
prime
music unlimited
better with Echo
free delivery
two-day and faster
video streaming
movies and tv shows
voice shopping
with Alexa and Echo
free listening
music and Audible shows
free reading
ebooks and magazines
Alexa, play song of the day
echo

Innovation slowdown?

ARE WE OUT OF BIG IDEAS?

Dwindling gains in science, technology and medicine are a hidden drag on economic growth

BY GREG IP

By all appearances, we're in a golden age of innovation. Every month sees new advances in artificial intelligence, gene therapy, robotics and software apps. Research and development as a share of gross dom… time high… engineers…

None o… ingful adv… of living.

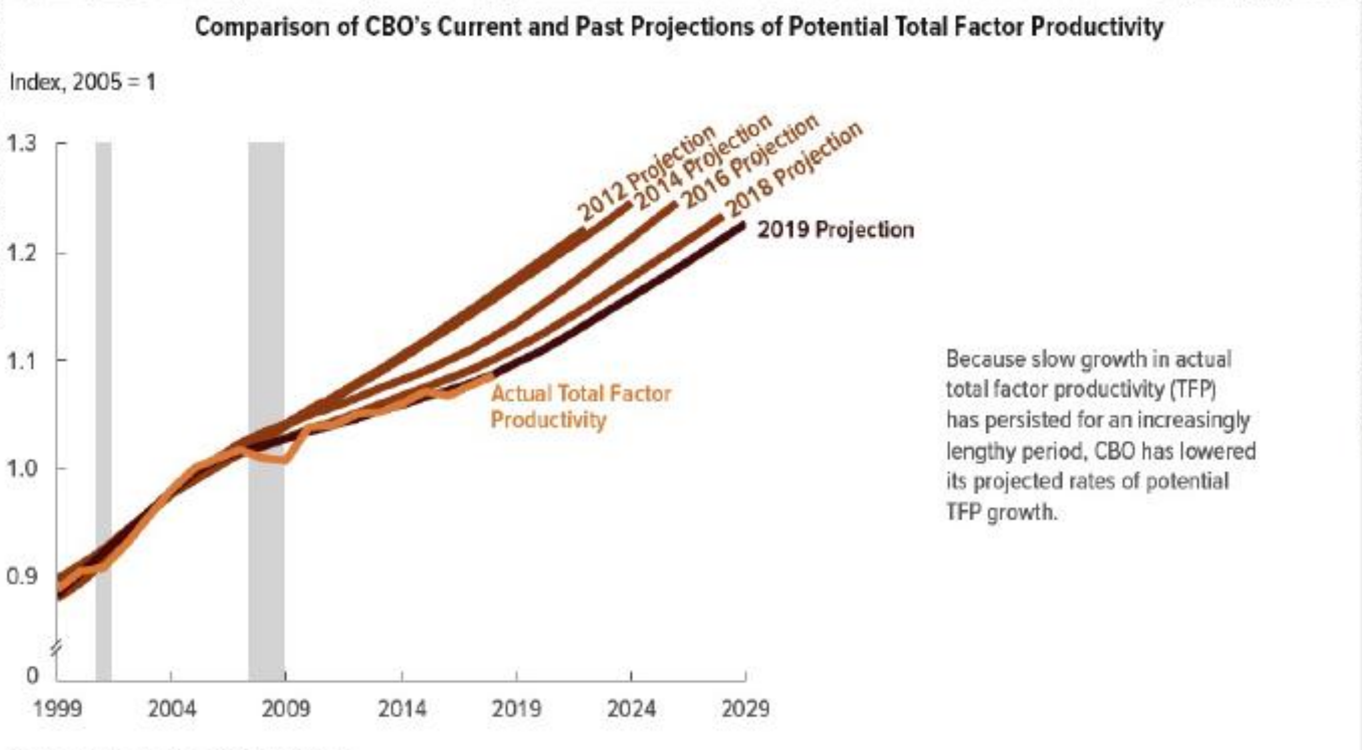
Econor… panding v… such as ec… ings, then… more crea… "total fact…

THE INNOVATION PARADOX

There is a yawning chasm between what innovation promises for the economy and what it is delivering. A Wall Street Journal series, running in full online,

…provements in everyday life have been …cremental, not revolutionary. Houses, a… pliances and cars look much like they c… a generation ago. Airplanes fly no faste… than in the 1960s. None of the 20 most prescribed drugs in the U.S. came to m… ket in the past decade.

Source: …



Comparison of CBO's Current and Past Projections of Potential Total Factor Productivity

Source: Congressional Budget Office.

Centre for Economic Policy Research
POLICY INSIGHT No.63
September 2012

Is US economic growth over? Faltering innovation confronts the six headwinds

Robert J Gordon
Northwestern University and CEPR

1. Introduction

The prospects for future long-run US economic growth were already dismal in 2007 but were little noticed in the continuing euphoria over the invention of the internet and the related developments in information technology and communications (ICT). This Policy Paper pulls back from the past five years of financial crisis to pose a question with implications that will persist for decades even if the current international economic disorder is eventually resolved.

This paper is about US economic growth through 2007 and the future post-2007 path of potential or trend output for the subsequent 20 to 50 years. The analysis abstracts almost entirely from the … since 2007. … questions of … recovery have … output, and … trend path and

…dox yet worth … in the context … frontier of … ing have been … th century. If … slows down, … the slowing … ties for future

growth by all nations as the pace of productivity growth in the US fades out.

The paper makes these basic points:

1. Since Solow's seminal work in the 1950s, economic growth has been regarded as a continuous process that will persist forever. But there was virtually no economic growth before 1750, suggesting that the rapid progress made over the past 250 years could well be a unique episode in human history rather than a guarantee of endless future advance at the same rate.
2. The frontier established by the US for output per capita, and the UK before it, gradually began to grow more rapidly after 1750, reached its fastest growth rate in the middle of the 20th century, and has slowed down since. It is in the process of slowing down further.
3. A useful organising principle to understand the pace of growth since 1750 is the sequence of three industrial revolutions. The first (IR1) with its main inventions between 1750 and 1830 created steam engines, cotton spinning, and railroads. The second (IR2) was the most important, with its three central inventions of electricity, the internal combustion engine, and running water with indoor plumbing, in the relatively short interval of 1870 to 1900. Both the first two revolutions required about 100 years for their full effects to percolate through the economy. During the two decades 1950-70, the benefits of the IR2 were still transforming the economy, including air conditioning, home appliances, and the interstate highway system. After 1970, productivity growth slowed markedly, most plausibly because the main ideas of IR2 had by and large been implemented by then.

