Machine Learning presentation

07-09-2017

Table of contents

- Introduction to Deep Learning
- Text analysis on CNAF ticketing system
- Deep Learning School
- Sophia Conf - Artificial Intelligence

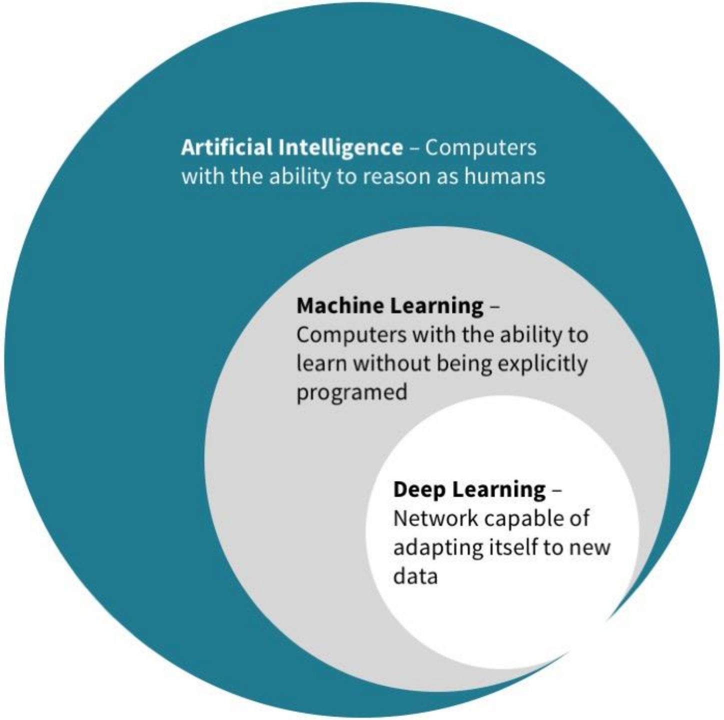
Videos in French

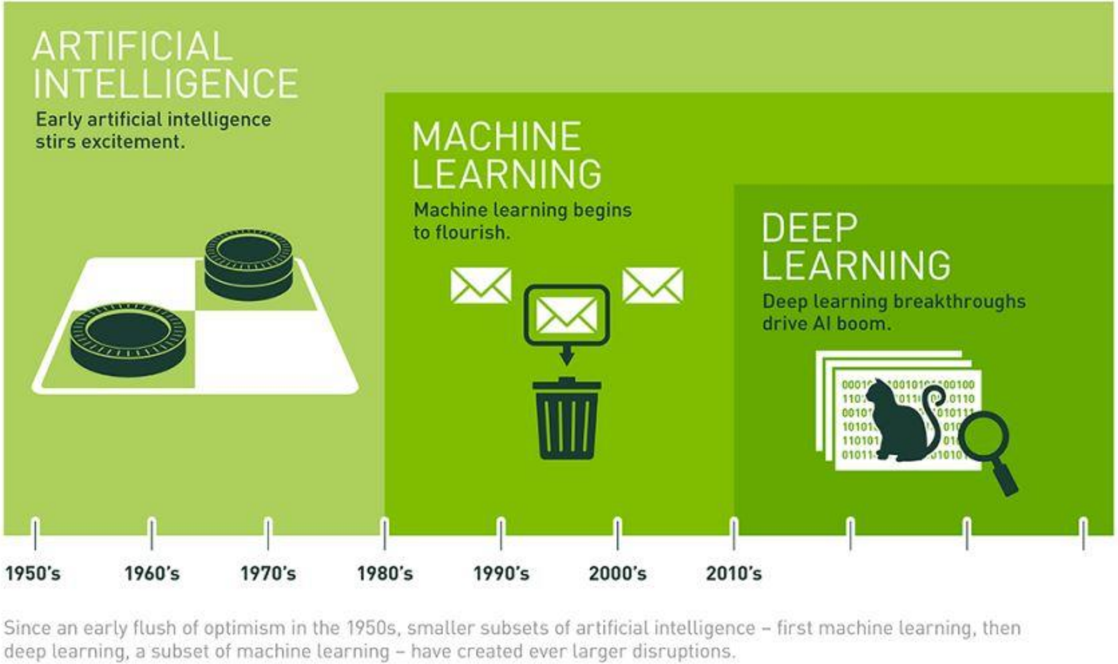
- Intro
  - https://www.youtube.com/watch?v=c7mIXLJESOk&feature=youtu.be
- Deep Learning for CNAF
  - https://www.youtube.com/watch?v=1DZkdrGwSSE&feature=youtu.be
- Feedback Deep Learning school
  - https://youtu.be/vjtVkDFVbNE
- Feedback Sophia conf – AI
  - https://www.youtube.com/watch?v=Ad77CAYFr2U&feature=youtu.be

1 Introduction to Deep Learning

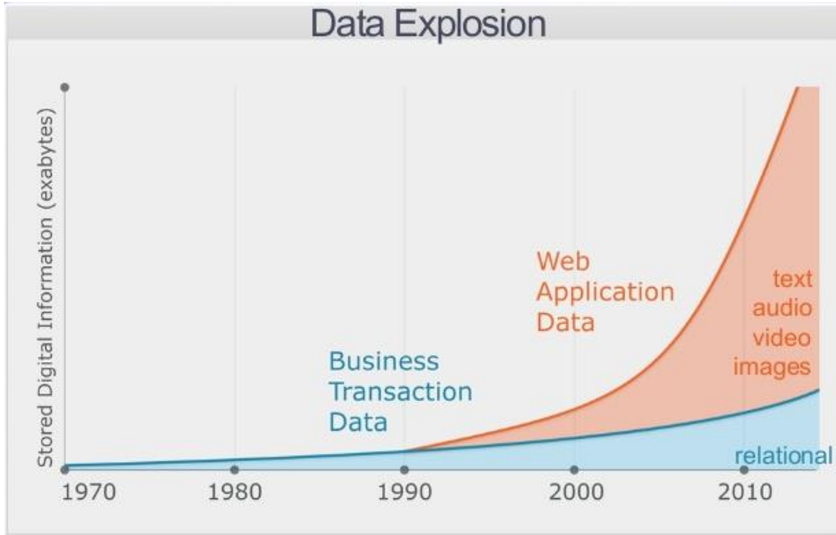
Deep learning ?

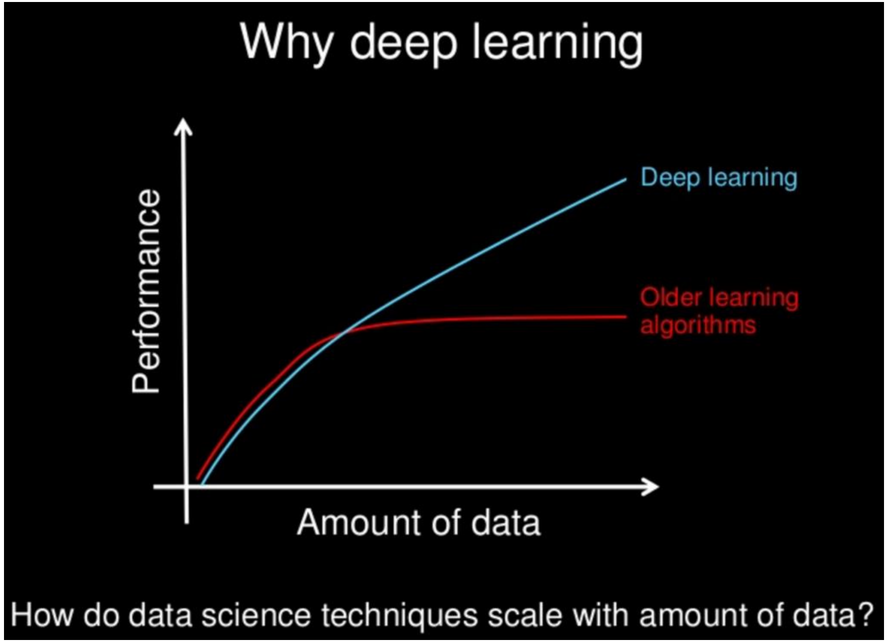
Part of Artificial Intelligence



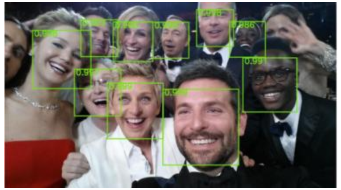


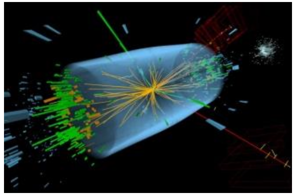
Why deep learning ?

