

Scuola universitaria professionale
della Svizzera italiana

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Dipartimento tecnologie innovative

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della
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italiana



Istituto
Dalle Molle
di studi
sull'intelligenza
artificiale

Photonics-Workshop: «Artificial Intelligence in Photonics»

Fachanlass Swissem-Fachgruppe Photonics in Zusammenarbeit mit Swissphotonics
Dienstag, 3. September 2019, 13.30 bis ca. 17.30 Uhr

Artificial Intelligence solves real problems in industry and business

Dario Piga, IDSIA

Lugano – Switzerland – www.idsia.ch

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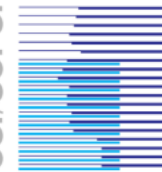
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di studi
sull'intelligenza
artificiale

IDSIA

IDSIA is a research institute on Artificial Intelligence founded in 1988 in Lugano



IDSIA is affiliated to
USI and SUPSI since 2000

Now about 80 people



Thanks to italian philanthropist
Angelo Dalle Molle (1908-2002)



«Die Fortschritte der Wissenschaft im Allgemeinen und die der aufstrebenden Informatik im Besonderen den Menschen nicht unterwerfen, sondern ihm nützen sollten.»

- Machine Learning
- Data mining
- Optimization
- Robotics
- Dynamical systems and control

15-20 running projects

MODERN DATA SCIENTIST

Data Scientist, the sexiest job of the 21st century, requires a mixture of multidisciplinary skills ranging from an intersection of mathematics, statistics, computer science, communication and business. Finding a data scientist is hard. Finding people who understand who a data scientist is, is equally hard. So here is a little cheat sheet on who the modern data scientist really is.

MATH & STATISTICS

- ☆ Machine learning
- ☆ Statistical modeling
- ☆ Experiment design
- ☆ Bayesian inference
- ☆ Supervised learning: decision trees, random forests, logistic regression
- ☆ Unsupervised learning: clustering, dimensionality reduction
- ☆ Optimization: gradient descent and variants

PROGRAMMING & DATABASE

- ☆ Computer science fundamentals
- ☆ Scripting language e.g. Python
- ☆ Statistical computing packages, e.g. R
- ☆ Databases: SQL and NoSQL
- ☆ Relational algebra
- ☆ Parallel databases and parallel query processing
- ☆ MapReduce concepts
- ☆ Hadoop and Hive/Pig
- ☆ Custom reducers
- ☆ Experience with xaaS like AWS



DOMAIN KNOWLEDGE & SOFT SKILLS

- ☆ Passionate about the business
- ☆ Curious about data
- ☆ Influence without authority
- ☆ Hacker mindset
- ☆ Problem solver
- ☆ Strategic, proactive, creative, innovative and collaborative

COMMUNICATION & VISUALIZATION

- ☆ Able to engage with senior management
- ☆ Story telling skills
- ☆ Translate data driven insights into decisions and actions
- ☆ Visual art design
- ☆ R packages like ggplot or lattice
- ☆ Knowledge of any of visualization tools e.g. Flare, D3.js, Tableau



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65% of children entering primary school today will ultimately end up **working in completely new job types that do not exist today**



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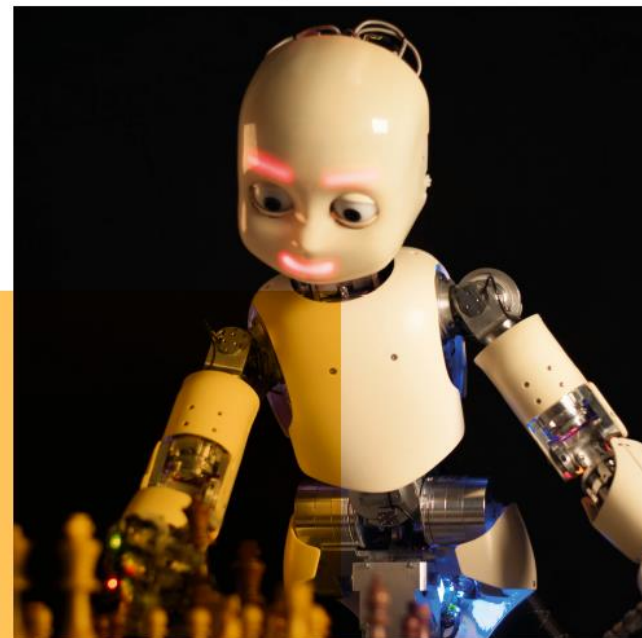
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Facoltà
di
scienze
informatiche

A master
based on
30 years
of research
at the Swiss AI
Lab IDSIA.



www.mai.usi.ch



What is Artificial Intelligence?

AI is a science that takes inspiration from humans in developing machines that are able to solve problems. Now machines can also learn



... and what we really want?

Robots, machines and systems that can interact with humans, adapt to new situations, help humans in performing tasks and help in making the correct decisions





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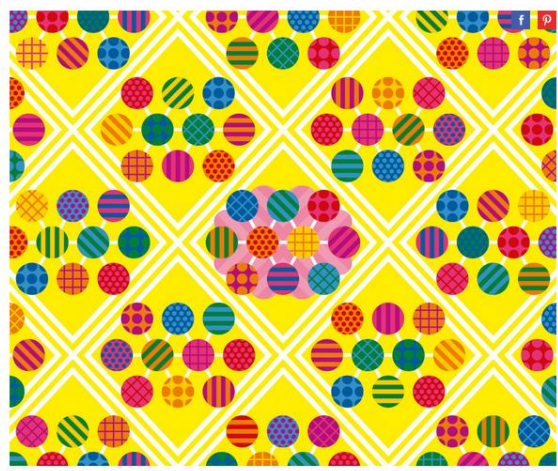
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CADE METZ BUSINESS 02.04.16 7:00 AM

AI IS TRANSFORMING GOOGLE SEARCH. THE REST OF THE WEB IS NEXT



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LATEST NEWS

PRODUCT REVIEW
Review: Klipsch Reference X6i

One of our Phd student is one of the three founders of Google DeepMind

Google to acquire artificial intelligence company Deep Mind

Monday, Jan 27 2014, 10:57 GMT

Google is reportedly close to acquiring artificial intelligence company Deep Mind.

The web giant has agreed to pay \$500 million (£302m) for the London-based startup

DeepMind is a cutting edge artificial intelligence company. We combine the best techniques from machine learning and systems neuroscience to build powerful general-purpose learning algorithms.



