep learning to identify patterns to gain intelligence



IMAGE

COMPUTING

THANK YOU