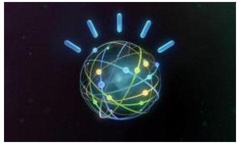


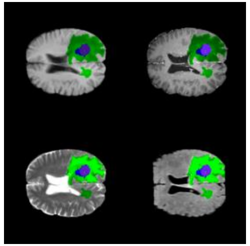


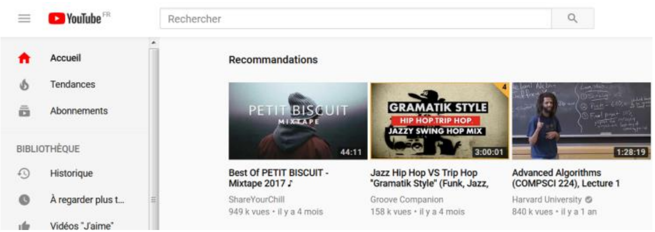
Applications



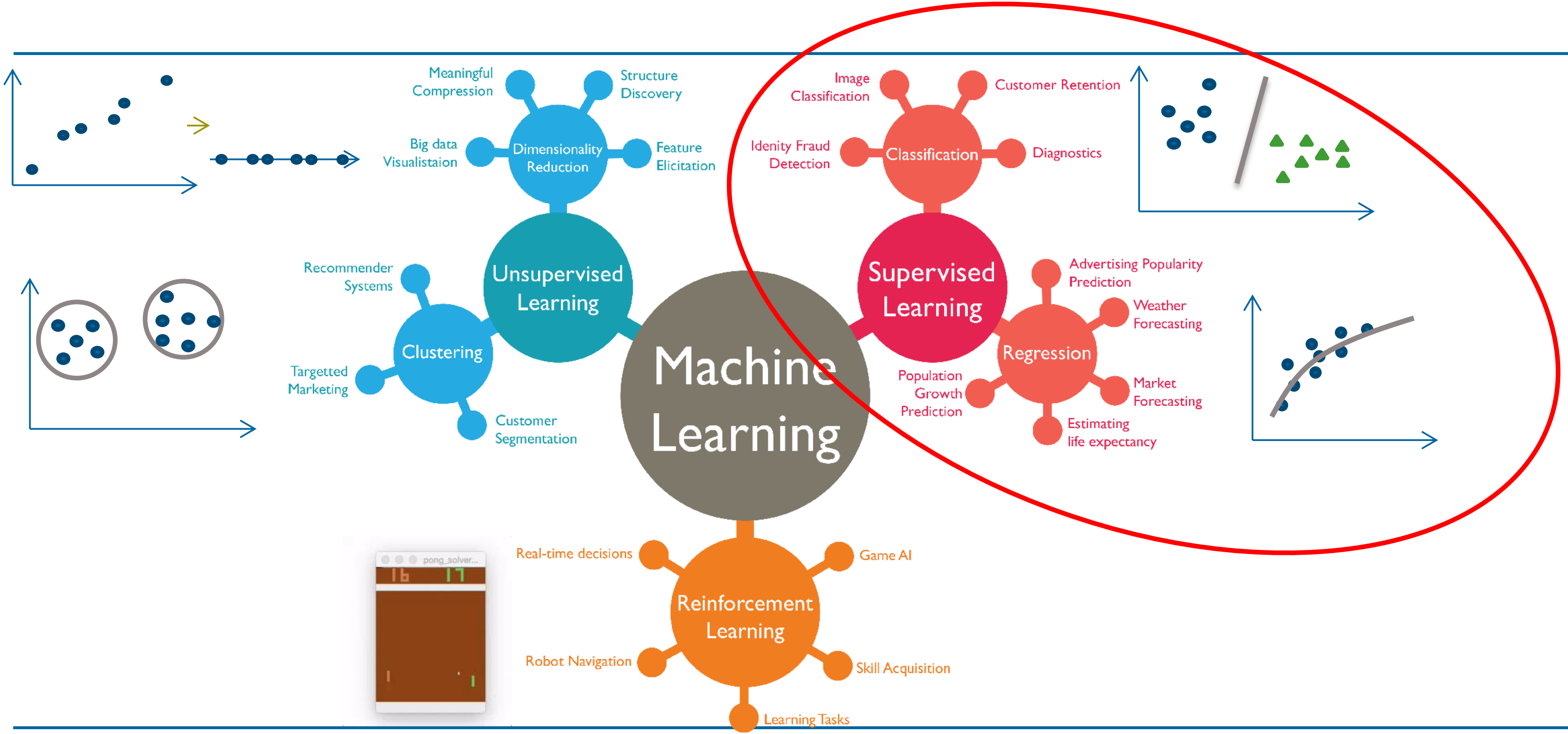




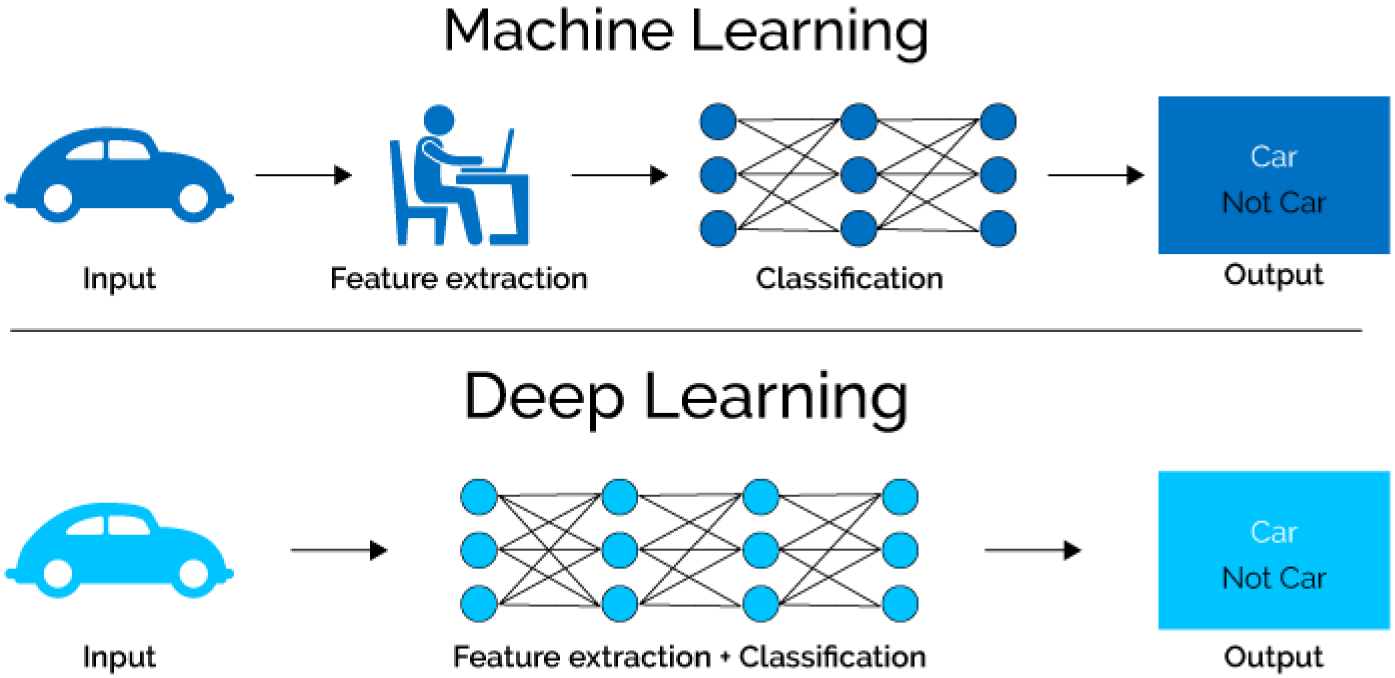




Machine learning basics



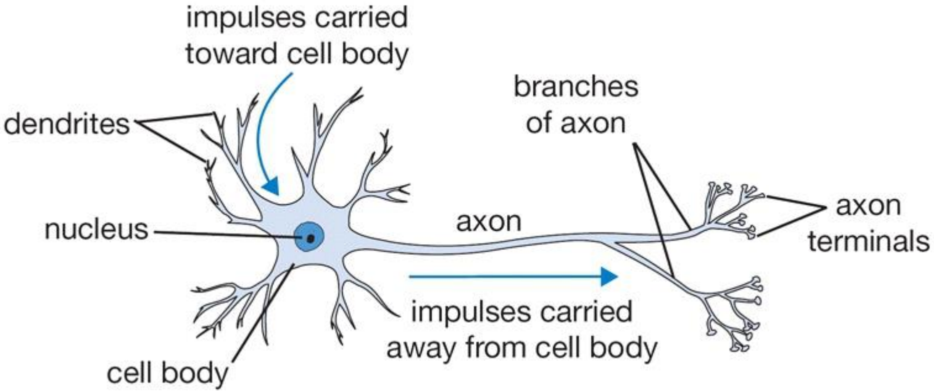
Machine Learning vs Deep Learning

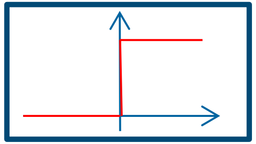


Basics in deep learning