LUGANO - Si chiama Shane Legg, ha conseguito il suo dottorato di ricerca presso l'Istituto Dalle Molle di studi sull'intelligenza artificiale ed è uno dei tre fondatori di DeepMind ...



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People directory AZ Index Reserved area

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- > Bachelor, Diploma and Master
- > Continuing education
- > Research

Profession and Passion

Celine Cometti, Student, Engineering and Management. Flexibility, versatility, inter-disciplinarity and technology are future of tomorrow.



People directory

NEW SEARCH

Person

Name, Surname or phone number

Unit

All



Search details

Contacts >	Biography >	Publications >	Research Projects >
Name and Surname	Shane Legg		
Department/School/Unit	Dalle Molle Institute for Artificial Intelligence		

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http://www.theverge.com/2016/2/17/11032004/x-prize-ai-contest-ibm-watson-ted-2020

Tech **2** COMMENTS

X Prize and IBM announce a \$5 million artificial intelligence competition


By Sean O'Kane on February 17, 2016 12:15 pm [Email](#) [@sokane1](#)



(IBM)

[Share on Facebook \(223\)](#) [Tweet](#) [Share \(28\)](#) [Pin](#)

The X Prize Foundation and IBM have just announced a new global X Prize competition with a focus on artificial intelligence. Teams from around the world can take part in the



The \$5 million IBM Watson AI XPRIZE is a global competition challenging teams to develop and demonstrate how humans can collaborate with powerful AI technologies to tackle the world's grand challenges.



Tesla Autopilot: Behind the wheel of the world's first AI-powered driving experience

TechRepublic's Hope Reese drove an Autopilot-enabled Tesla Model S and evaluated the most impressive features as well as the common misperceptions about the technology.

By Hope Reese | October 5, 2016, 4:00 AM PST



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WHITE PAPERS, WEBCASTS, AND DOWNLOADS

White Papers // From CA Technologies

An Enterprise Architect's Guide to API Integration for ESB and SOA (French)



Today's enterprise needs to reduce complexity, particularly at the IT integration level. The right API management solution should help you simplify integration and work across

ESB, SOA, cloud and IoT - all without writing code or adding connectors.

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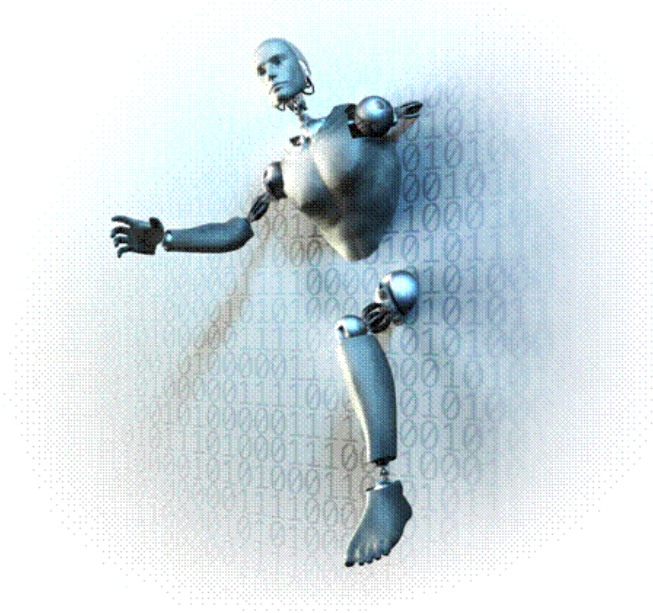
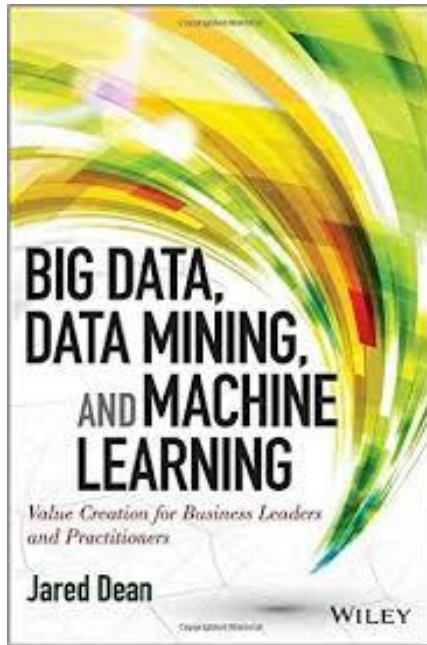
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How do I Balance Robust Security with a Frictionless Online Shopping Experience for Cardholders?

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What is Artificial Intelligence today?

