AI for Totally Intelligent Behavior

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Hope, Wish, Will, Care, Solidarity, Prayer,... of Individual, Group, or Organization
夢を叶える Dreams Come True

2004、TIMES誌記事より

Team Play: Synchronizing wills of members

Superb and Exquisite pass

How he knows what
Other players are doing?

Practice makes perfect
Good habit is smart

Autonomous Systems can synchronize

Real World Efforts for Computer to be Intelligent/Intellectual

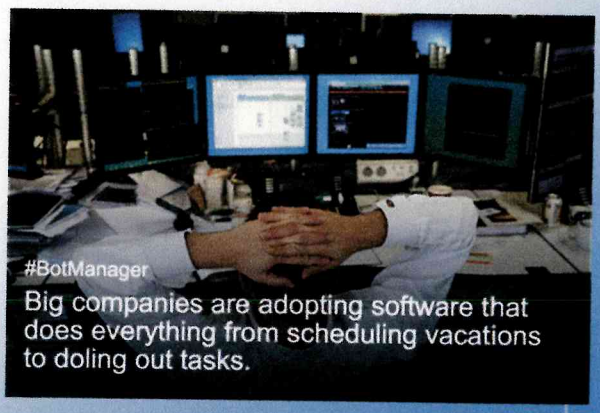
- Dreams and small improvements join into Artificial Intelligence in 50 years of scientific/engineering efforts
- There were several turning points to jump
  - Early days: symbolic processing of thoughts, knowledge representations, machine learning
  - Then, making Robots to walk, understanding natural language communication
  - Delivering practically usable tools like expert systems
  - Connectionism and Neural Networks
  - Deep learning for image recognition and stream predictions

Big Data: Accumulation of Enormous Data online

- Keeping huge amount of Raw Data as is, not processed
  - Statistic handling ignores various unexplored characteristics of data
  - Evaluate the meaning of data at the moment of needs
- Automatic accumulation of automatically created raw data
  - Access logs
  - Posting to SNS
  - Sensor data in real time
  - Results of organizational works
  - Music, Picture, Video clips
  - Government created public data

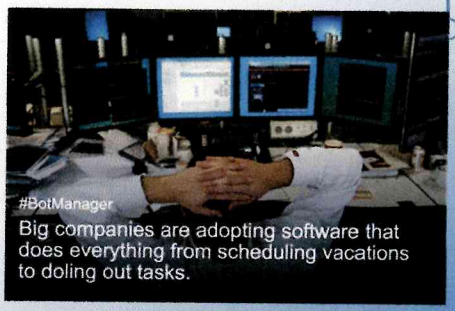
AI is a concept to make computer 'smarter'

- On December 13 2017, I woke up with the mail from LinkedIn having this picture
- The title is "Why your next boss could be a robot"
- It's not easy to understand whole AI
- Not a simple tech to apply to daily operations, and 'improve'
- It's from a science of "think differently" for industrial executives
- Or you may think AI as a concept to change your paradigm



Two types of Jobs will Survive?...

- Lower layer works, and high layer works
  - In what sense?
    - Ex. Human interaction works and strategy/policy design
  - Micro ⇔ Macro?
  - Non-intelligent ⇔ intelligent?
  - Support for each individual ⇔ total happiness?
- Middle layer would be substituted by automation, robots, computers, ...



Breaking News on December 28, 2017 "AI substitutes 90% of Mitsui Sumitomo Insurance Sales Staff members administrative works" by Nikkei

- Mitsui Sumitomo Insurance, a major property and casualty insurance company, will replace 90% of administrative work handled by sales staff members with artificial intelligence (AI), etc. since fiscal 2018. It automatically make procedures related to contracts of insurance and correspondence of information inquiries, and reduce the work volume seen on a companywide basis by 20%. The staff with hands will be handed over to sales representatives and others. Improve profitability by linking new technologies to optimal placement of human resources.
- Press Release on December 19, 2017 of the company "Mitsui Sumitomo Insurance has established a system that supports inquiries by customers and agencies using AI (artificial intelligence) technology, and has now been in operation. By introducing AI technology, this system will shorten the time required to respond to inquiries and homogenize the content of responses and realize quicker and higher-quality customer response than ever."