…and other Policy Insights, visit www.cepr.org

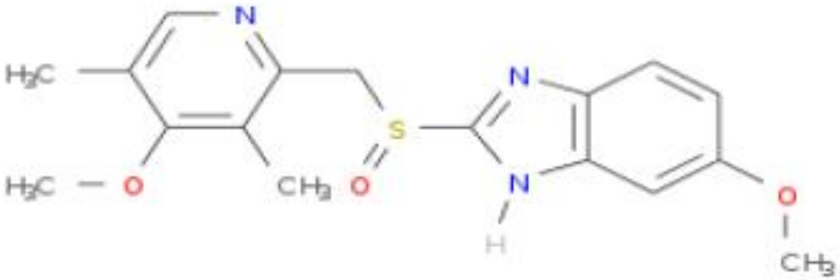
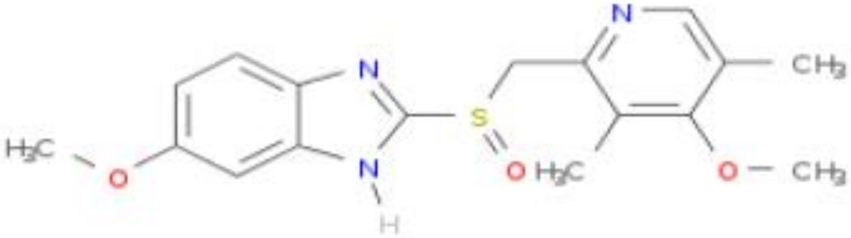
Quality and quantity of innovation?

An innovation is valuable if

- It is novel (i.e., it does not copy an existing idea)
- It is useful (i.e., others use it or build on it)

We have a mechanism for tracking innovations: patents

Sadly, many patents are neither novel nor useful.

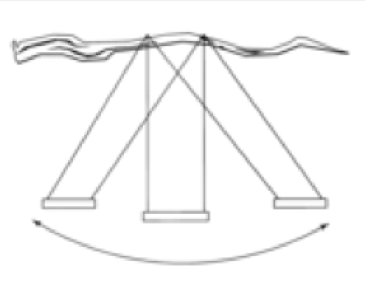
"A new medicine that isn't any better for ordinary heartburn than the one it will succeed" (WSJ, 2002)

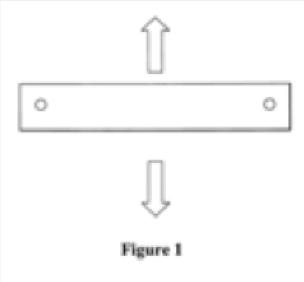
Method of swinging on a swing

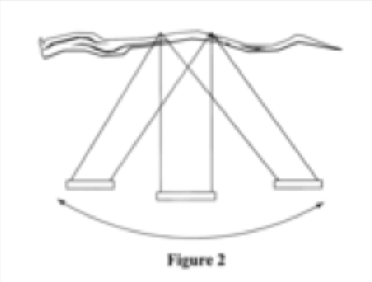
Abstract

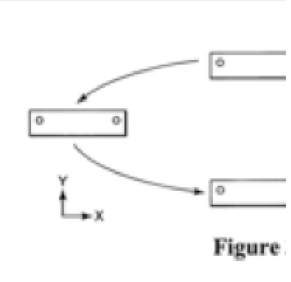
A method of swing on a swing is disclosed, in which a user positioned on a standard swing suspended by two chains from a substantially horizontal tree branch induces side to side motion by pulling alternately on one chain and then the other.

Images (4)









Classifications

A63G9/00 Swings

US6368227B1

US Grant

Download PDF Find Prior Art Similar

Inventor: Steven Olson

Original Assignee: Steven Olson

Priority date : 2000-11-17

Family: US (1)

Date	App/Pub Number	Status
2000-11-17	US09715198	Expired - Fee Related
2002-04-09	US6368227B1	Grant

Info: Patent citations (2), Cited by (11), Legal events, Similar documents, Priority and Related Applications

External links: USPTO, USPTO Assignment, Espacenet, Global Dossier, Discuss

Cited By (11)

Publication number	Priority date	Publication date	Assignee	Title
US6932710B1	2004-09-15	2005-08-23	William T. Hartin	Board swing
US20060036552A1 *	2003-01-31	2006-02-16	Microsoft Corporation	Secure machine counting
US20060293926A1 *	2003-02-18	2006-12-28	Khury Costandy K	Method and apparatus for reserve measurement
US20070232449A1 *	2004-11-26	2007-10-04	Nordisk Terapi As	Training apparatus
US20080293545A1 *	2004-11-26	2008-11-27	Redcord As	Training Apparatus
USRE41363E1 *	1995-11-21	2010-06-01	Samsung Electronics Co., Ltd.	Thin film transistor substrate
US20110003669A1 *	2004-11-26	2011-01-06	Redcord	Training apparatus
US20110239315A1 *	2009-01-12	2011-09-29	Ulla Bonas	Modular dna-binding domains and methods of use
US8420782B2	2009-01-12	2013-04-16	Ulla Bonas	Modular DNA-binding domains and methods of use
US8586526B2	2010-05-17	2013-11-19	Sangamo Biosciences, Inc.	DNA-binding proteins and uses thereof
US8697853B2	2009-12-10	2014-04-15	Regents Of The University Of Minnesota	TAL effector-mediated DNA modification
Family To Family Citations				

* Cited by examiner, † Cited by third party, ‡ Family to family citation

Complex computer

Images (51)

Classifications

G06F7/443 Multiplying; Dividing by successive additions or subtractions

US2668661A

US Grant

Download PDF | Find Prior Art | Similar

Inventor: George R Stibitz

Current Assignee : Nokia Bell Labs

Original Assignee: Nokia Bell Labs

Priority date : 1944-11-23

Family: US (1)

Date	App/Pub Number	Status
1944-11-23	US2668661A	Expired - Lifetime
1954-02-09	US2668661A	Grant

Info: Patent citations (14), Cited by (15), Similar documents, Priority and Related Applications

External links: USPTO, USPTO Assignment, Espacenet, Global Dossier, Discuss

Automated patent quality measurement

Need to ‘read’ 9MM USPTO patent since 1836 to see how each is

- Novel: distinct from previous patents
- Impactful: related to subsequent patents

Automate this:

- Featurize patent text to capture info that was key *when it appeared*
- Train ML to infer past and future patents from these features

Low past similarity implies novelty, good future predictors have impact.