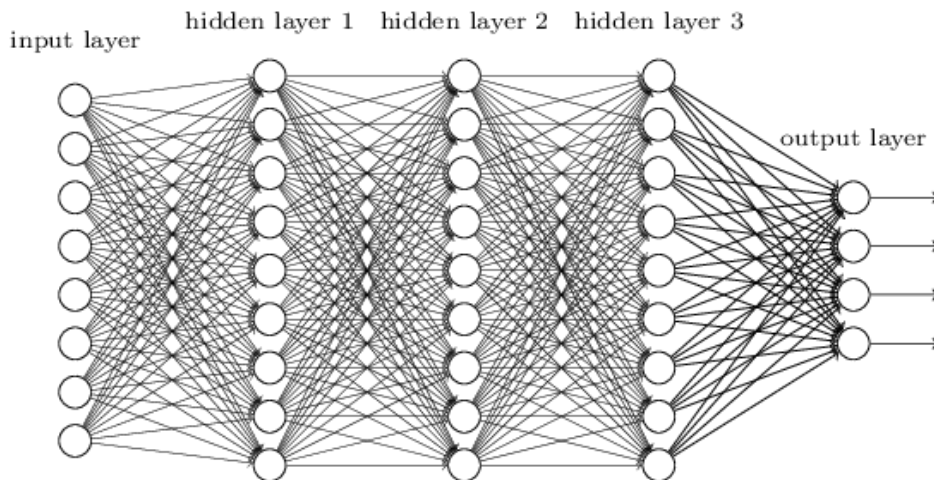


Industry
4.0



robotics

Deep Machine Learning



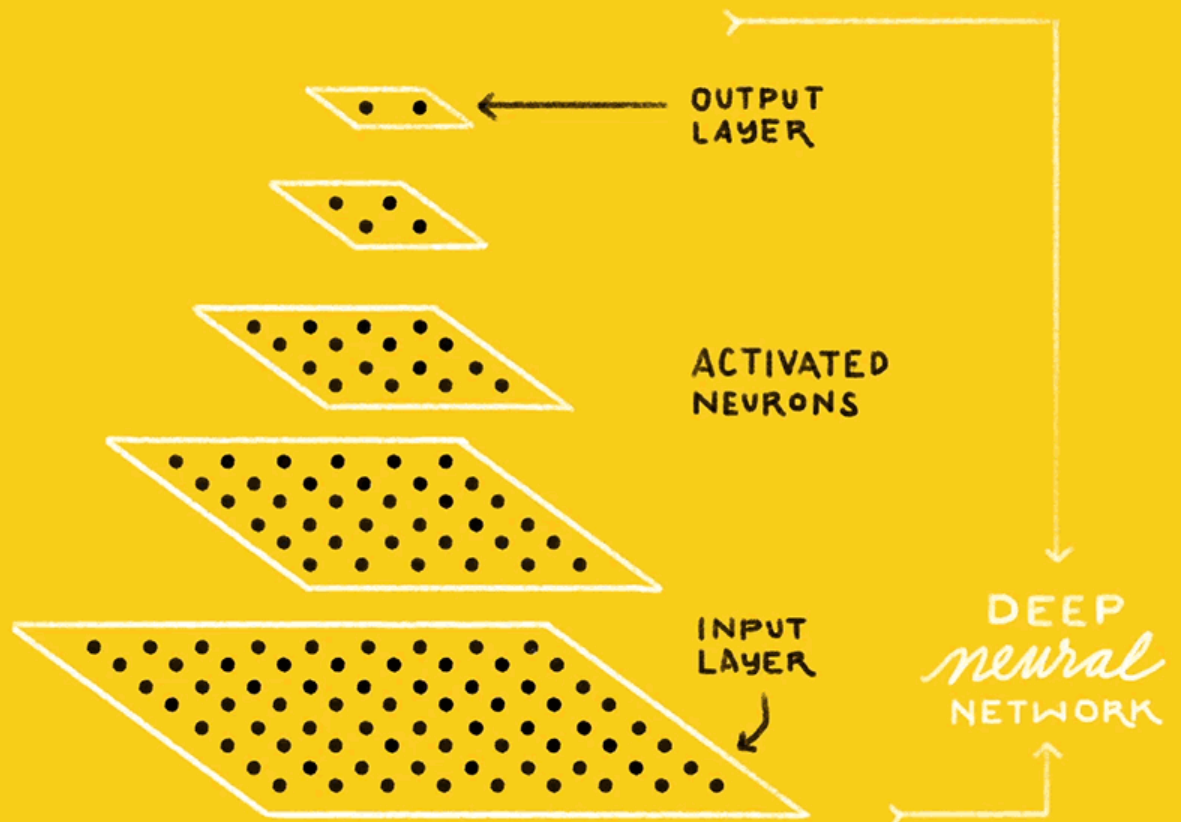
Deep Neural Networks

Deep Machine Learning

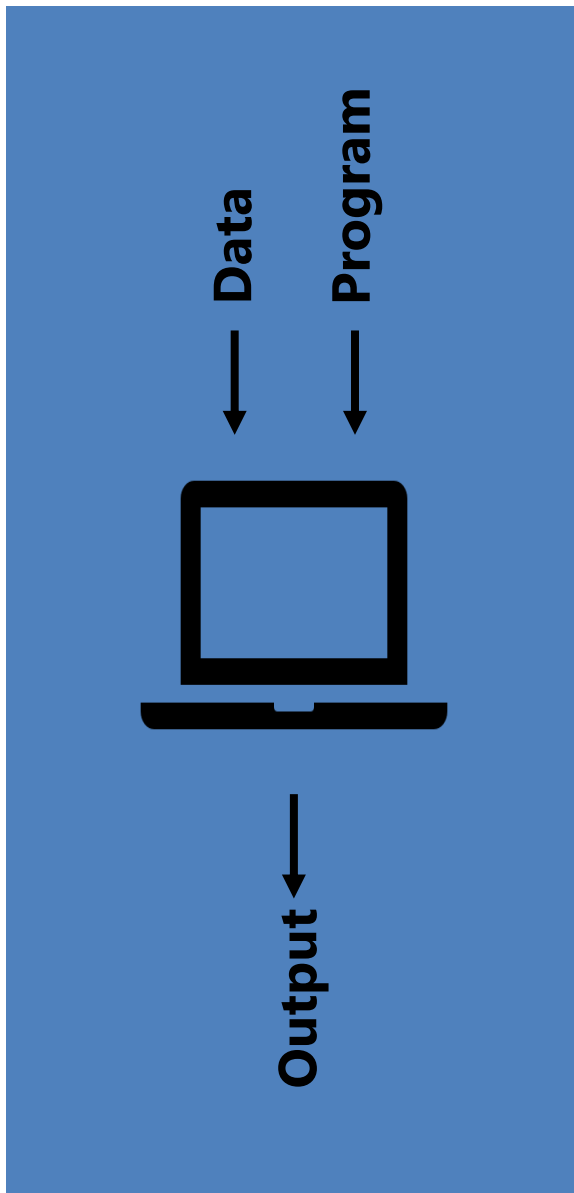
IS THIS A
CAT or DOG?