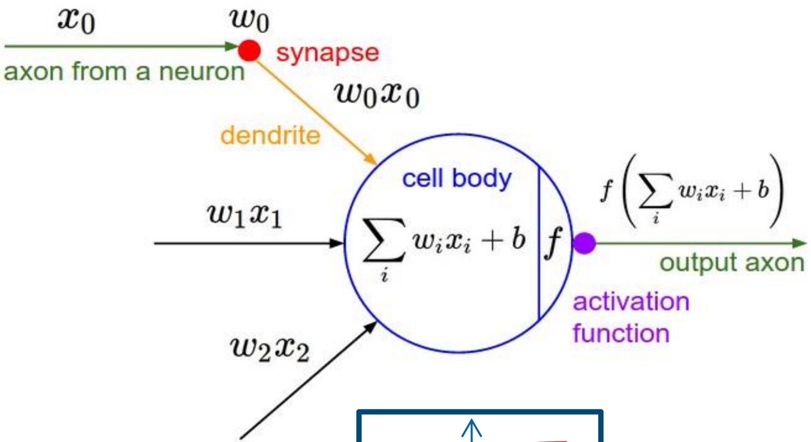
Neuron, called Perceptron

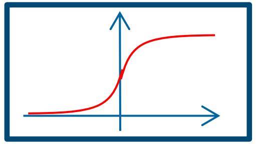
Biological neuron ≠ *Artificial neuron*





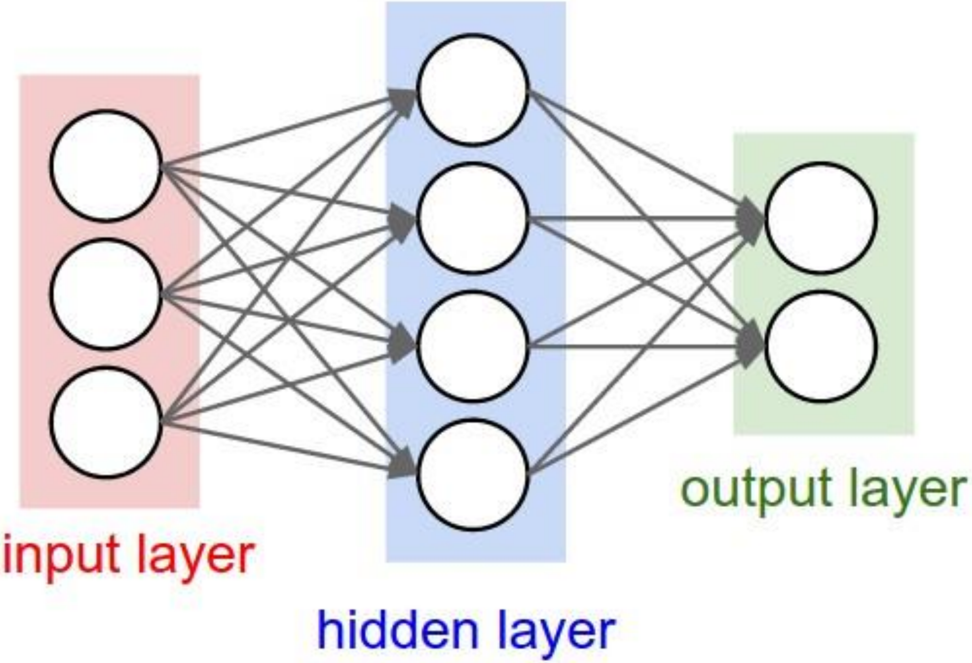
cell body activation



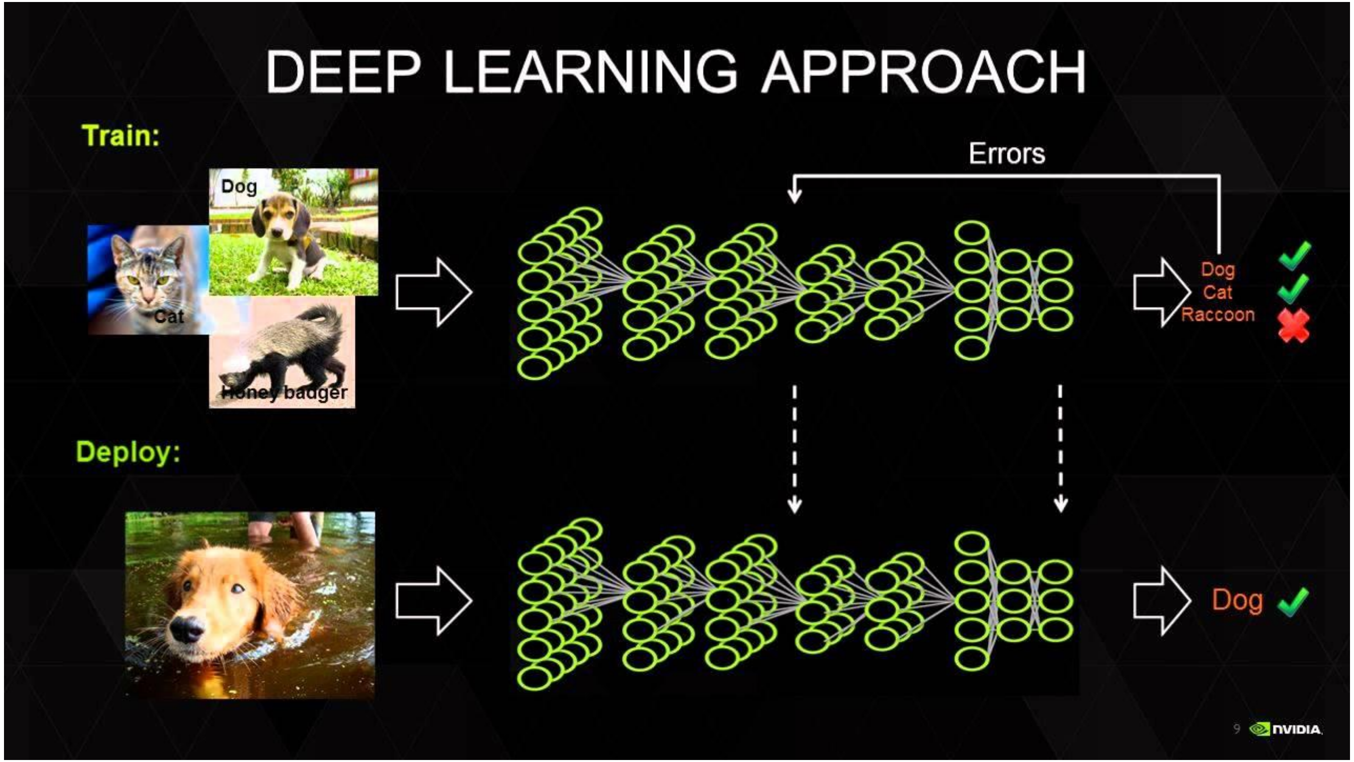


cell body activation

Neural network

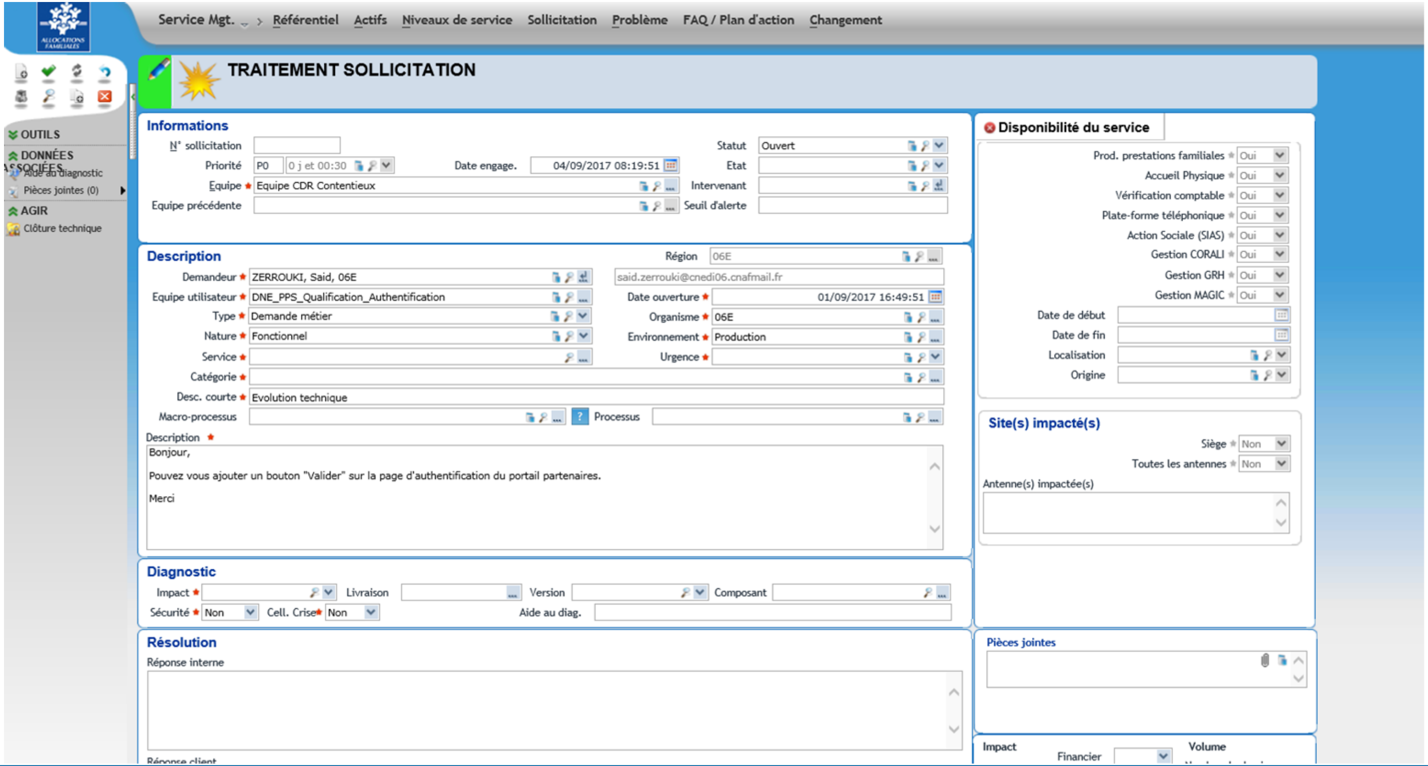


Deep learning



2 Text analysis on CNAF ticketing system

Ticketing system



Problem identified