Deutsche Bank Launched a Digital Revolution

https://fintechonline.jp/archives/99996

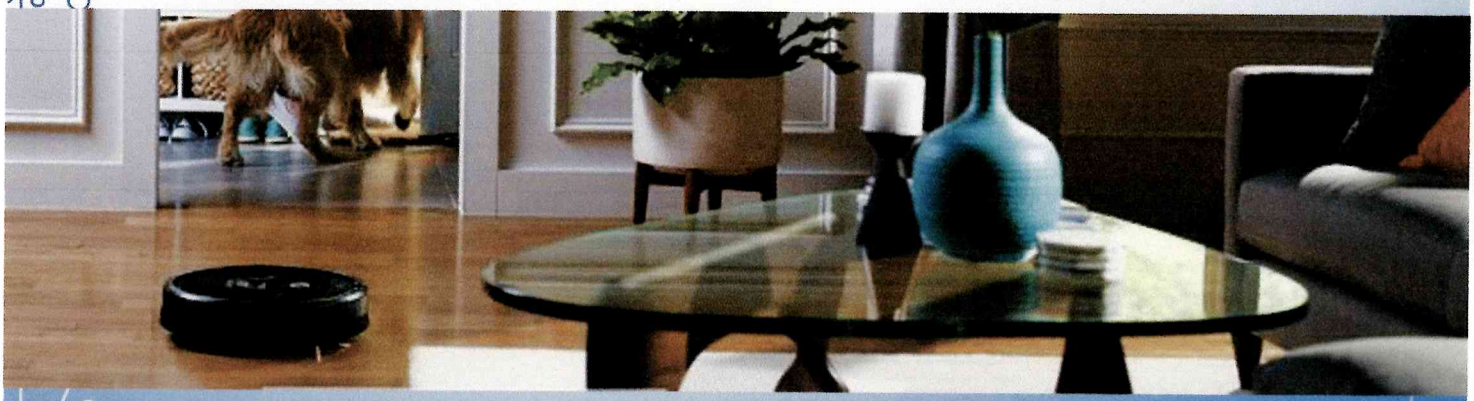
- Deutsche Bank announced on June 21 2016 that it will close 188 shops, equivalent to 25% in Germany
  - Through this decision, 3000 people (of which 2,500 work at branch offices) lost their jobs and the number of branches will be reduced from 723 stores to 535 stores
  - Deutsche Bank aiming for large-scale business shrinking intends to further closing branches and deleting personnel
    大規模な事業縮小を目指すドイツ銀行は、さらなる支店閉鎖と人員削除を実施する意向
- The "digital revolution" by major companies became popular and the mass restructuring accompanying it became no longer an unusual move大手企業による「デジタル革命」が常識となりそれにともなう大量リストラは最早珍しい動きではなくなった
  - Digitization is a perfect way for companies which need cost reductions, and at the same time, the best "new products" that attract consumers' attentionコスト削減を余技なくされた企業にとって、デジタル化はうってつけの手段であると同時に、消費者の関心を惹きつける最高の「新商品」
  - Digitization that leads to long-term cost reduction requires a huge investment. In recent years, Deutsche Bank digitized 120 stores, investing 2.3 million dollars in each store長期的なコスト削減につながるデジタル化には、莫大な投資が必要となる。ドイツ銀行はここ数年で120店舗をデジタル化、各店舗に230万ドル（約3億2188万円）ずつ投資
- "In situation like low interest rates, strengthening of regulations and changes in consumer trends now, it is inevitable to reduce personnel in competition with rivals equally"「低利率、規制の強化、そして消費者動向の変化といった厳しい状況下にある今、ライバルと対等に競ううえで人員削減は避けられない」

So many applications succeeded reported in 2016-

- Huma face recognition, Cat recognition, Scene analysis, category classification, Car type detection, shelves monitoring, ...
- Sales forecast, human population estimations, Customer number predictions, ...
- Natural language comprehension, Machine translation, Natural language interaction, chat-bot, ...
- Automatic Telephone answering with natural language voice, Customer service operations...
- Automatic driving, automatic maneuvering, automatic detection(and recovery) of error/exception, process management, ...
- Smart equipment, smart services,...
- Decision supports, human assistance, ...
- Robot, AI clerk, ...
- AI Han character conversion, dynamic routing, fuzzy processing, many IT technical elements
- Medical applications, diagnosis, Robot surgery, ...

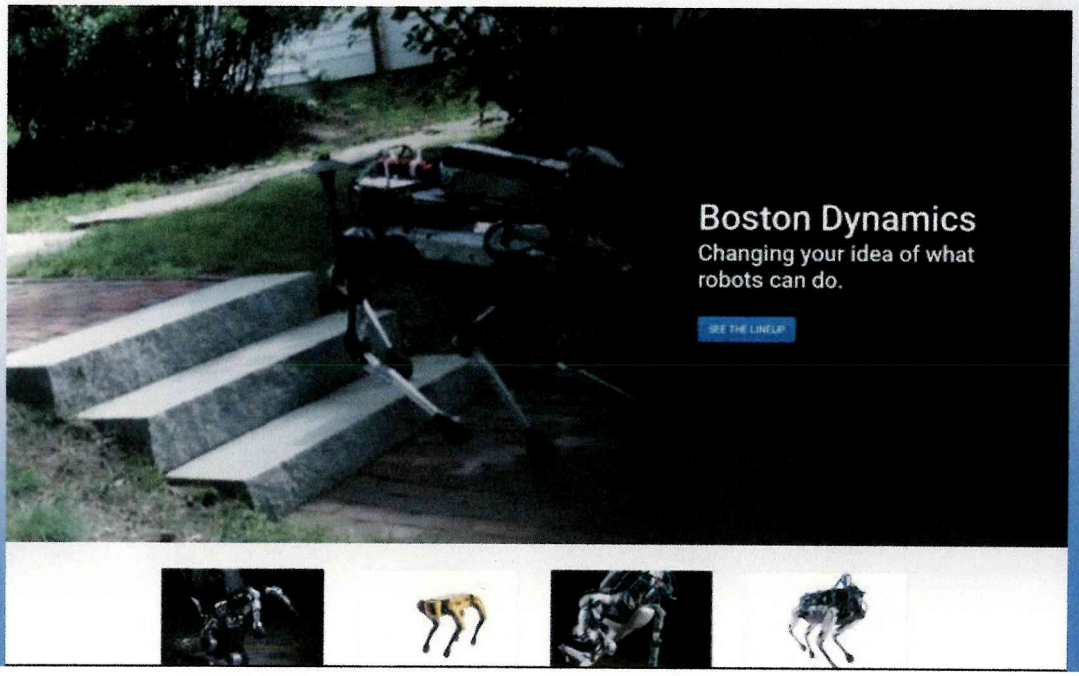
iRobot Roomba

https://www.irobot-jp.com/roomba/index.html
Appeared as a commercial product in 2002, then,
Improved many times till now



Boston Dynamics MIT Professor Founded in 1992

https://www.bostondynamics.com/



Traditional Approach: Algorithm based on domain knowledge and parameter tuning for detecting specific anomalies

Deep learning way is quite different

Industrial use report in 2016: manufacturing and factory, Detection of abnormal signals