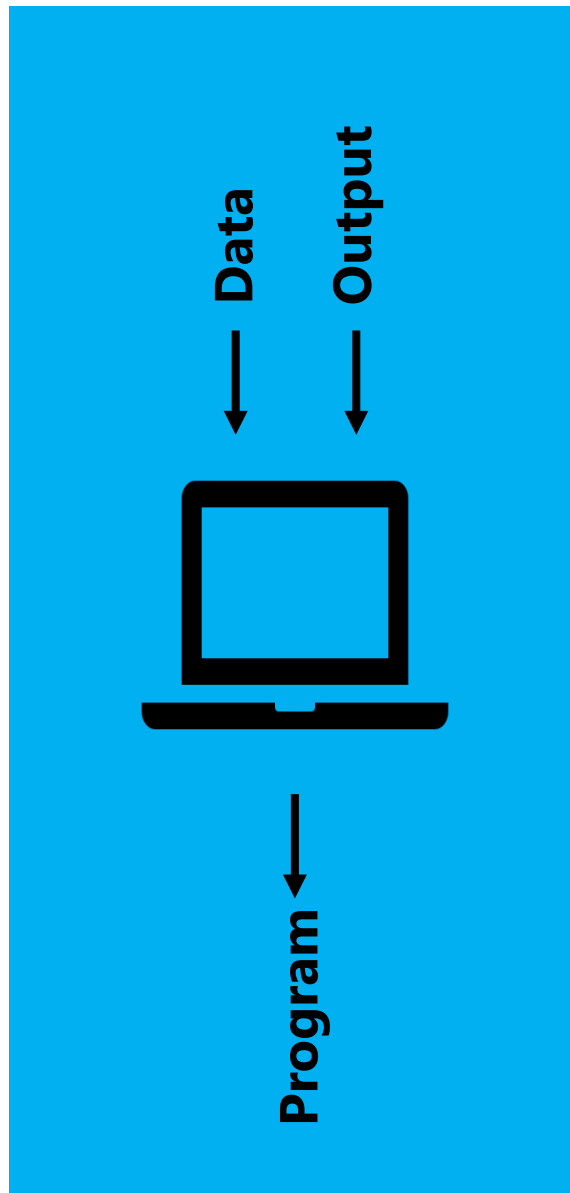
CAT DOG



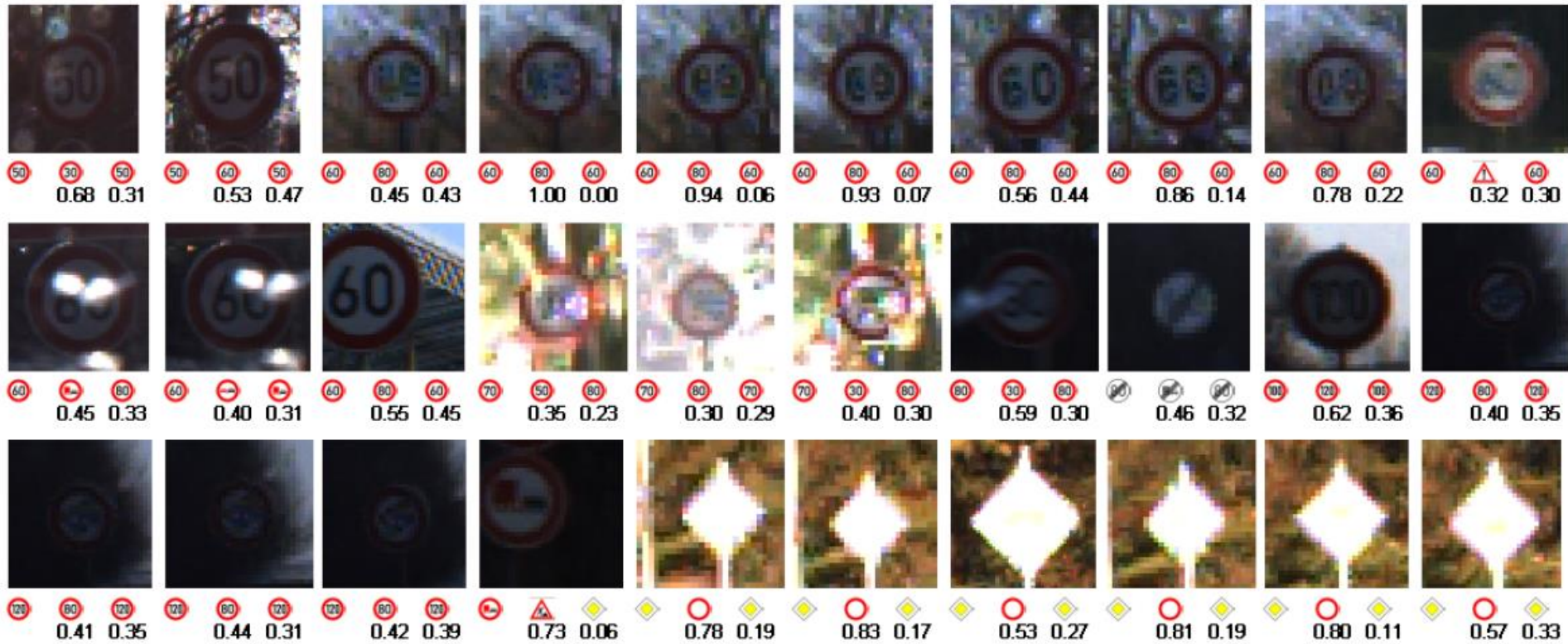
Traditional Programming



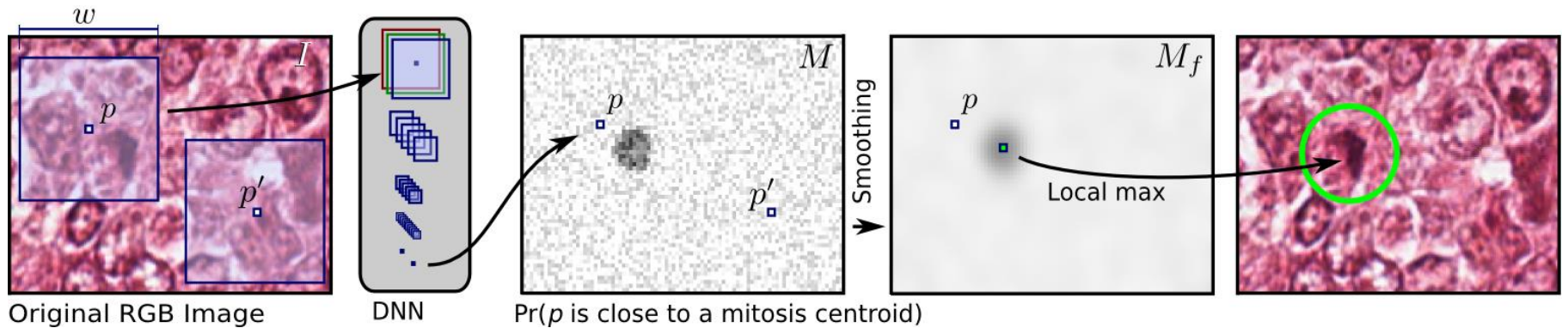
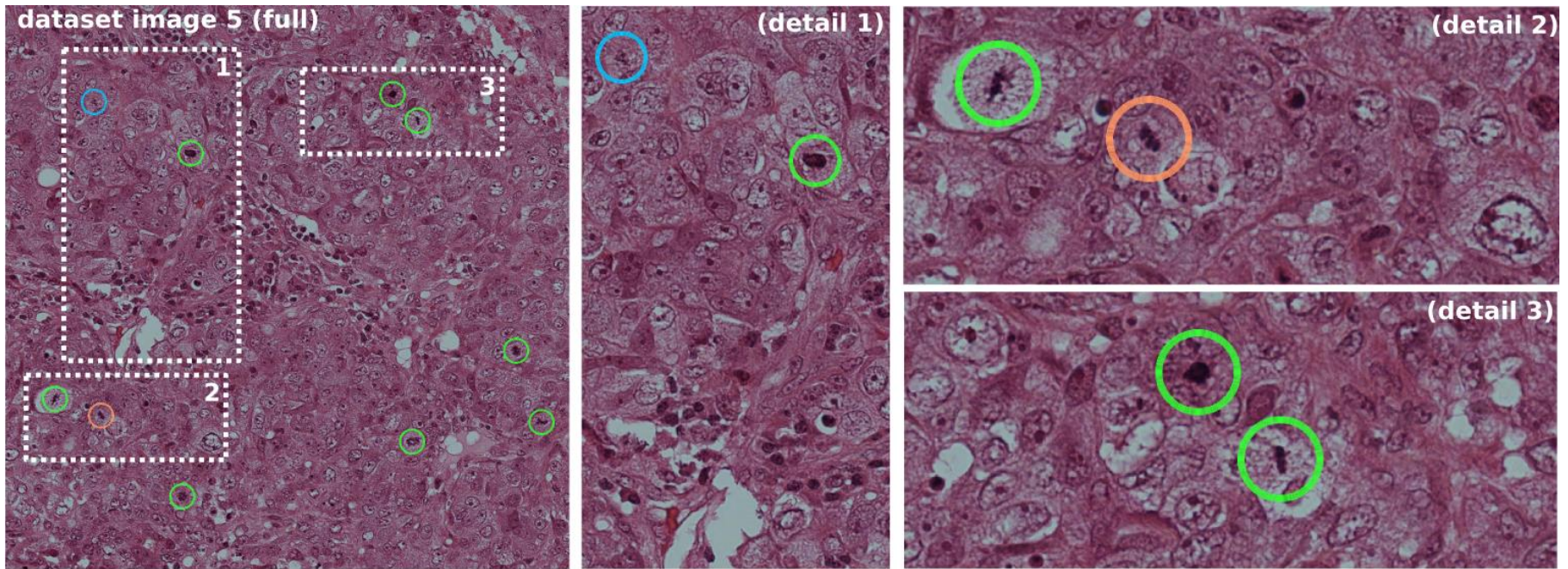
Machine Learning



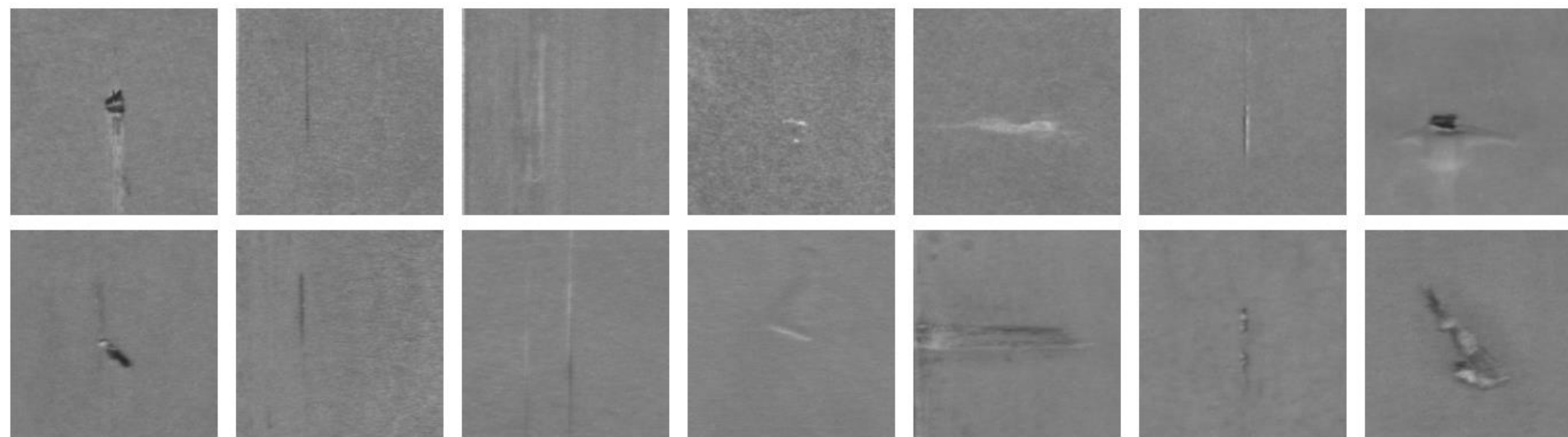
Traffic Sign Recognition



Detection of mitotic nuclei in breast cancer histology images



Classification of Steel Defects (with Arcelor Mittal)



	0	1	2	3	4	5	6
0	0.91	0.01	0.01				0.07
1	0.09	0.85				0.07	
2	0.01		0.99				
3	0.04			0.94	0.02		
4	0.02			0.02	0.97		
5		0.05	0.11			0.84	
6	0.14						0.86