- 300 000 tickets on 5 years

- Multiple duplicates and not always identified or sometimes late in the process

Solution → SIMILARITY PREDICTION

- Process to redirect ticket to team able to solve the ticket.
- Redirection is not always easy and some tickets are long to solve because of it.

Solution → TEAM PREDICTION

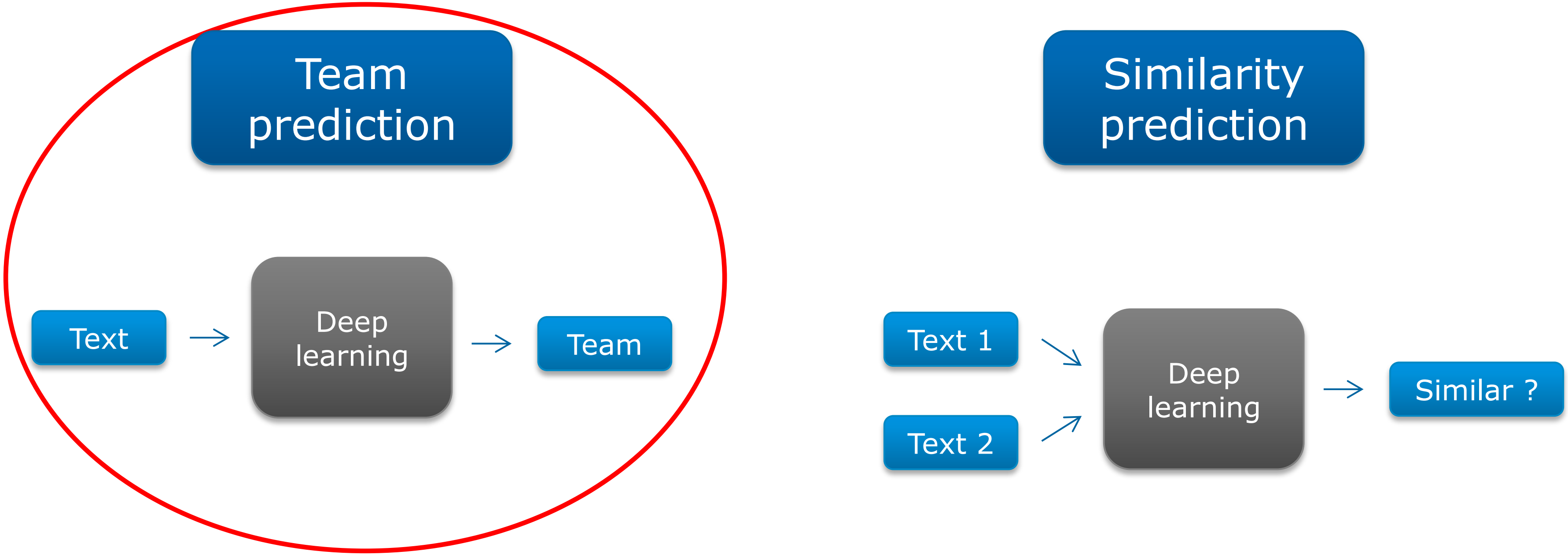
The purpose of every solution suggested is to help decision