Automated patent quality measurement

Need to ‘read’ 9MM USPTO patent since 1836 to see how each is

- Novel: distinct from previous patents
- Impactful: related to subsequent patents

Document featurization: words *w* in patent *d* at time *t* are given value

$$TFBIDF_{wd} = \frac{count_{wd}}{\sum_{w'} count_{w'd}} \times \log \frac{D_t}{1 + D_{tw}}$$

where D_{tw} is the # patents by t containing w and $D_t = \sum_w D_{tw}$

Check transaction processing, database building and marketing method and system utilizing automatic check reading

US 5,305,196 A

ABSTRACT

A method and system is disclosed for building a database for use in a retail store marketing program. A reader scans a customer's check which has been received at the retail store to detect a checking account identification number. The checking account identification number provides a unique customer identification code to distinguish between a plurality of customers using a plurality of different banking institutions. A data processor includes a stored database of unique customer identification codes . Circuitry is provided for transmitting the detected unique customer identification code to a data processor. The processor is operable for comparing the unique customer identification code against the stored database and for detecting the occurrence of a match between information in the stored database and the detected unique customer identification code. When a match occurs, the processor determines if predetermined identification criteria related to said detected unique customer identification is in the stored database . If the predetermined customer identification data is found in said stored database , the processor is being operable to transmit a signal from the data processor to the location of the check scanning to indicate that the customer record is complete and that no further data is required. If an indication is provided that the predetermined identification criteria is not contained in the database , the processor is operable for generating a signal to the location of the check scanning to indicate that insufficient identification criteria exists such that steps may be initiated to input required additional identification criteria into said database . A terminal is provided for entering the additional identification criteria into the database for storage in conjunction with the unique customer identification code.

Method and system for building a database for use with selective incentive marketing in response to customer shopping histories

US 6,307,958 B1

ABSTRACT

A system and method is disclosed for retail store marketing. A memory store s a database of existing customers of the retail store . The database includes a unique customer identification code for each customer. A memory store s a list of unique identification codes for prospective customers of the store who reside in a predetermined geographical area relative to the store . Circuitry compares the unique identification codes in the stored database of existing customers with the stored list of unique identification codes of prospective customers . Circuitry eliminates data from the list of prospective customers relating to the store 's existing customers , such that a non-customer database is produced for use in marketing.

Automated patent quality measurement

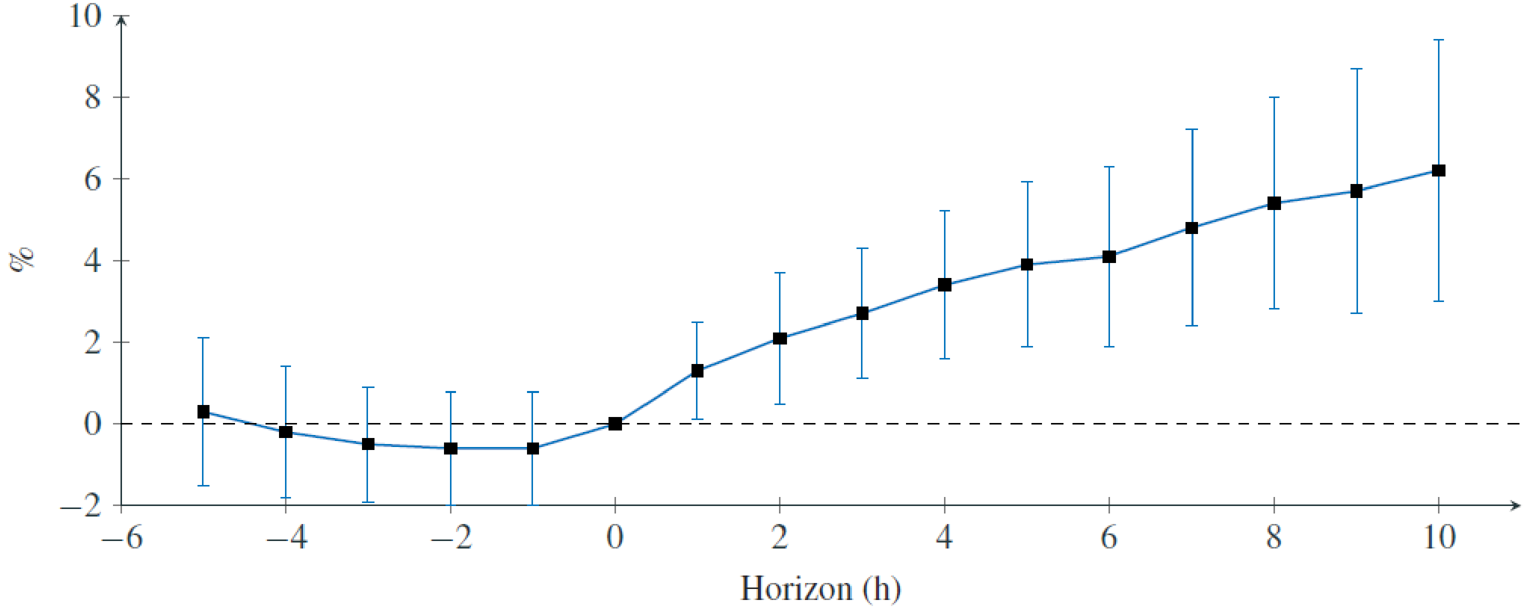
Need to ‘read’ 9MM USPTO patent since 1836 to see how each is

- Novel: distinct from previous patents
- Impactful: related to subsequent patents