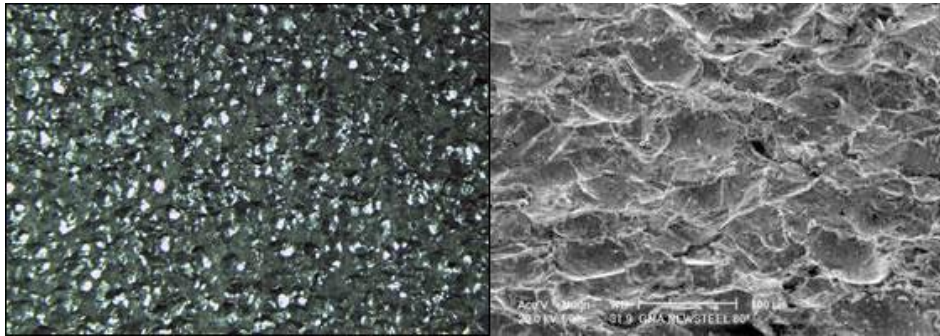
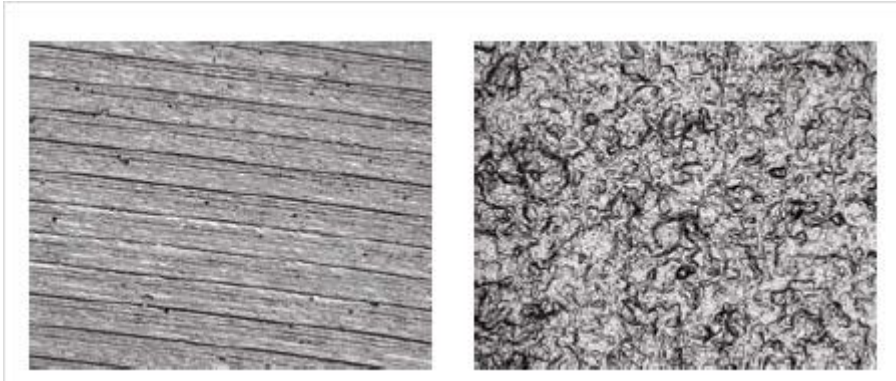
	0	1	2	3	4	5	6
0	0.80	0.01	0.01	0.08	0.02	0.01	0.08
1	0.11	0.89					
2	0.03	0.02	0.94			0.01	
3	0.14		0.02	0.83	0.01		
4				0.09	0.91		
5	0.05	0.19				0.76	
6	0.25				0.01		0.74

	0	1	2	3	4	5	6
0	0.85	0.01		0.03	0.01	0.01	0.11
1	0.12	0.88					
2	0.01		0.98			0.01	
3	0.09		0.01	0.88	0.02	0.01	
4			0.02		0.98		
5	0.05	0.05		0.14		0.76	
6	0.20						0.80

Fig. 5. Confusion matrices for the best classifiers. Left: MPCNN, middle: PHOG, right: PHOG + MONO-LBP committee. Only on defect number 2 the classical features obtained a better result than our MPCNN. Also note the non marginal improvement of a committee w.r.t. the single best classifier.



On line surface Inspection System for EDM



data and experts knowledge in the same AI framework

Viola: Virtual Operator with self-Learning Ability (VIOLA) for Electrical Discharge Machining (EDM) drilling process optimisation



Adaptive Tuning and Online Optimization

Machine Learning + Optimization

+GF+
georgfischer

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inspire

KTI/CTI

Industry 4.0

Predictive maintenance, failure detection and
distance process analytics

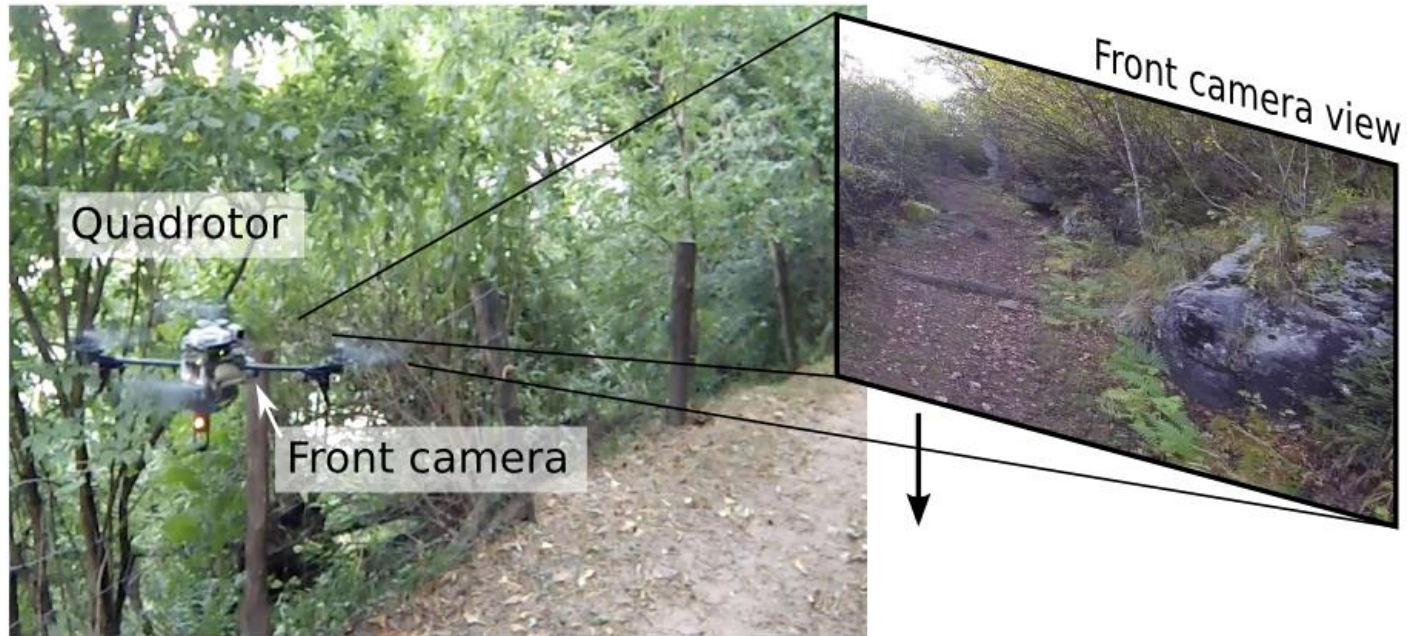


AI-CARES

Advanced artificial intelligence algorithms embedding expertise and knowledge on ammonia plants, lead to a unique service for automated continuous monitoring and decision support

A Deep Machine Learning approach to Visual Perception based navigation in Forest Trails