Using only text of a ticket

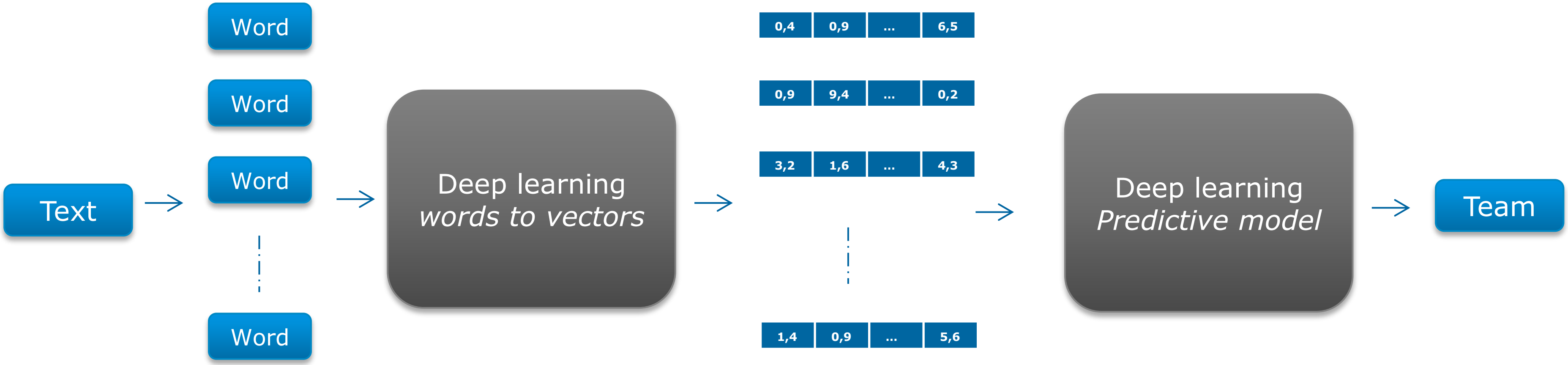
- One challenge → use only text
- Makes it reusable for other applications at CNAF
- Another approach in progress which is not presented here uses also categorical variables
- Scientific approach:
  - My method using Deep Learning will be compared with a classical approach in Machine learning (*and Natural Language Processing*)

Solutions proposed

Using only text



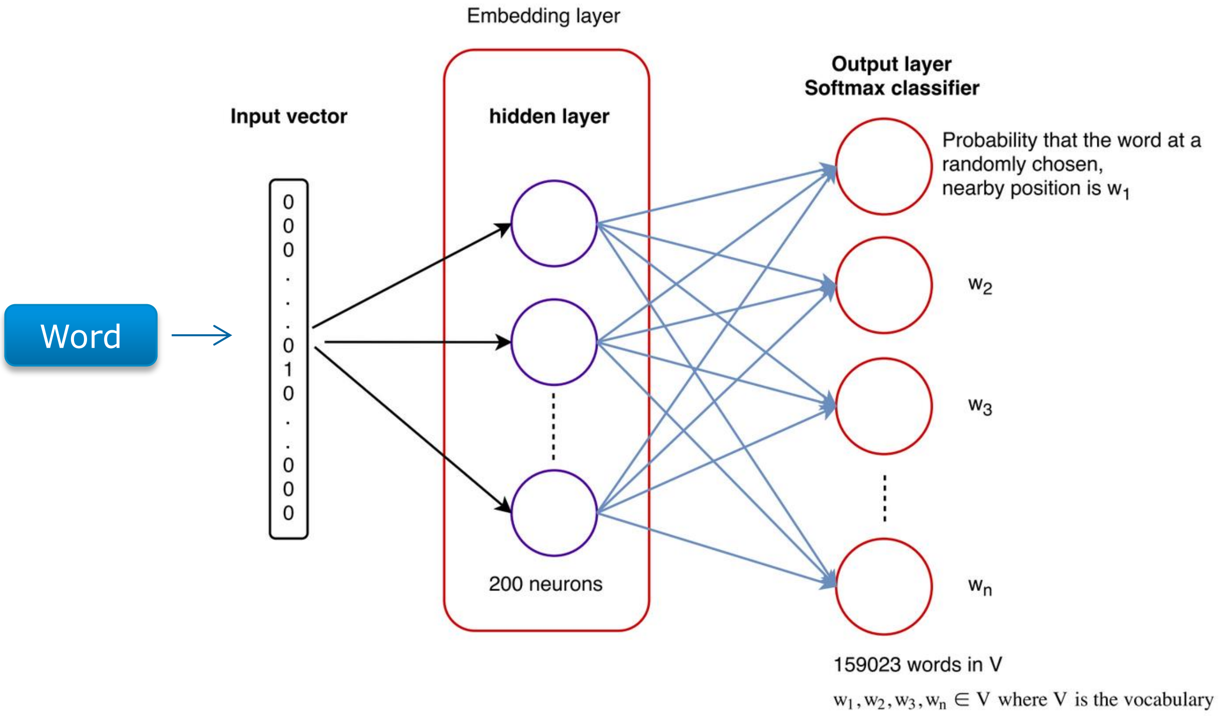
Deep learning solution proposed



From words to vectors

Embedding model (Skip gram)

NOT DETAILED IN THIS PRESENTATION

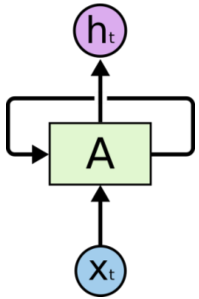


- Fake task: predict surrounding words of the input
- hidden layer is the representation by a vector of reals of the input word