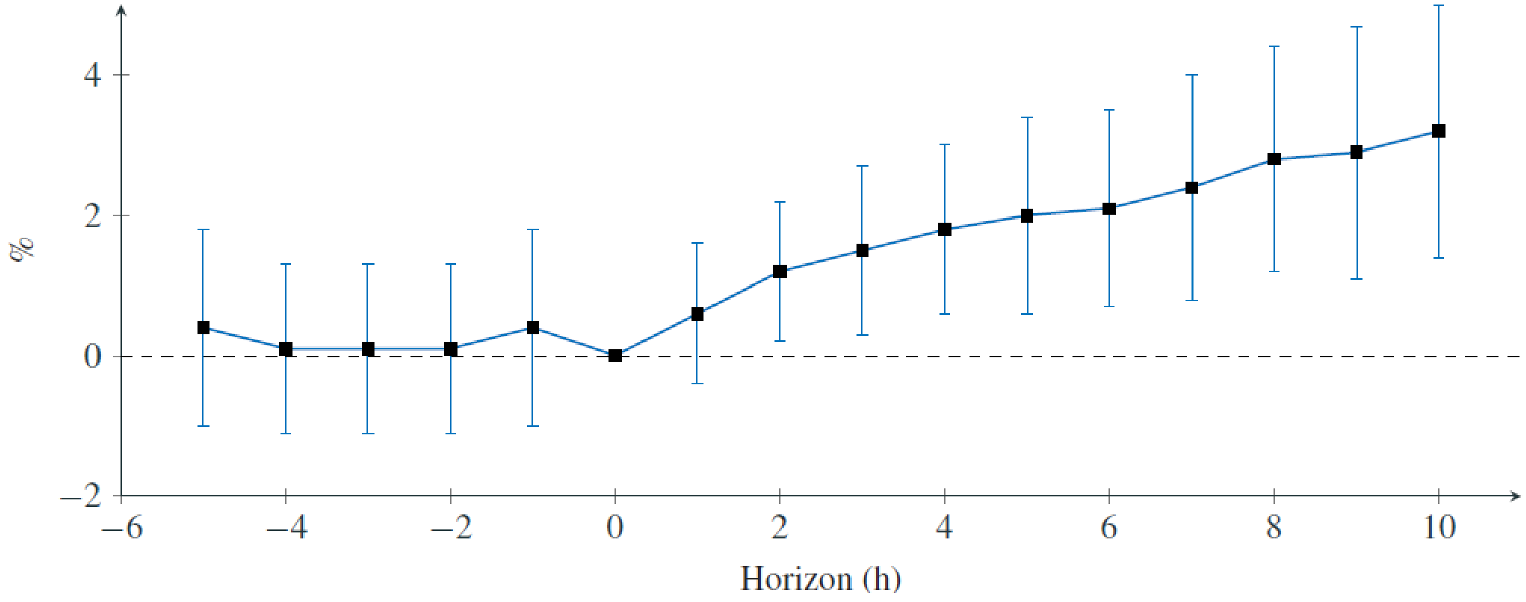
Connecting to past and future:

- Calculate cosine similarity on TFBIDF vectors, ρ_{dk} for patents d, k
- Sum similarities for each patent with future (f_d) and past patents (b_d)
- Define *quality* as ratio of future over past similarity $q_d = \log \frac{f_d}{q_d}$

A. Breakthrough Innovations and Firm Profits



B. Breakthrough Innovations and Labor Productivity (output-per-worker)



An index of innovation

Decompose quality for patent d from year t as $q_d = \alpha_t + \beta_d$

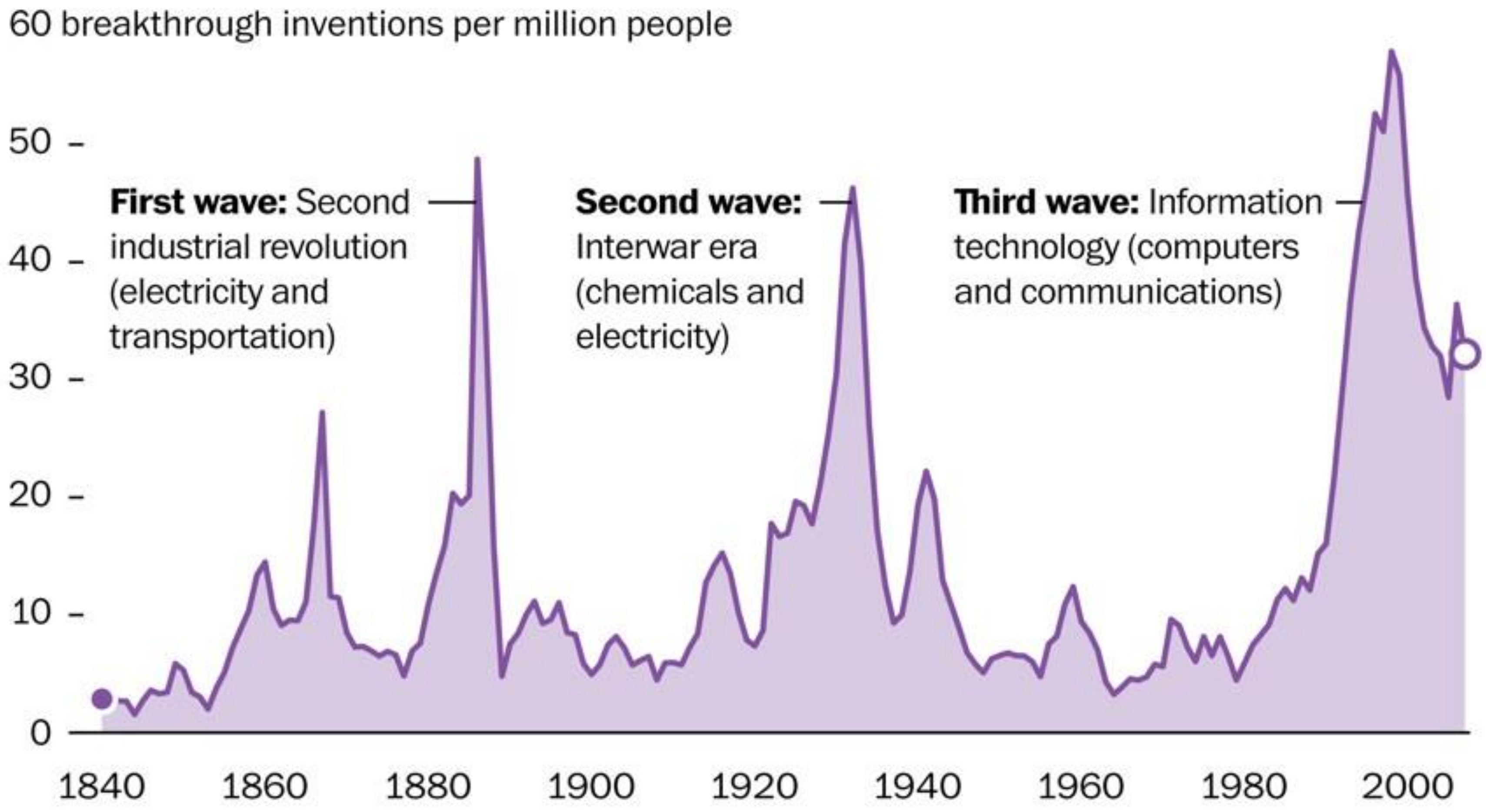
(control for the temporal changes in language usage)