- UAV autonomously follows a forest trail
- Applications in search and rescue



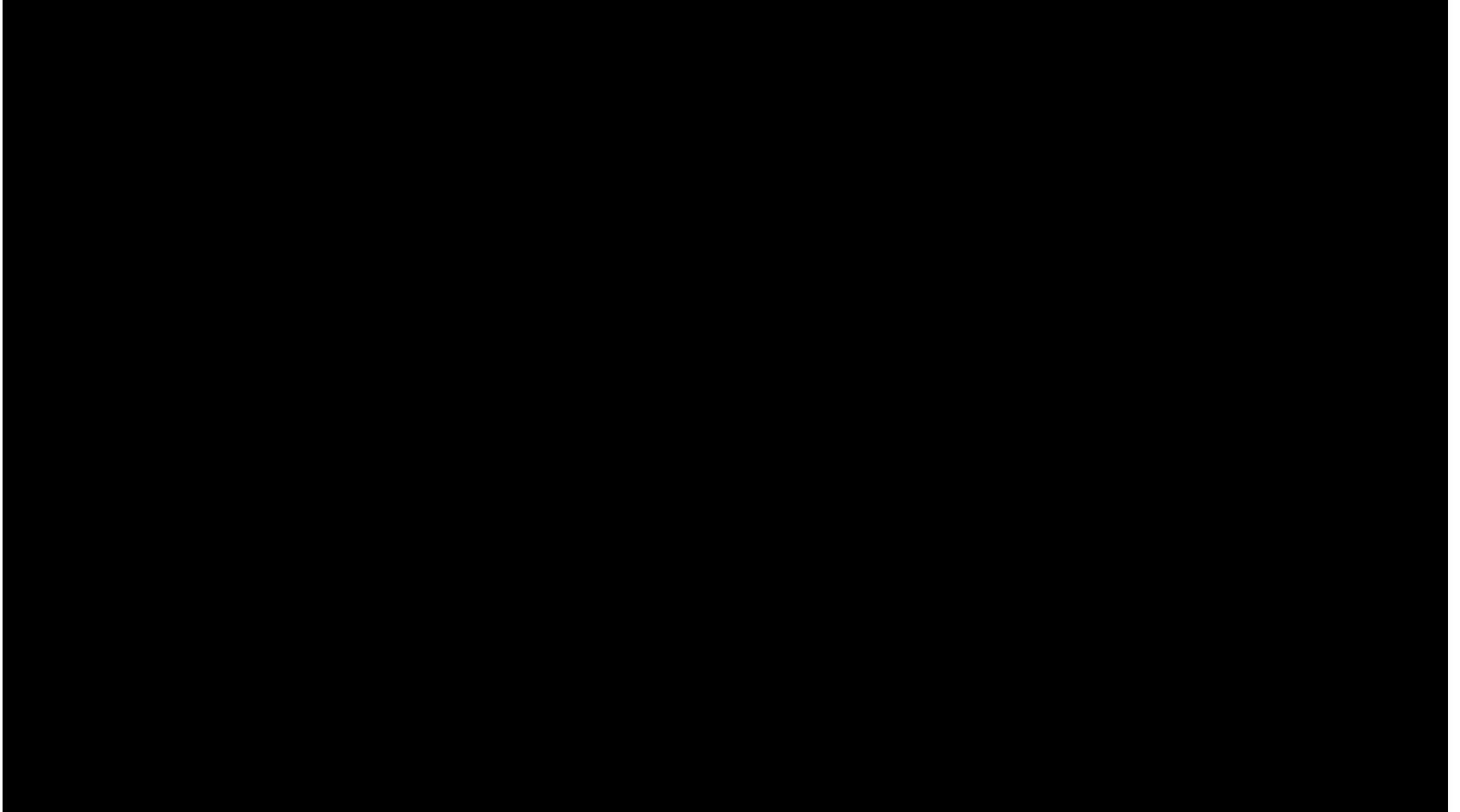
Teaching by examples



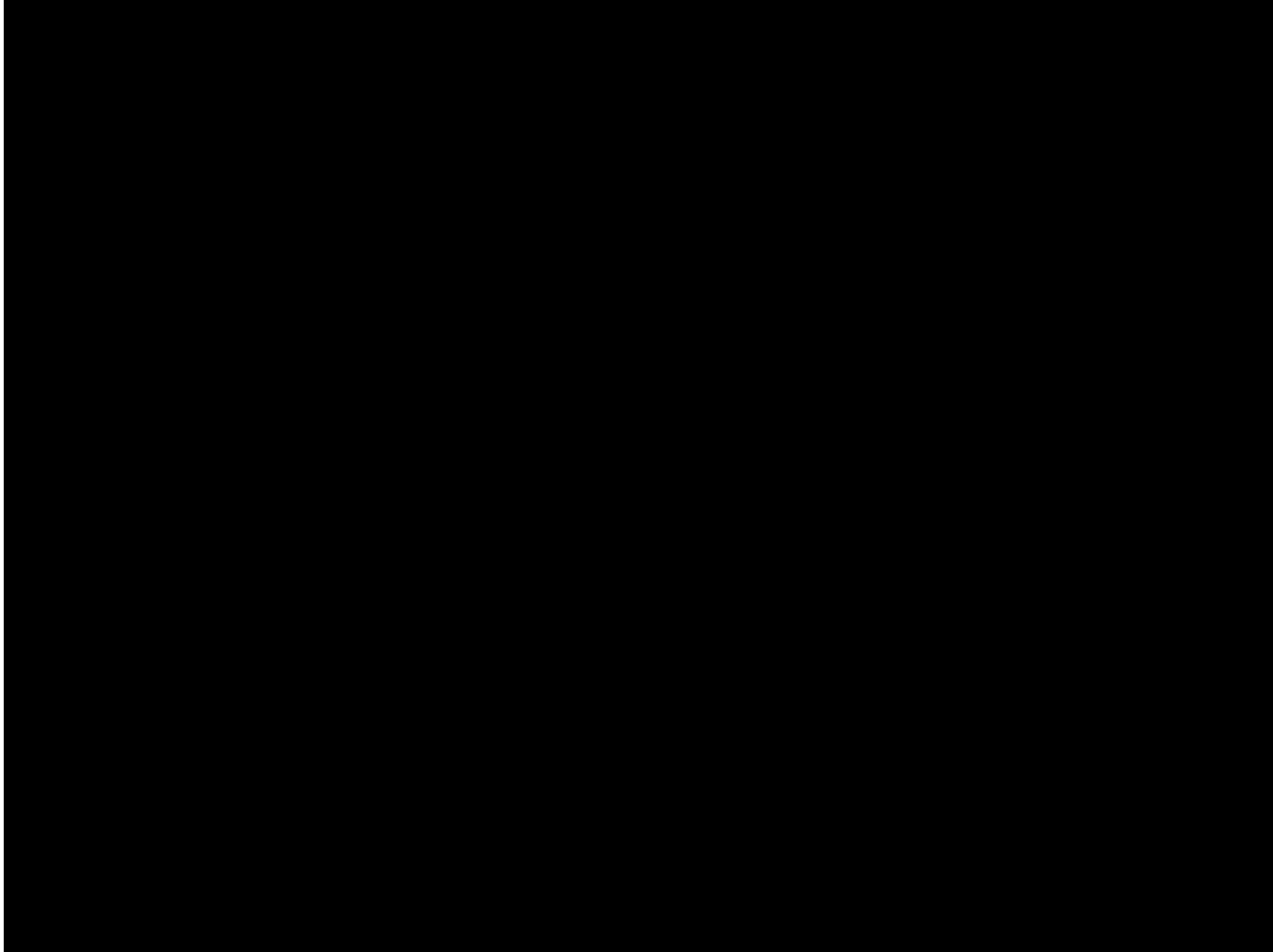
20^k
of images



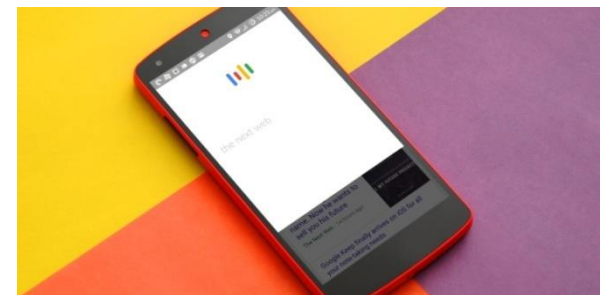
The drone with an artificial brain



a new hybrid world is coming



We give voice to Google !!!!



Google Research Blog

The latest news from Research at Google

Google voice search: faster and more accurate

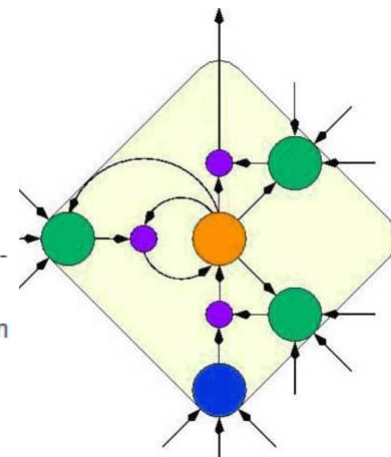
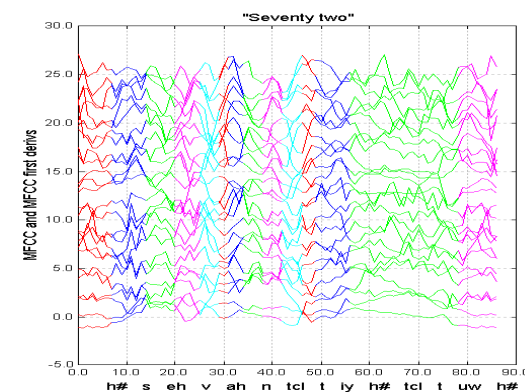
Posted: Thursday, September 24, 2015

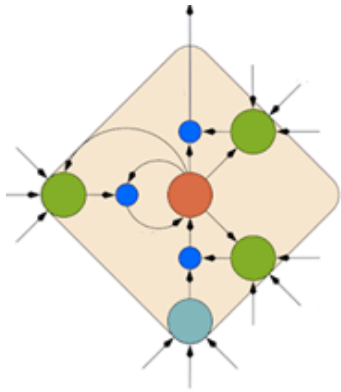


Posted by Haşim Sak, Andrew Senior, Kanishka Rao, Françoise Beaufays and Johan Schalkwyk – Google Speech Team

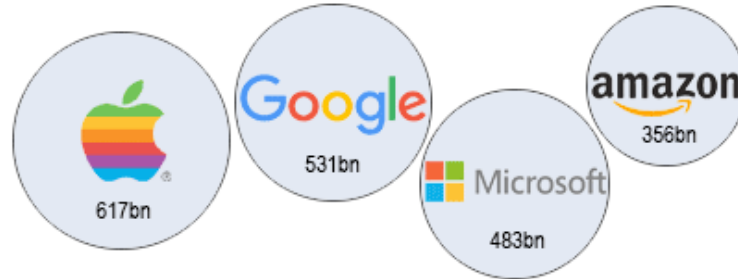
Back in 2012, [we announced](#) that Google voice search had taken a new turn by adopting [Deep Neural Networks \(DNNs\)](#) as the core technology used to model the sounds of a language. These replaced the 30-year old standard in the industry: the Gaussian Mixture Model (GMM). DNNs were better able to assess which sound a user is producing at every instant in time, and with this they delivered greatly increased speech recognition accuracy.