In traditional way, extraction of features, then detect

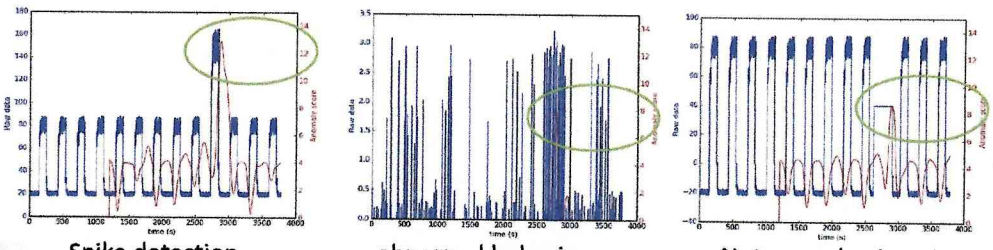
GPU TECHNOLOGY CONFERENCE

Preferred Networks

産業オートメーション向けディープラーニング

ディープラーニングの異常検知システム

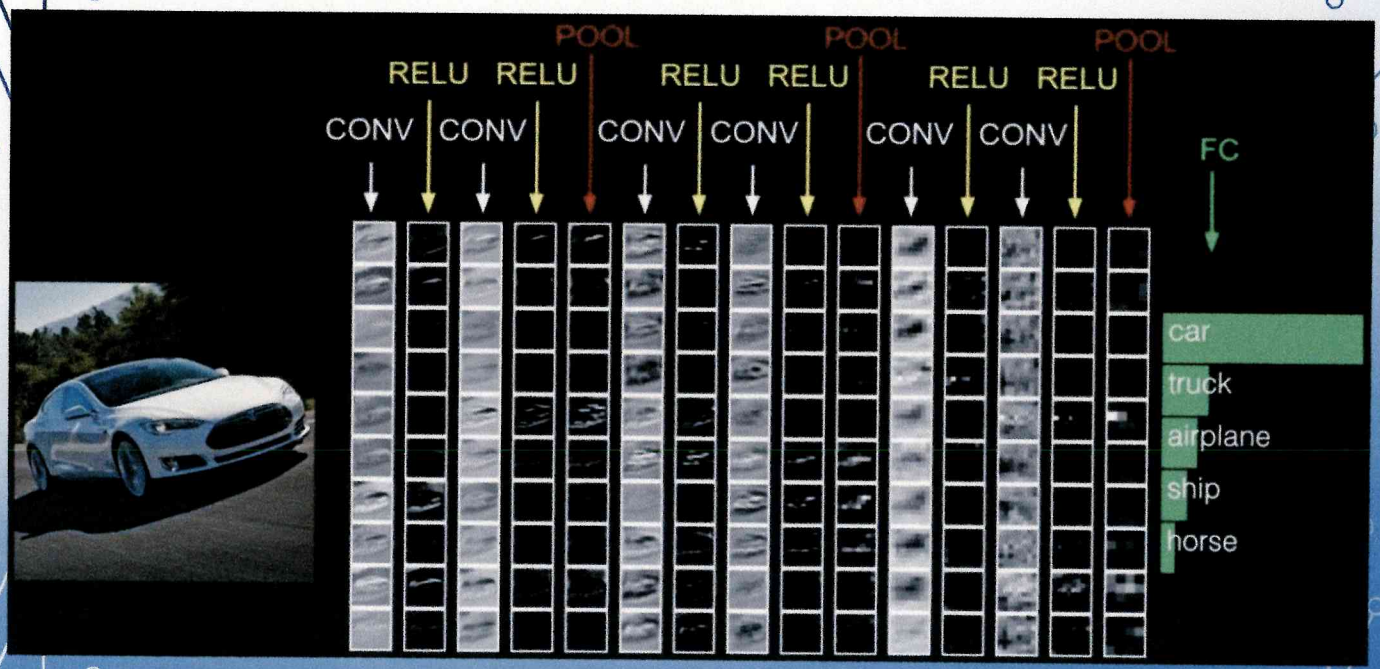
- 特異なパターンの検出にチューニング不要
- 同一構成の単一アルゴリズムで３種類の異なる異常を検知