Count the number of patents for year t with β_d in the 95th percentile

(dampen estimation noise)

When the most influential U.S. inventions were patented

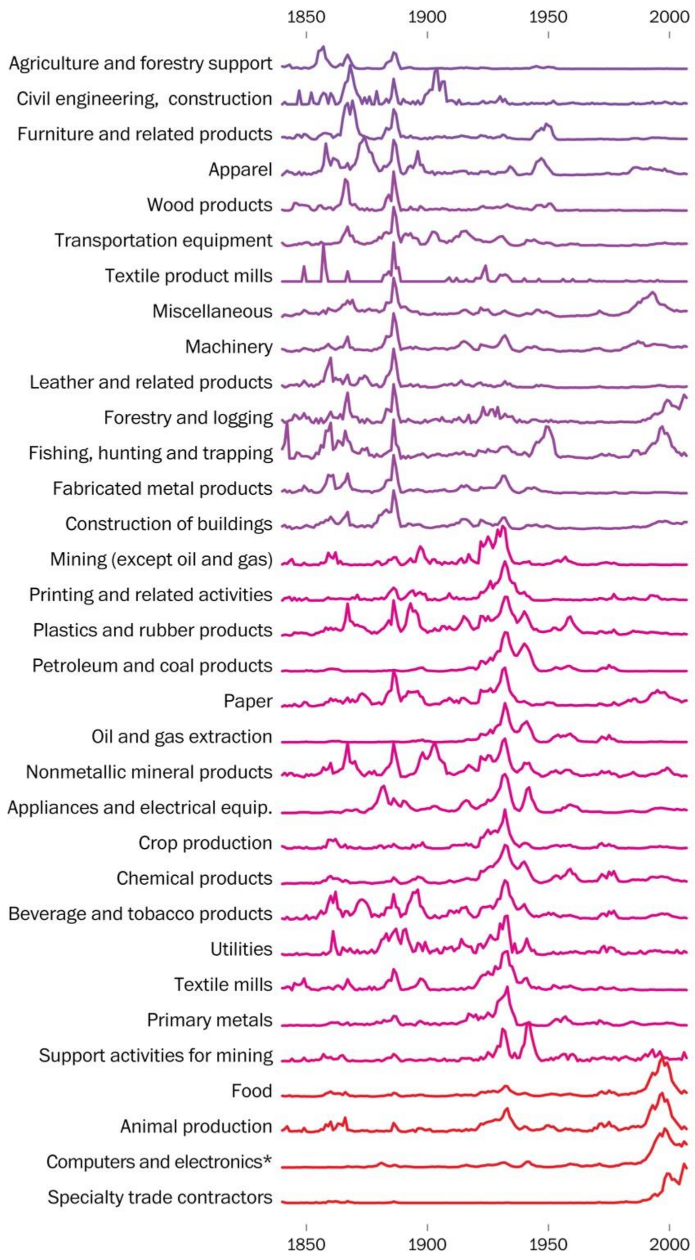
Annual count of breathrough patents, adjusted for population



Source: Analysis of U.S. Patent Office data by Bryan Kelly, Dimitris Papanikolaou, Amit Seru, Matt Taddy
THE WASHINGTON POST

When each industry's top innovations were patented

Indexed relative to each industry's individual peak

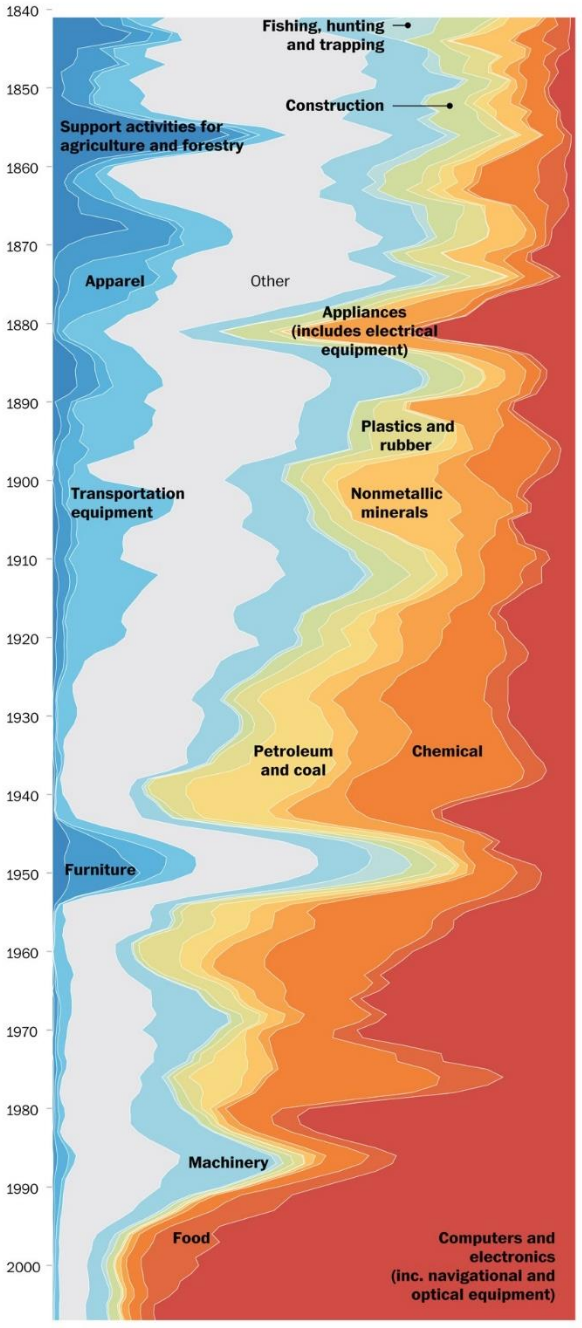


* Includes navigational and optical equipment

Source: Analysis of U.S. Patent Office data by Bryan Kelly, Dimitris Papanikolaou, Amit Seru, Matt Taddy