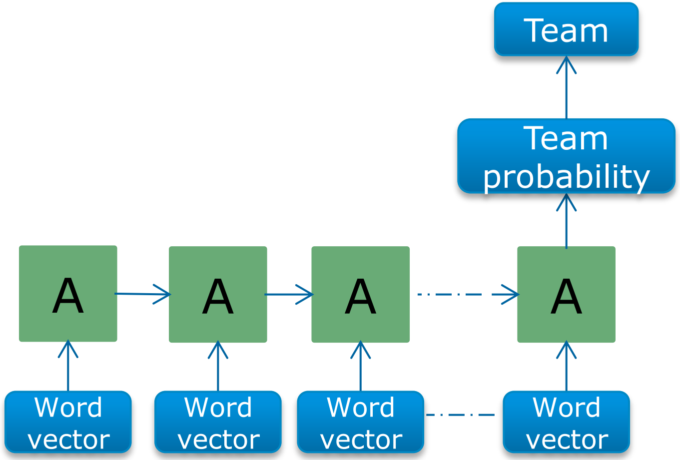
Predictive model

Recurrent Neural Network (RNN) and bidirectional RNN

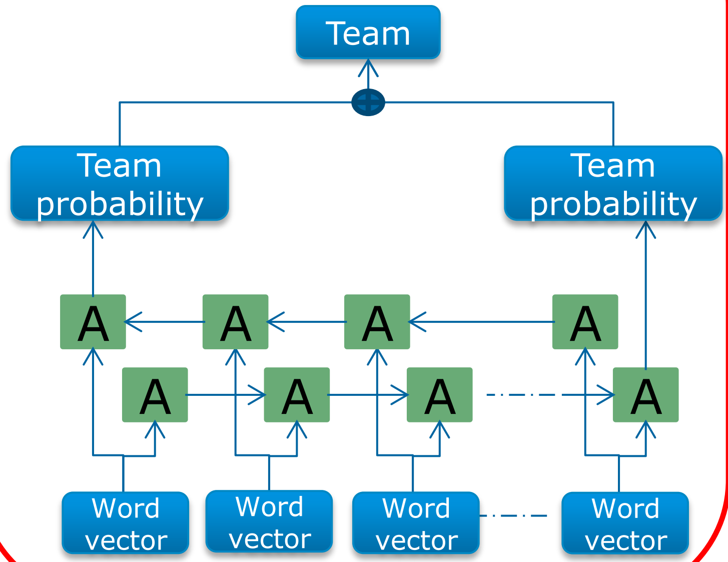
Recurrent neuron



Recurrent neuron unrolled

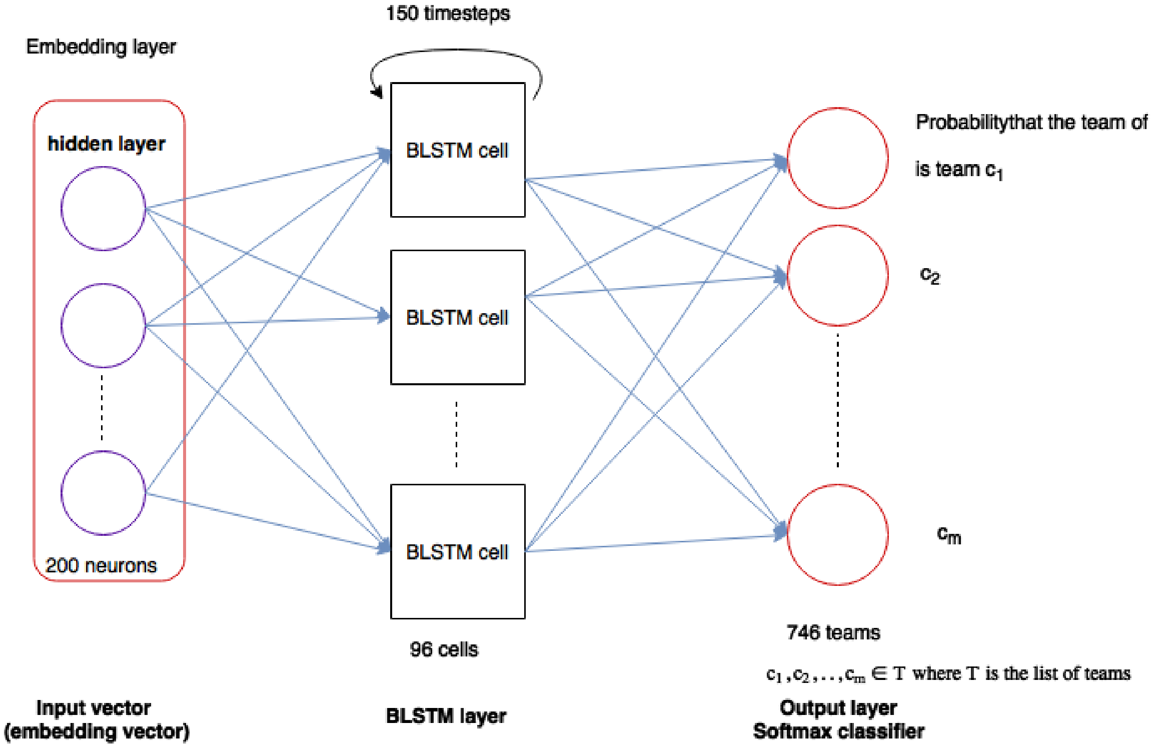


Bidirectional neuron unrolled



Team prediction

NOT DETAILED IN THIS PRESENTATION



Results

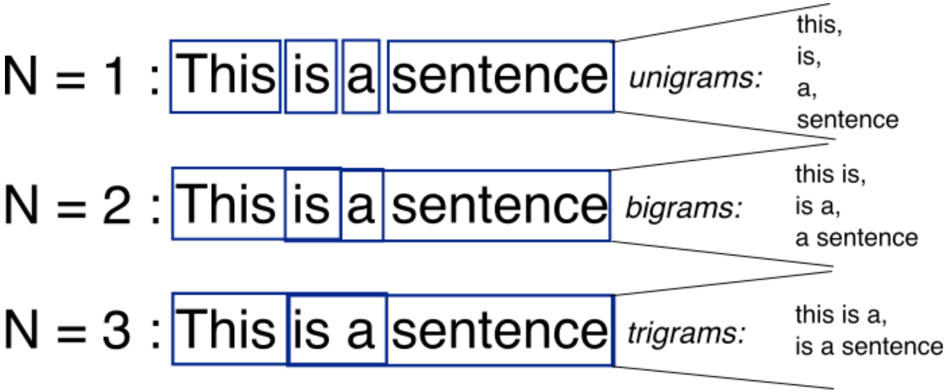
- +700 teams

Model	Test accuracy (%)
Hazard following distribution	1.21
Most represented team	4.54
Traditional approach (no deep learning)	23.26
Proposed approach	47.12

- Good results and research project to be continued…

Traditional method ?

NOT DETAILED IN THIS PRESENTATION



$$\text{tf-idf}_{(t,d)} = \text{tf}_{(t,d)} \times \text{idf}_{(t)}$$

t = term

d = document

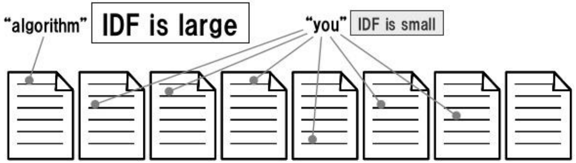
Term-Frequency Metric	Term(1)	Term(2)	Term(3)	Term(4)	Term(5)	Term(6)	Term(n)
Document(1)	225	300	0	0	0	25	0
Document(2)	78	87	0	92	0	175	0
Document(3)	58	137	0	0	237	0	21
Document(4)	0	12	101	0	0	0	0
Document(5)	3	15	0	24	0	48	87
Document(6)	0	0	71	0	0	0	0
Document(n)	109	0	901	221	331	441	551

Inverse Document Frequency (IDF)

Give more weight to a term occurring in less documents

$$IDF(t) = \log \frac{|D|}{df(t)}$$

t : Term
$df(t)$: Document frequency of t
$|D|$: Number of documents in D



Project conclusion

- Github in progress (soon available): https://github.com/turpaultn/CnafSAXO

- Research report available (deep learning basic knowledge required)
  send a mail to: turpaultn@gmail.com

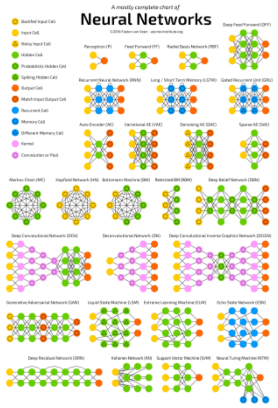
3

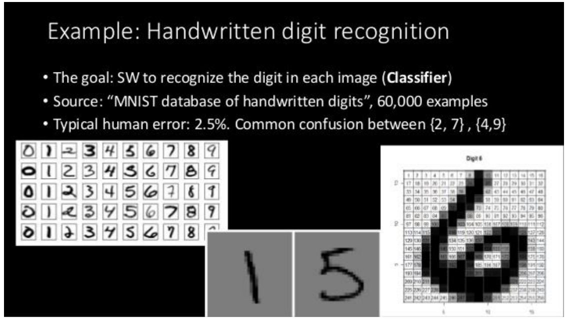
Deep Learning School
June, 12-15

Lundi 12 Juin

Introduction and getting started workshop

- Presented by Stéphane CANU and Frédéric PRECIOSO
- Mathematical basics
- Deep learning concepts with presentation of Convolutional Neural Network (CNN)
- Workshop already using a neural network
- Good introduction and gives basics to rapidly come on deep learning

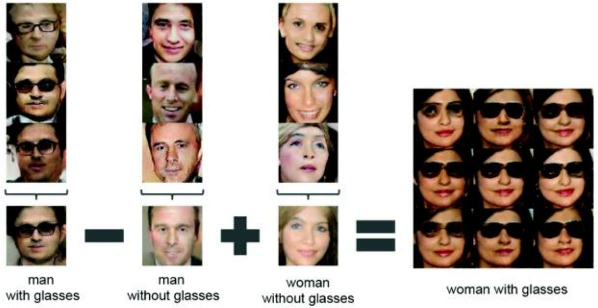




Mardi 13 Juin

Deep architectures

- Soufiane BELHARBI & Mélanie DUCOFFE
- Presentation of some of their thesis work
- Presentation of GANs and Autoencoders with applications
- From basics to research applications
- Gives better understanding of some architectures with some tricky points
- Lab on medical data segmentation with GAN



Fictional celebrity faces generated by a variational autoencoder.