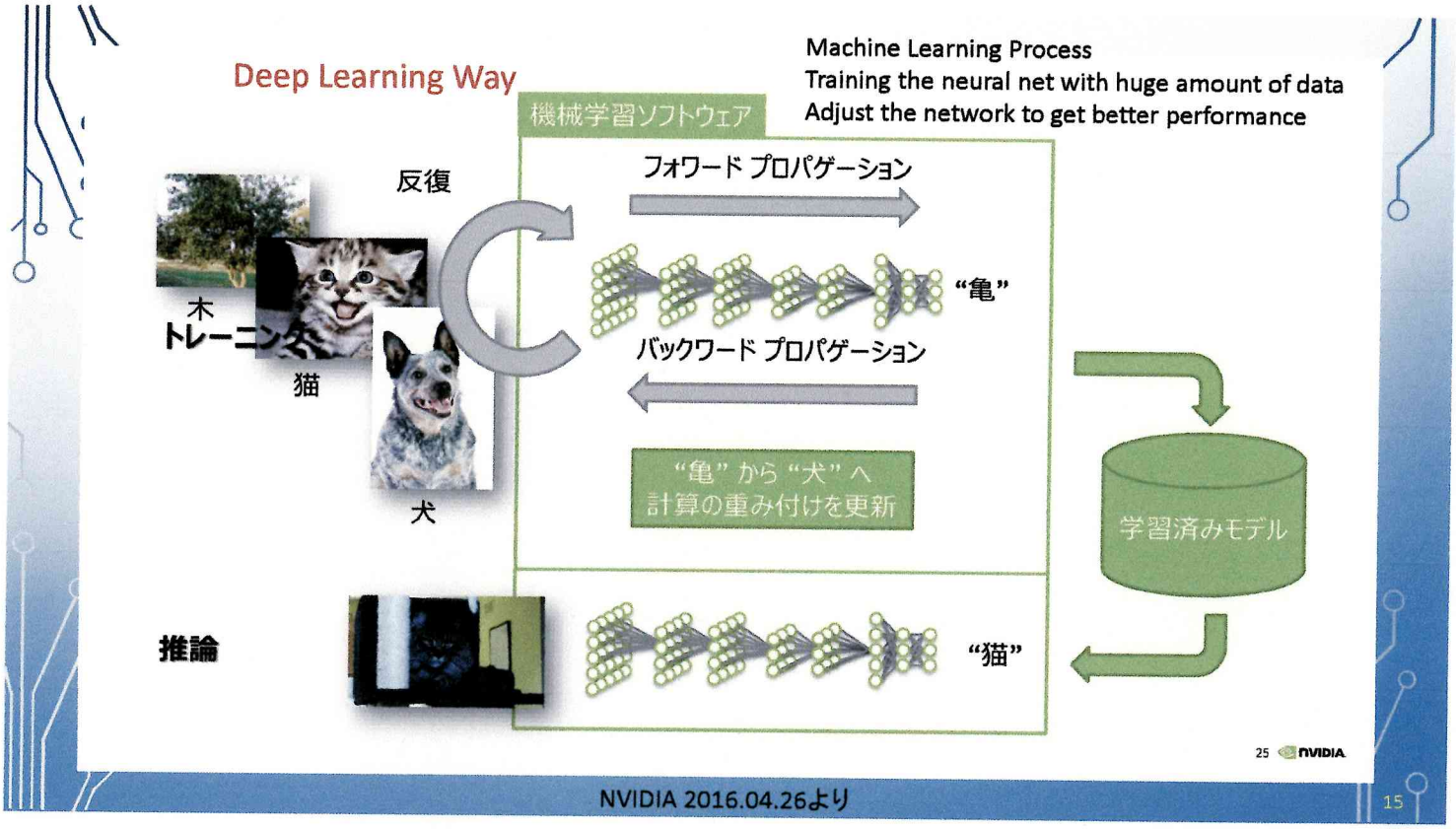


Spike detection　　abnormal behavior　　Not enough triggering

Numenta NAB artificial datasets with anomalies

http://cs231n.stanford.edu/slides/winter1516_lecture7.pdf





Real time monitoring of Video streams and online chatting, and quality watching

ドワンゴによるニコニコ動画の解析・監視

- Reported in 2016

『「AIファンド」は、人間のトレーダーを駆逐するのか』
Will "AI Fund" eradicate human traders?
17/9/7 https://news.yahoo.co.jp/feature/740

- 『あらゆる分野で人工知能(AI)の活用が止まらない。証券取引の世界も例外ではなく、AIの導入による業務効率化が進む。今年春には、米大手証券会社ゴールドマン・サックスがかつて600人いたトレーダーを2人に削減したと報じられるなど、従来の人間の仕事を奪う事態も起きている。日本の金融機関でも、AIの活用は待ったなしだ。このままいくと、証券取引もすべてAIが代替する時代がやってくるのだろうか。そのとき人間の役割はどうなるのか。』The use of artificial intelligence (AI) can not stop in every field. **The world of securities trading is not an exception**, and the introduction of AI promotes work efficiency. In the spring of 2009, a situation arises in which the major US securities firm Goldman Sachs reports that he had reduced the traders who had 600 in the past to two people. Even Japanese financial institutions do not wait for the use of AI. If we continue to do this, will the time when AI replace all securities trading will come? What is the role of human beings then?
- 『「朝、出社してくると、今日売買すべき銘柄と株数がパソコンに表示されている。いま『日本AI』の運用担当者の仕事はAIが出してきた売買の指示を確認し実行すること。AIの判断に基づくAIが主役の運用です」三菱UFJ信託銀行資産運用部の<氏名引用略>チーフファンドマネージャーはそう笑う。』"When coming to work in the morning, the stocks and the number of shares to be sold today are displayed on the personal computer. The work of the person in charge of the operation of "Japan AI" now confirms and executes the instruction of the sale and purchase issued by AI. AI based on the judgment of AI is the operation of the leading role." said the chief fund manager at Mitsubishi UFJ Trust and Banking, Asset Management Department

Stock Market Forecast tool at prattle
2017.10.26 AI Start-up Seminar at Basis Tech.

- アルゴリズム化・定量化する手法が増えてはいるが、定性的・感性情報による株式売買の予測も数量化できる While Algorithmic and quantifying methods are increasing, prediction of stock trading by qualitative/sensitivity information can also be mathematically handled
  - ファンドとしては、こっちの方が良いと思う、を何に基づいて言うかAs a fund, how you say, based on what I think this is better
  - 定量化手法では、既知の情報をできるだけたくさん集めて、その後、それらから判断するIn the quantification method, we collect as much information as possible and then judge from them
- 自動化した株価推移のフォローは安価にでき、かつ、現在ダウの40%は解析・リサーチされていないが、それも対象にできるFollow-up of automated stock price transition can be made cheaply, and 40% of Dow's current brands is not analyzed, but it can also be targeted
- Combination of Traditional AI methods and DL make better forecast.