THE WASHINGTON POST

Distribution of influential U.S. inventions by industry



Source: Analysis of U.S. Patent Office data by Bryan Kelly, Dimitris Papanikolaou, Amit Seru, Matt Taddy

THE WASHINGTON POST

Day 1

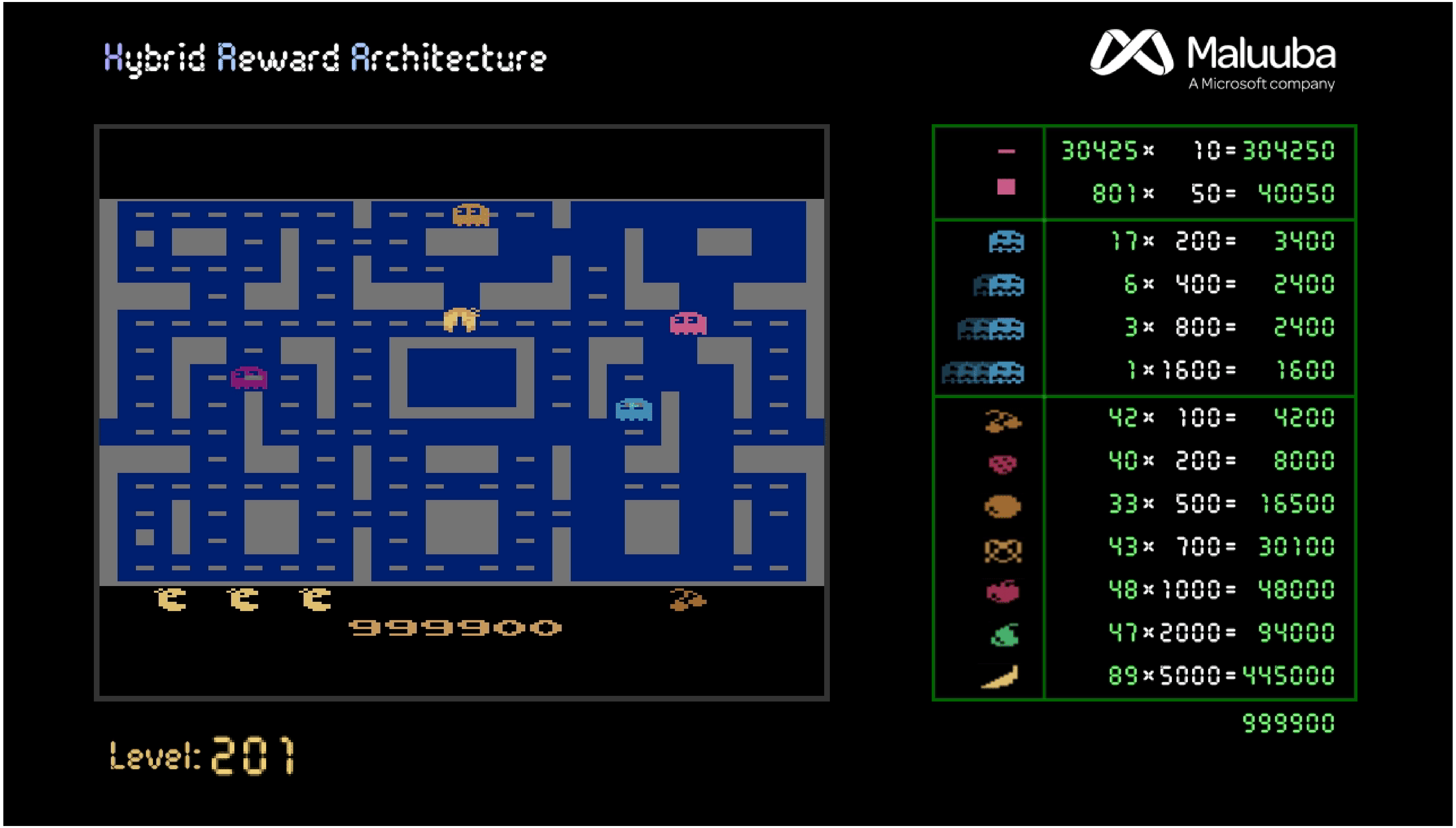
At Amazon we say, it's always "Day 1." What do we mean? Our approach remains the same as it was on Amazon's very first day — to make smart, fast decisions, stay nimble, innovate and invent, and focus on delighting customers.

What is AI?

Domain Structure + Data Generation + General Purpose ML

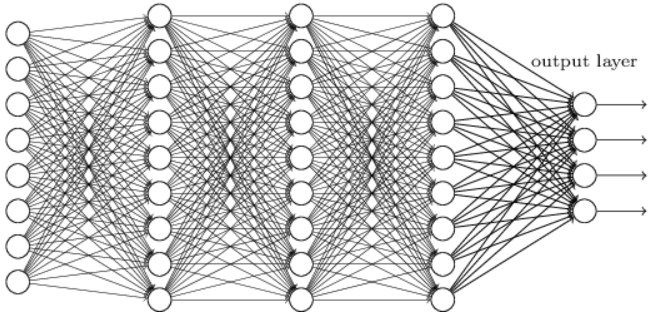
Econ/Biz Framework Hands off the Wheel Causal Inference	Reinforcement Learning Sensor/Camera networks Simulation/GANs	Auto ML, Sagemaker, Inferentia, DNNS, GPUs, Comp Vision, NLU, NLG