Our improved acoustic models rely on Recurrent Neural Networks (RNN). RNNs have feedback loops in their topology, allowing them to model temporal dependencies: when the user speaks /u/ in the previous example, their articulatory apparatus is coming from a /j/ sound and from an /m/ sound before. Try saying it out loud - "museum" - it flows very naturally in one breath, and RNNs can capture that. The type of RNN used here is a [Long Short-Term Memory \(LSTM\)](#) RNN which, through memory cells and a sophisticated gating mechanism, memorizes information better than other RNNs. Adopting such models [already improved the quality](#) of our recognizer significantly.





OUR IMPACT ON THE WORLD'S MOST VALUABLE COMPANIES



NVIDIA



GTC keynote on Tuesday April 5, 2016 Jensen H Huang, CEO of NVIDIA

The prize is the new NVIDIA DGX-1 Deep Learning Supercomputer
valued at 130'000\$

Berkeley

Carnegie Mellon University



Stanford University

Université de Montréal



Frameworks for
Multi-GPU Pascal

Large-scale Deep Learning

Reinforcement Learning

Unsupervised and Transfer
Learning

Natural Language
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Autonomous Driving

Medical Applications

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Swiss companies directly benefit from the work of its researchers**

Concluding remarks and

- AI is not anymore academia
- AI is deeply changing industry and society
- AI is the new electricity
- People before machines



Lugano



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Thank you for your attention