Experiments in Japan finally starts in Dec. 2017

Self driving car experiments on public road

No driver in the car

Automatic Driving becomes ready

California State DMV report in Jan. 2017

The auto driving levels becomes defined as SAE J3016

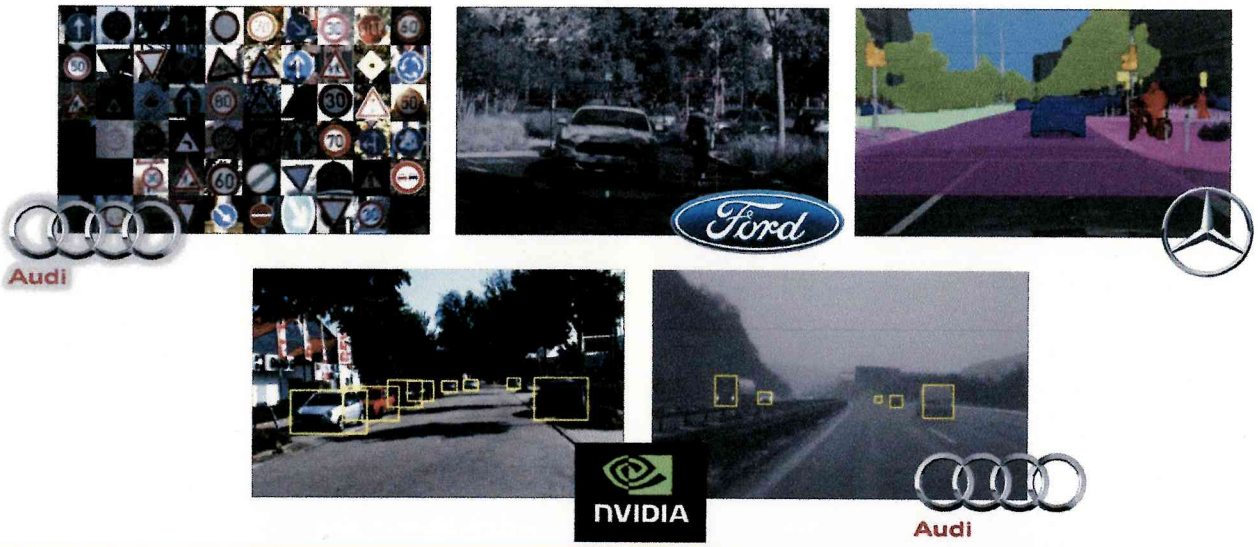
	Miles driven in a year	Human interventions	Rate of intervention per 1K mile	Number of Cars used
Google	635,868	124	0.20	60
Cruise	10,015	284	28.36	25(GM)
Nissan	4,099	28	6.83	5
Delphi	3,125	178	56.95	2(Audi)
Bosch	983	1,442	1466.94	3
Mercedes	673	336	498.95	1
BMW	638	1	1.57	1
Ford	590	3	5.08	2
Tesla	550	182	330.91	4
Honda	0	0	0.00	
VW	0	0	0.00	

Google reports total 420Kmiles driven in 2015 Intervention rate was 0.8

While, Compete Auto Driving is still a dream, ...

Google Driverless Car

自律走行車の為のディープラーニング



NVIDIA 2016.04.26より

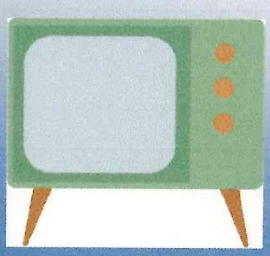
Topics around Unattended driving truck are quietly going on

- Experiments of truck without driver is now going on
- And Platooning
- No human in the cars, do not go into town
- Long driving inside the campus
- 国土総合利用の観点Viewpoint of total use of the land
- Employment issues for existing truck drivers

https://gigazine.net/news/20160408-platooning-challenge/

Sharp announced AQUOS 4K TV having AIoT feature AIoT of Sharp started in 2015, recommends program to watch etc

The AI on the cloud analyzes and learns frequent TV programs and familiarly watched TV programs and learns and tells programs recommended by each family, such as programs of favorite genres and favorite talents.



シャープ、AIoT対応液晶テレビ「AQUOS 4K」5機種を発売

2017/9/28 17:00

https://www.nikkei.com/article/DGXLRSP458651_Y7A920C1000000/

発表日：2017年9月28日

シャープは、AI(人工知能)が家族の好みを学習し、おすすめの番組を音声でお知らせするAIoTクラウドサービス「COCORO VISION（※1）」に対応し、音声検索や豊富なアプリケーションで楽しみが拡がる「Android TVTM」を採用したAIoT対応液晶テレビ『AQUOS 4K』5機種を発売します。

本機は、クラウド上のAIが家族のよく見るテレビ番組や視聴する時間帯を分析・学習することで、好みのジャンルやよく見るタレントが出演する番組など、それぞれの家庭ごとにおすすめの番組を音声でお知らせしてくれます。本体前面に搭載した人感センサーが、本機の電源を自動的に起動し、番組の情報だけでなく、その時々の旬な情報もお知らせしてくれます。スマートフォンとの連携も可能（※2）で、気になる番組の開始時刻などが手元の端末に通知されるだけでなく、簡単な操作でテレビのチャンネル選局も行えます。

Customer Behavior monitor at Store front with camera, NEC

2017/10/11 6:30　日経産業新聞セレクション

https://www.nikkei.com/article/DGXMZO22082380Q7A011C1X90000/

- NECは、人工知能（AI）を活用して商品棚の前での消費者の行動を把握する技術を開発した。カメラの撮影画像をもとに、買わなかったが手に取った商品などを特定できる。POS（販売時点情報管理）データの購入履歴からは分からない客の興味度を知ることができ、販促などに役立つ。複数の小売業と実店舗で実証実験をしており、実用化を目指す。NEC has developed a technology to grasp the behavior of consumers in front of product shelves utilizing artificial intelligence (AI). Based on the photographed image of the camera, it is possible to identify the product etc. which he did not buy but picked up. It is possible to know the degree of interest of customers who do not know from POS (point of sale information) data purchase history, and it is useful for promotion etc. We are conducting field trials in multiple retailers and real stores, aiming for practical use.
- 天井に設置したカメラで商品棚の前を撮影した画像をもとに「触れただけ」「手にしたけど戻した」を区別する。分析用ソフトウエアが画像内に人が入ってくるのを認識。あらかじめ設定しておいた商品棚に手を伸ばしたのをとらえて「触った」と判定する。画像処理に使うAI技術、深層学習をもとに、消費者の手の位置を特定し、手の周りの形から商品を持ったかどうかを識別するBased on the image taken of the front of the commodity shelf by the camera installed on the ceiling, we distinguish "just touched", "I picked it up but returned it". Analysis software recognizes people coming in the image. I grasped that I reached out to a preset commodity shelf and judged "touched". Based on the AI technique used for image processing, based on deep learning, identify the position of the hand of the consumer and identify whether the item is held from the shape around the hand