Self-training structures of ML predictors that automate and accelerate human tasks



https://www.youtube.com/watch?time_continue=13&v=zQyWMHFjewU

DEEP NEURAL NETWORKS



Train faster, generalize better:
Stability of stochastic gradient descent

Adaptive Subgradient Methods for Online Learning and Stochastic Optimization*

$$\mathcal{L} + \beta \underbrace{\frac{1}{2}\|w\|_2^2}$$

Dropout: A Simple Way to Prevent Neural Networks from Overfitting

TensorFlow

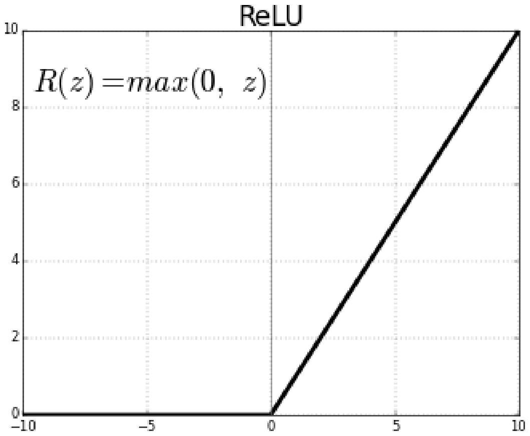
mxnet

PyTorch

K

GLUON

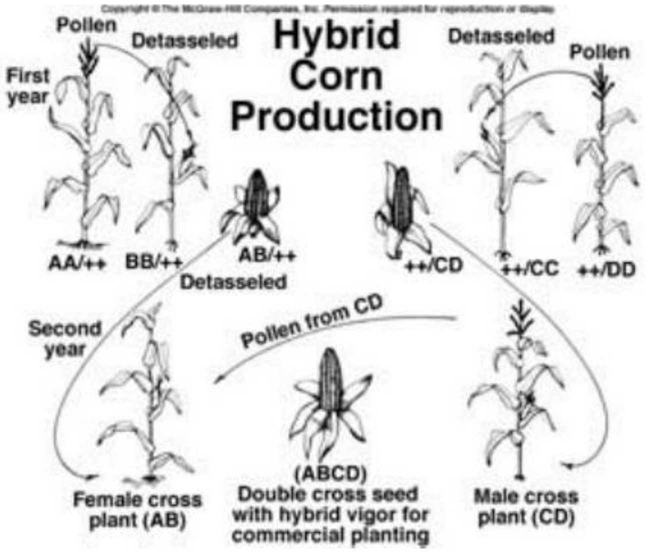
HOROVOD



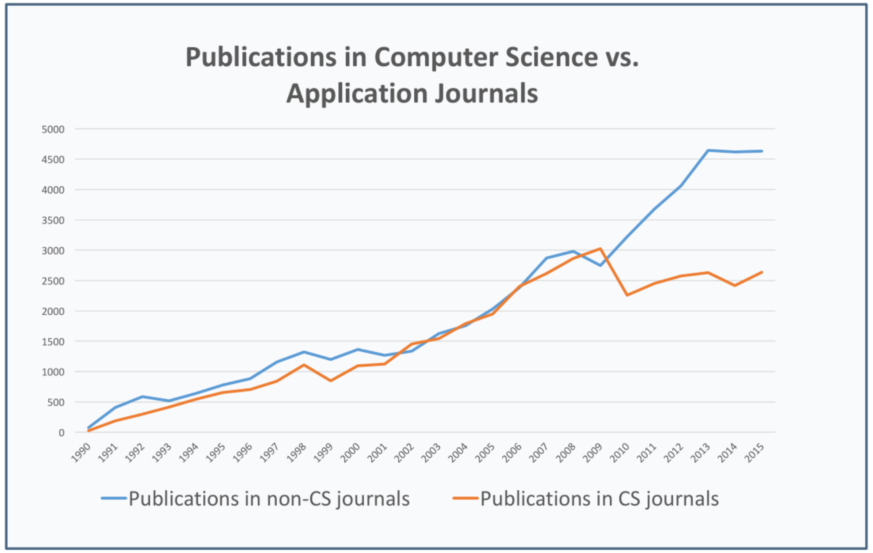
The Economics *of* AI

DNNs are GPT and ‘method for invention’

- Broad impact, up and down the value chain
- Gets better, faster, and cheaper in time
- Can suffer from underinvestment
- Productivity gains lag invention



AI research in computer science journals vs. other application sectors.