Mercredi 14 Juin

Dealing with time

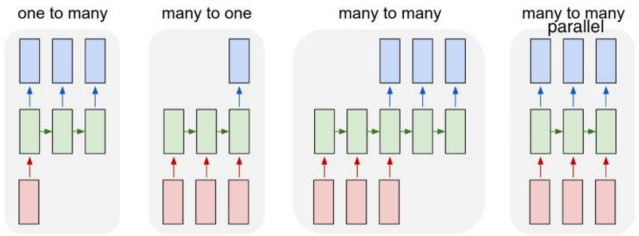
- Rémi CADENE and Jakob VERBEEK

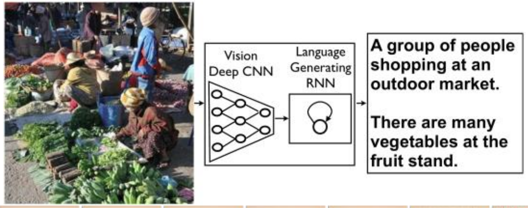
- Introduction to Recurrent Neural Network
- Annotate content of an image

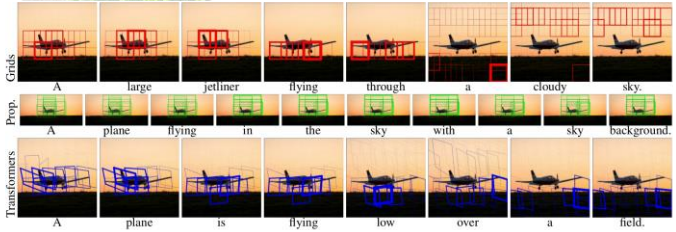
- Using CNN and RNN

- Presentations which represent research work, good vulgarization for beginners and some details for others

- Lab on modelling time series with RNN



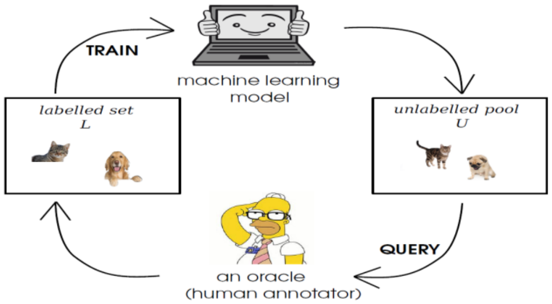


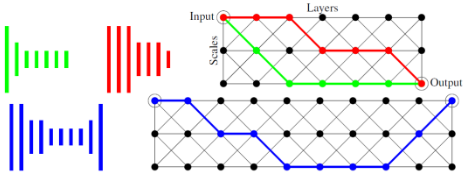


Jeudi 15 Juin

Building and training a Deep Network

- Frédéric Précioso, Mélanie Ducoffe and Jakob VERBEEK
- Active learning presentation
- Explanation of research experiments
- Optimization process with techniques and tricks
- Good conclusion explaining some difficulties to train deep networks.
- It needs time to find good parameters on the optimization process



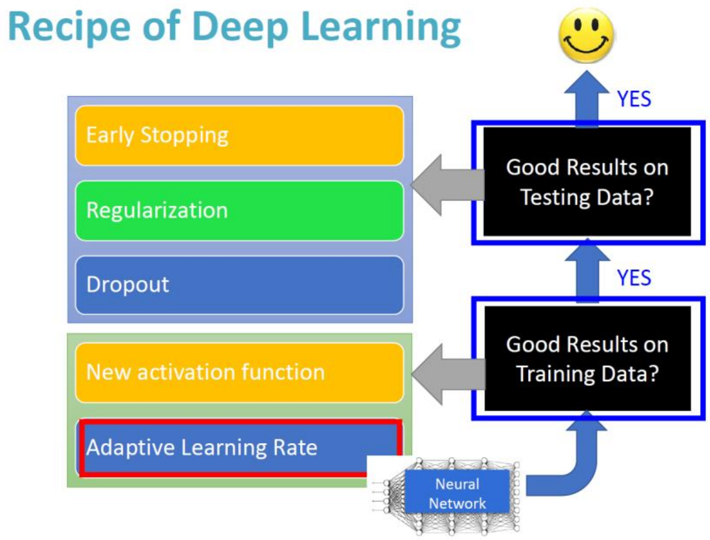


Conclusion and resources

- http://univ-cotedazur.fr/events/deep-learning-school

- Mostly industrial public
- Good initiation for beginners
- And labs designed for them
- Good levels of details for others

- Big success for this 1st Deep learning school in France
- To be reproduced next year and extended to other cities



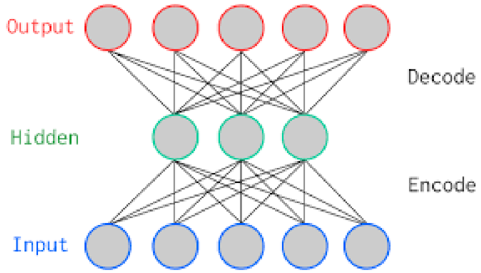
4

Sophia Conf – July, 5
Artificial Intelligence

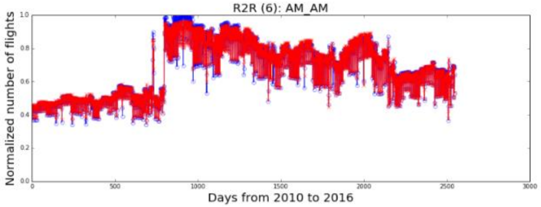
Anomaly detection

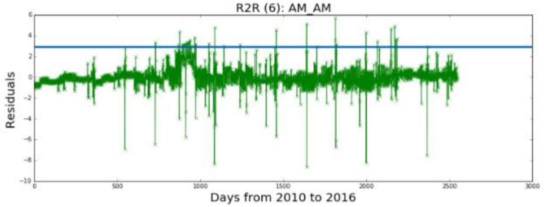
Asmaa FILLATRE - Amadeus

- http://www.telecom-valley.fr/wp-content/uploads/2017/05/FILLATRE.pdf
- **Autoencoder** for anomaly detection



- **Unsupervised learning**

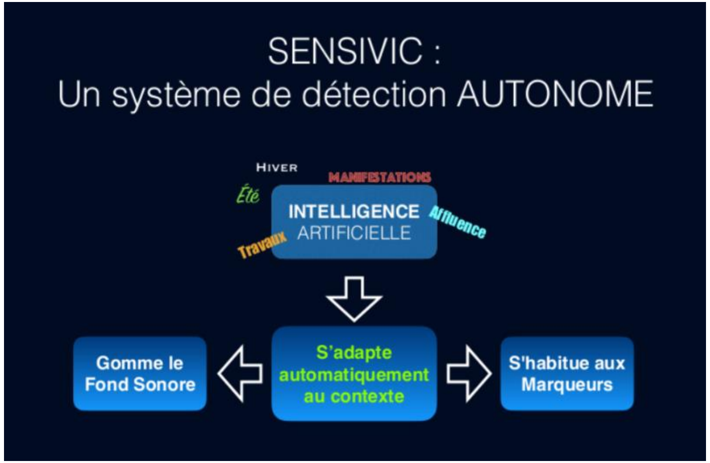




Anomaly detection in sound for security

Jean DEMARTINI – USS SENSIVIC

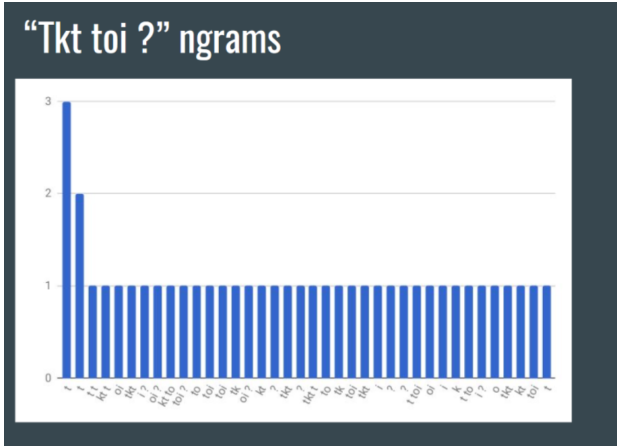
- http://www.telecom-valley.fr/wp-content/uploads/2017/05/DEMARTINI-20170705_Sophia_Conf_DAAS_IA_pratique.pdf
- Add microphone with camera in security to detect anomalies camera can not see.
- No algorithm given



Language identification in (very) short texts

Mathieu LACAGE - Alcméon

- http://www.telecom-valley.fr/wp-content/uploads/2017/05/LACAGE.pdf
- Classification problem using ngrams
- No deep learning
- Learning by examples available on github