The Big Problem With Self-Driving Cars Is People

and we'll go out of our way to make the problem worse
https://spectrum.ieee.org/transportation/self-driving/the-big-problem-with-selfdriving-cars-is-people

- Posted 27 Jul 2017 by Professor Rodney Brooks, who became the director of CSAIL MIT, after Professor Winston
- "Detecting whether a pedestrian standing on a street corner is going to cross or simply talking is still impossible with current technology"

Totally depend on an AI system, or use AI based tool as a part

- At least, vague approach is dangerous, must have clear idea
- Automation or robot idea is effective in general
  - Security and safely, strength of the whole system
  - Need back up?
  - IoT or real time monitoring for 24hrs 365 days?
  - Customer services need patience sometimes, warm interaction
  - Nursing and Care for Seniors
- The system mechanism is deterministic or probabilistic? And responsibility
- Assistance or main player?

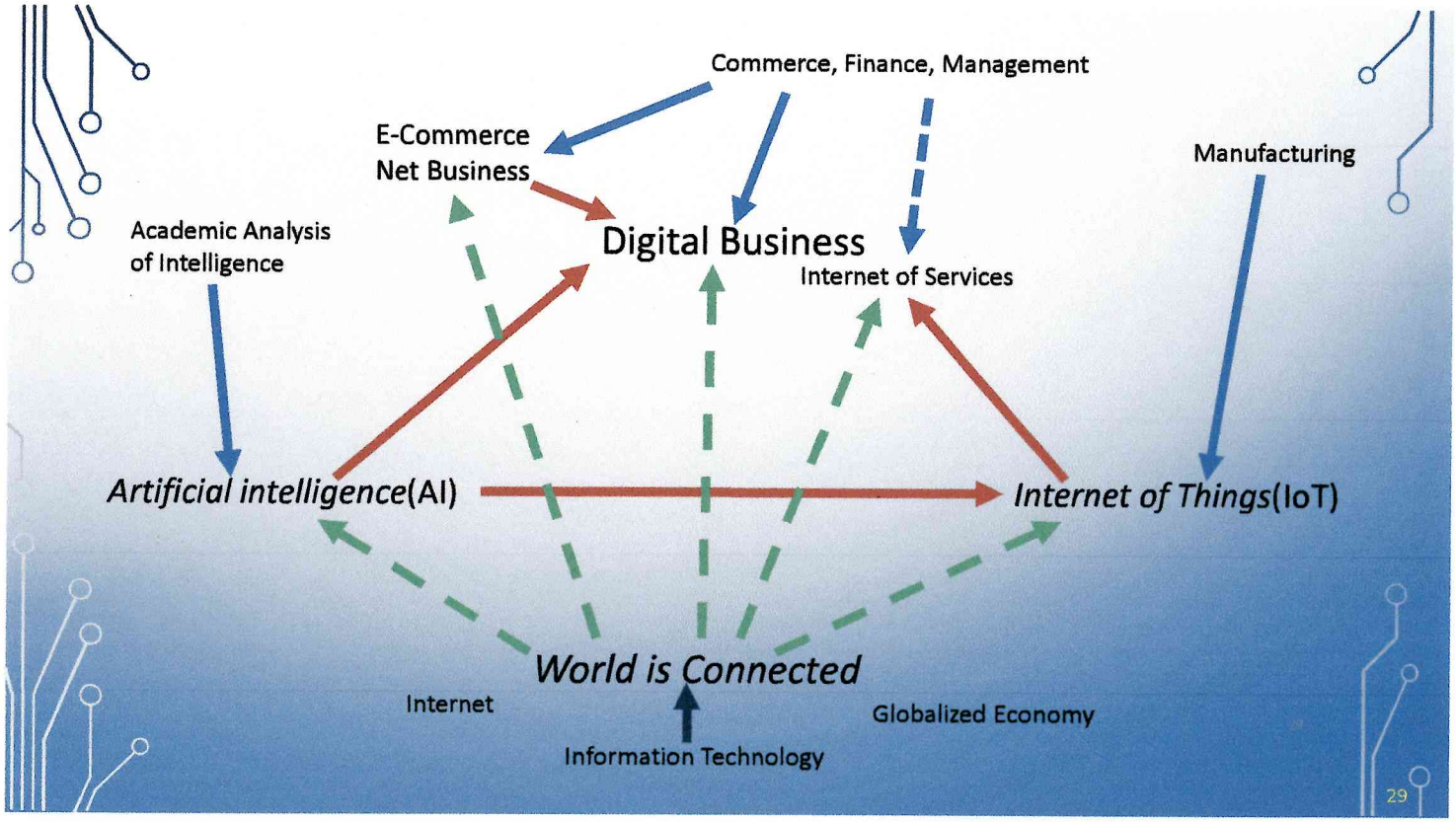
Amazon AI introduced December 1, 2016

http://www.publickey1.jp/blog/16/amazon_ai3aws_reinvent_2016.html

- Amazon Web Servicesは、ラスベガスで開幕した同社のイベント「AWS re:Invent 2016」で、「Amazon AI」傘下のサービスとして、画像認識、テキスト音声変換、音声認識と自然言語理解の3つを発表しました
  - Amazon RekognitionはイメージをAPIかSDK経由で渡すと、その画像に何が写っているのかを検出するサービス
  - Amazon Pollyは、テキストを音声に変換するサービス
  - Amazon Lexは、音声認識と自然言語理解の機能を提供するサービス