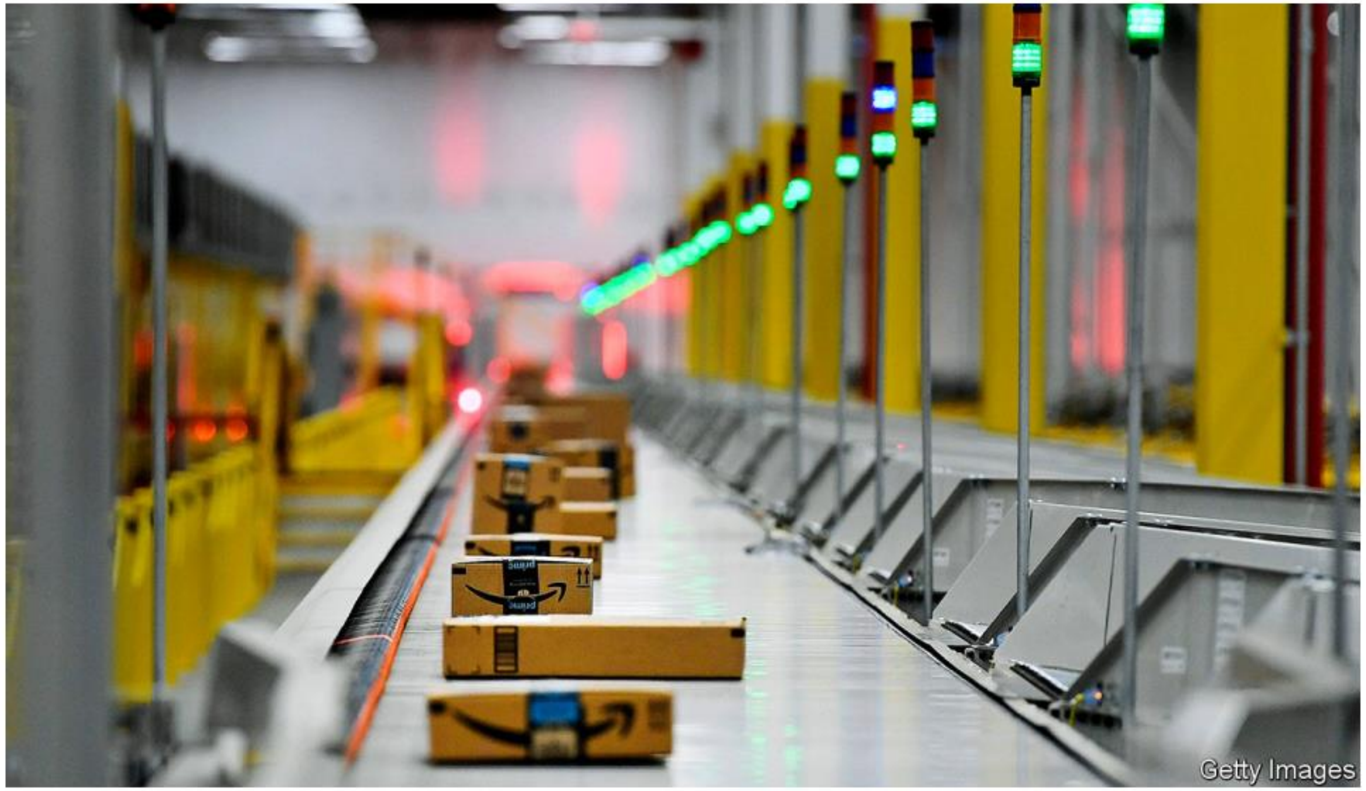


Graph from Cockburn/Henderson/Stern

The learning machine

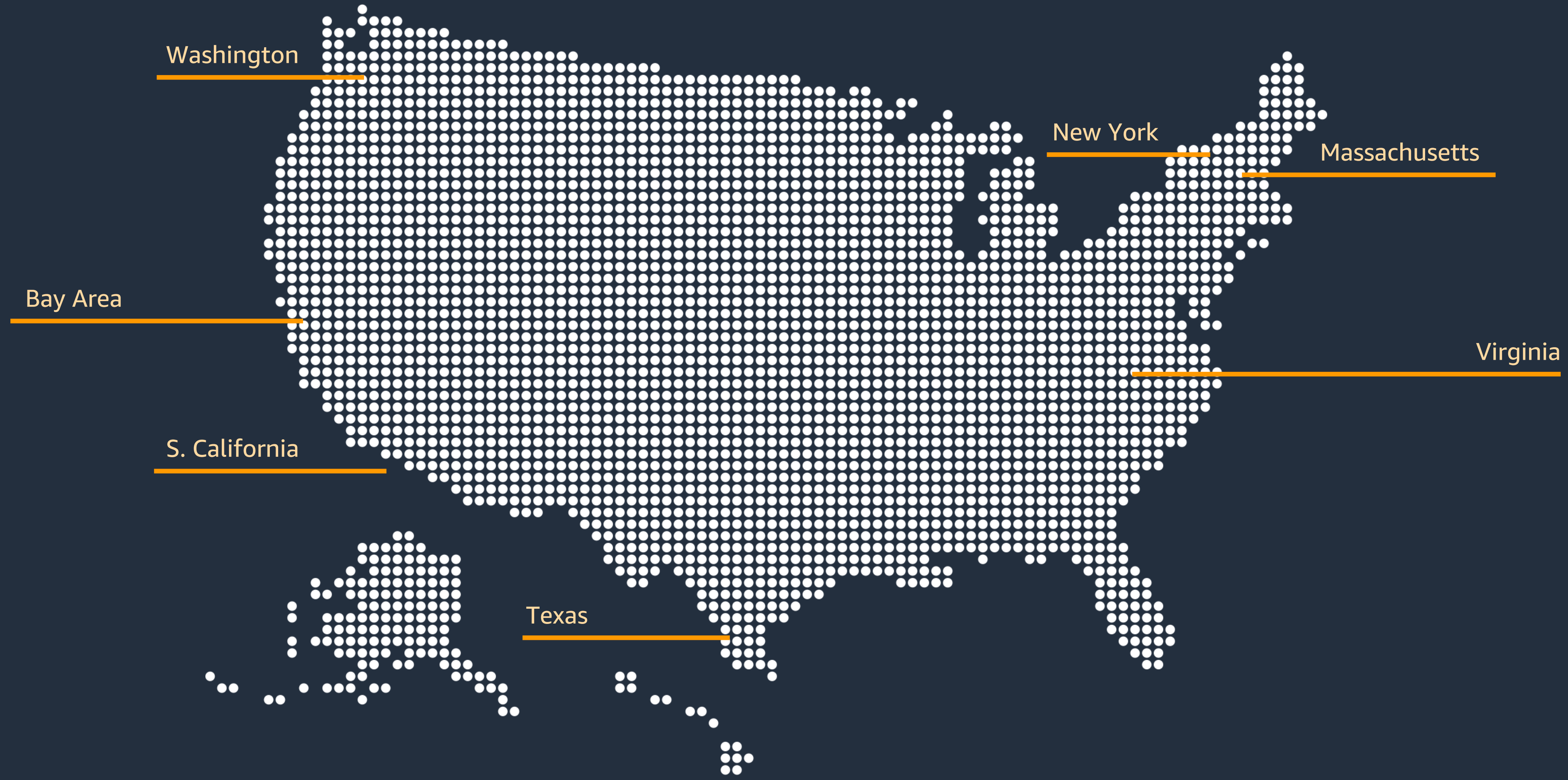
Amazon’s empire rests on its low-key approach to AI

Unflashy but high-powered machine learning powers everything from its fulfilment centres to the cloud



- Key business reviews ask: *How are you using ML?*
- Science and Business break big questions into ML tasks
- Need to answer “Why?”
- AI impacting physical world – boxes, robots, humans!
- Improving ML: Sagemaker, Auto ML, Inferential, CV …

Research in North America



Q&A