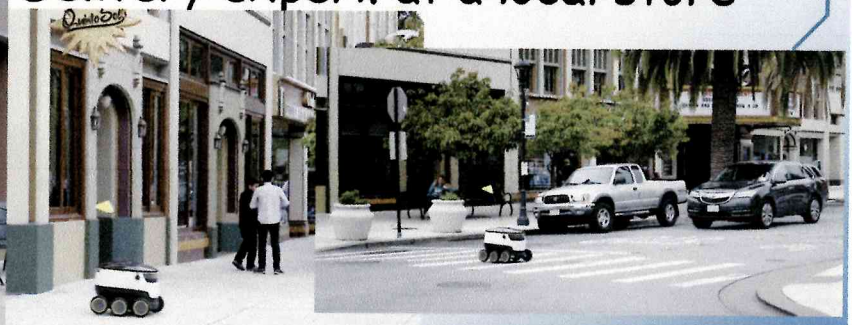
Google and Other Big Players supplies AI software development

- Google Cloud API for AI
- IBM Watson
- Microsoft Azure AI Platform
- AI speakers, Voice Input, from various venders
- Off-the-shelf tools
- Customer oriented development supports

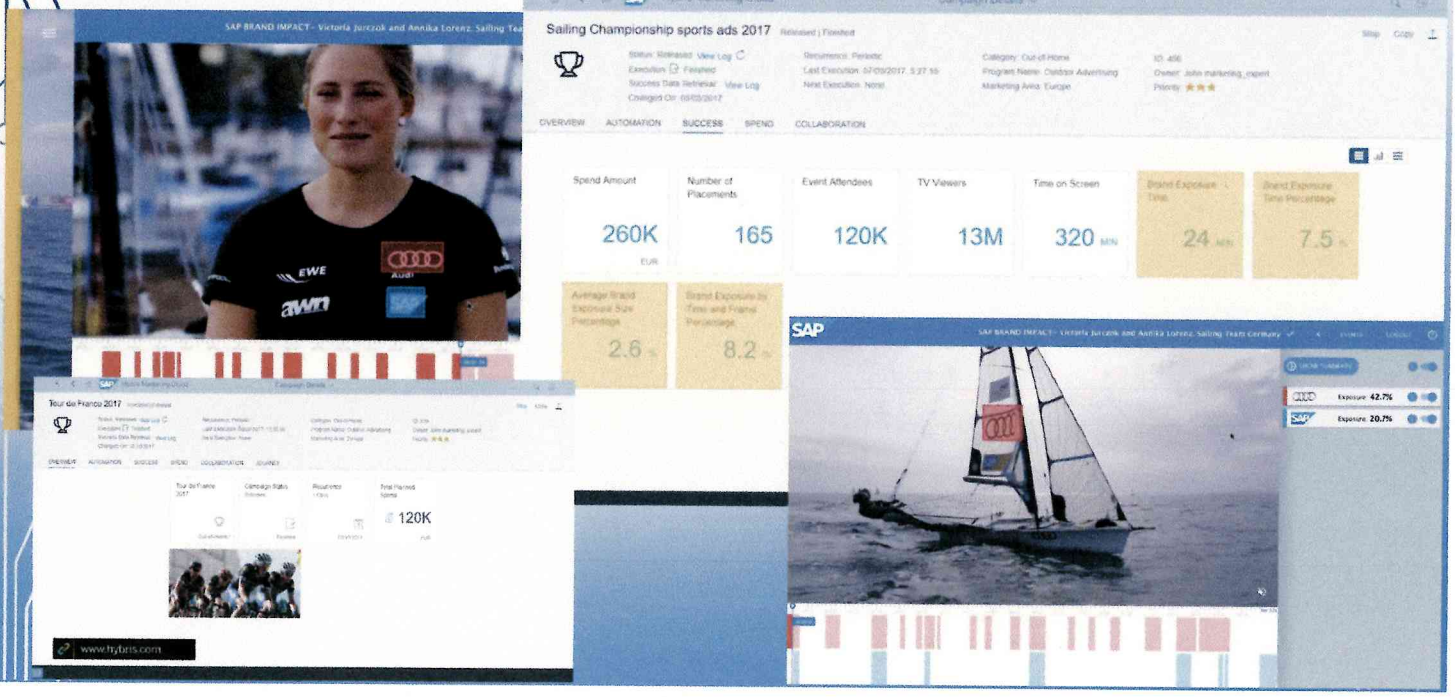


AI aids People: ex. Horus, an Italian company

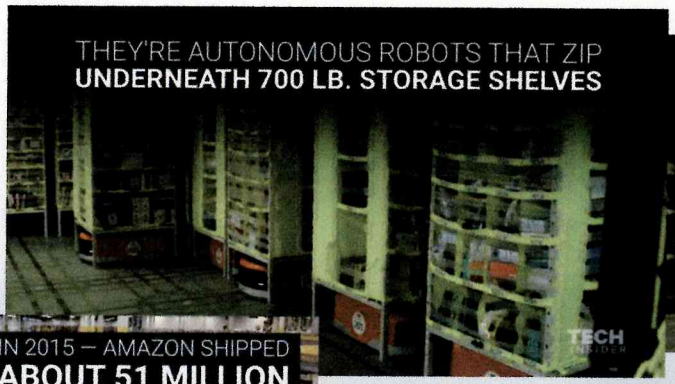
Starship Robot Delivery
Delivery experi. at a local store

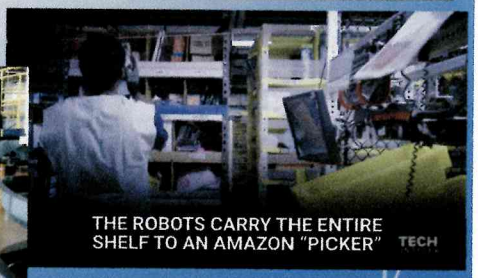



Brand Exposure Measurement
SAP Brand Impact can handle exposure duration too



Amazon Warehouse for Smart Logistics





Intelligent Flying Machine has Flying Robot to manage existing warehouse, Chicago

Sometimes, Warehouse becomes chaotic!

MIT AI Lab, the mother of AI founded in 1967

- I was a member in 1993, 2002, 2012; visiting there almost every year
- AI lab is combined with LCS and now renamed as CSAIL, MIT
- Spanned off various AI labs in the US, such as Stanford SAIL
- iRobot Roomba, or other many inventions
- I was involved with Common Lisp design in early days, later with natural language QA schemes
- AI reflects the experiences of human, and is built to help human using computer, so various different types of research including theoretical to practical

'Artificial Intelligence' got public awareness: At the Second phase of AI in history

- In the 1970s, Artificial Intelligence became popular buzzword
- High school math, theorem proving, symbolic algebra system, ...
- John McCarthy went to Stanford creating SAIL, Moses led the Project Mac, Simon and Newell started AI research in Carnegie Mellon bridging industrial issues and economics, D.Bobrow went to Xerox Parc, combining document processing and smart computation
- In the 80s, academic conference got huge audience
  - Keynote speech of a conference got 30,000 people in a large stadium

TOC of "Artificial Intelligence" Book by P.H. Winston established in the 1980s, and they were polished up after that

- Part 1: Representations and Methods
  - Introduction, Semantic Nets and Description Matching, Generate and Test and Problem Reduction, Nets and Basic Search, Nets and Optimal Search, Trees and Adversarial Search, Rules and Rule Chaining, Rules Substrates and Cognitive Modeling, Frames and Inheritance, Frames and Commonsense, Numeric Constraints and Propagation, Symbolic Constraints and Propagation, Logic and Resolution Proof, Backtracking and Truth Maintenance, Planning Using If-Add-Delete Operators,
- Part 2: Learning and Regularity Recognition
  - Learning by Analyzing Differences, Learning by Explaining Experience, Learning by Correcting Mistakes, Learning by Recording Cases, Leaning by Managing Multiple Models, Learning by Building Identification Trees, Learning by Training Neural Nets, Learning by Training Perceptrons, Learning by Training Approximation Nets, Learning by Simulating Evolution
- Part 3: Vision and Language
  - Recognizing Objects, Describing Images, expressing Language Constraints, Responding to Questions and Commands

Representations and Methods

- Knowledge representation and how to utilize it
  - Knowledge representation systems and languages like KRL
    - MIT, Xerox Parc, Stanford U, Daniel Bobrow and others
    - Methods to hold and access such knowledge data as systems had long story
    - Data design for Deep learning requires such achievements as the base
- Starting from encoding attributes and properties in digital world
  - Gender information, individual attributes
  - Hierarchy of information semantics
  - Late Binding of the object in question and its name holder
  - Mixing value and value computation procedure

Expectation for three basic fields

- **1. New application fields and new technology invention for computer**
  - Get hints from human behavior, understand enough to simulate, and implement the functional equivalence as a program
  - In AI, "Good software is at least workable software
  - It means, Enable computer software/systems to function in an unexplored fields
- **2. Analysis and synthesis of human 'intelligent' behavior**
  - **AI as a basic science to understand human information processing, perception, recognition and such**
  - What the mechanism of brain? How about eye? Or ear? How we have language comprehension skill?
- **3. Advanced technology, methods for computer use**
  - **Advanced level of Computer Science research to find a radically different computing or processing schemes**
  - Algorithmic optimization can make greater speed up than hardware based for most of the computation, No brute force
  - Huge amounts of data waiting for processing in rational time computing

Stream toward Deep Learning Improving Machine Learning concepts

- Deep Learning gets huge attraction with the high quality results recently
  - Traditional way of learning: Sampling, extract features, statistical analysis, then use the results for the future application
  - New Learning: The trends in the total data is the source of learning
- Study on Neural networks begins in the 1970s
  - Neural network was studied in the AI boom of 90s, but could not deliver rational achievements
  - Three layers to Multiple layers: Several groups succeeded to manage multiple layer neural networks, and it was the great leap

Several fundamental Keywords for further research

- Procedural or Patterns; Symbolic Processing and Neural networks
  - Nature of machine learning
- Problem solving and human decision process
- Ill structured problems
- Heuristics
- Proven AI technics, especially for searching/pattern matching, knowledge representation, knowledge acquisition, reasoning and inferencing, image processing, natural language handlings, forecast, ...and robotics technology

Several Current Issues in front of us

- Future of Business itself, and the role of AI
  - Checking the current process and refine
  - Challenging a new way
  - Eco-system to fit with human nature
- Solution as One result, or as a system to solve
- Smart conversation between Computer system and human
- Developing our future as a new way of utilizing IT
  - Smart judgement assistance or automation
  - Human cannot work 24hrs/365days
  - Controlling quick and accurate action/processing
- Basic Research and Science

Group Works on Part3

- Which one is most impressive among slides 30-34?
- Which one is most interesting among all the slides? And Why?