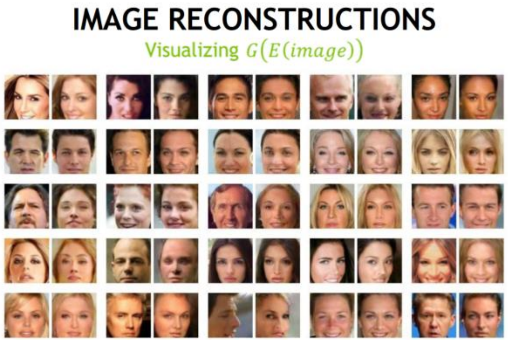
“Tkt toi ?” out-of-place distance

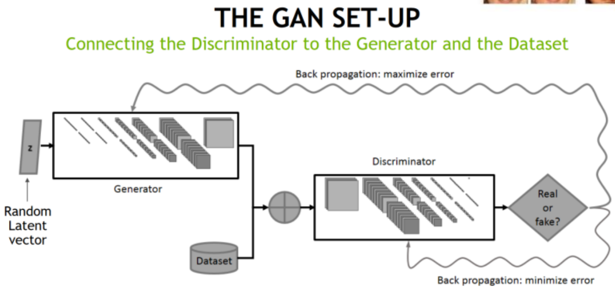
English	87300
Dutch	87541
French	87553
Italian	87753
German	87926
Spanish	88444
Russian	88845
Arabic	90000

Photo editing with GANs

Greg HEINRICH - Nvidia

- http://www.telecom-valley.fr/wp-content/uploads/2017/05/HEINRICH.pdf
- GANs: Generative Adversarial Network
- Basics of the algorithm very well explained
- Famous algorithm
- Learning to generate the right data, in this case images

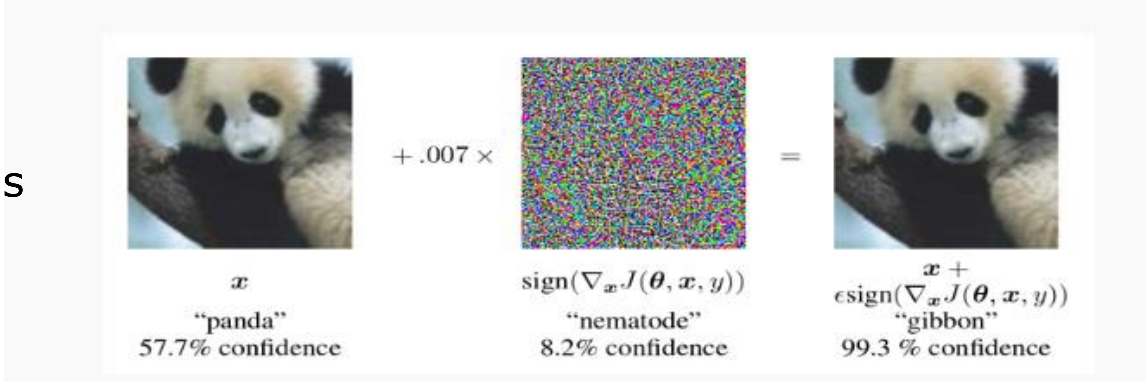




Fooling Deep Netwoks

Guillaume DEBARD – Laboratoire I3S

- http://www.telecom-valley.fr/wp-content/uploads/2017/05/DEBARD.pdf
- More technical
- Show some limitations of GANs
- How to attack a GAN
- Very good presentation which reduces the claim of Deep learning

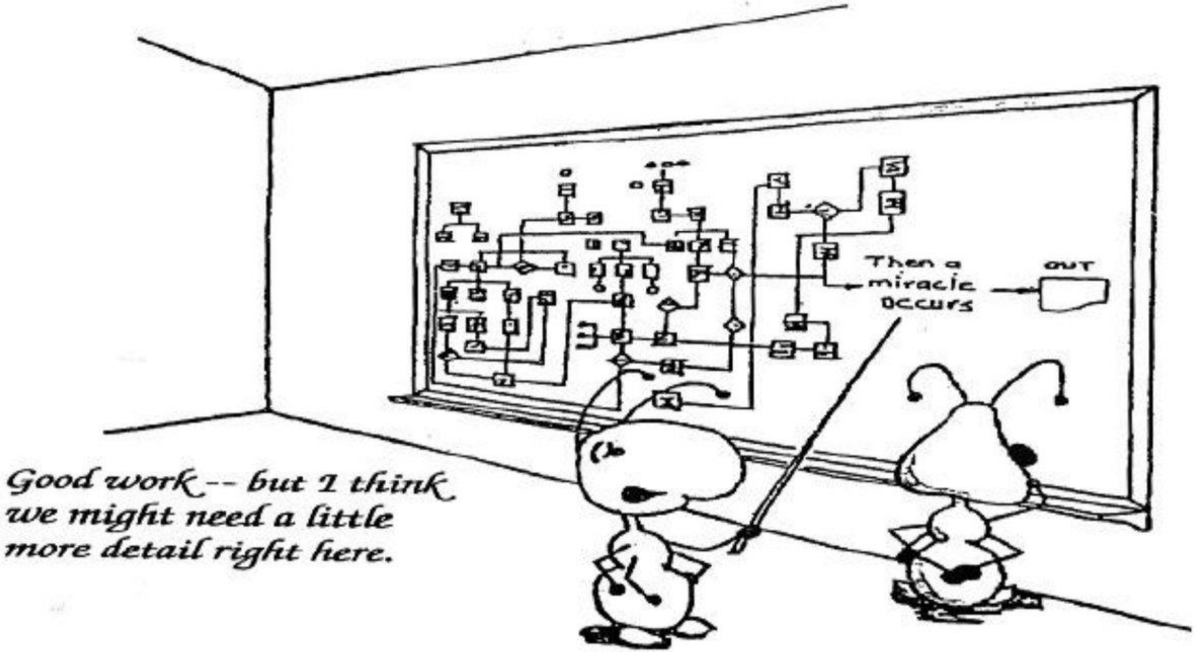


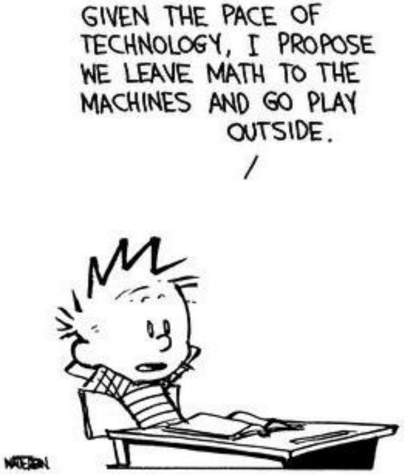
5 Conclusion

Deep learning

- First steps easy to implement
- Can solve new problems our outperforms previous method
- Not only for robots
- It is an **optimization process** relevant for many applications
- *Why don't you try ?*

Any questions?





6 References

References

Images

- https://leverton.de/blog/2016/12/21/3-deep-learning-trends-2017/
- https://www.mongodb.com/blog/post/deep-learning-and-the-artificial-intelligence-revolution-part-2
- https://blogs.nvidia.com/blog/2016/07/29/whats-difference-artificial-intelligence-machine-learning-deep-learning-ai/
- https://www.technologyreview.com/s/535201/the-face-detection-algorithm-set-to-revolutionize-image-search/
- https://www.analyticsvidhya.com/blog/2017/01/introduction-to-reinforcement-learning-implementation/
- http://med.stanford.edu/gevaertlab.html
- http://cs231n.github.io/neural-networks-1/
- https://www.youtube.com/watch?v=4A14mOsT6vQ
- http://www.businesswire.com/news/home/20170118005301/en/Neurala-Announces-14-Million-Series-Bring-Deep
- https://www.singularityweblog.com/alphago-deepmind-intelligence/
- https://www.linkedin.com/pulse/text-mining-deep-learning-part-1-shamane-siriwardhana
- https://www.ibm.com/blogs/insights-on-business/government/watson-in-defense-not-just-for-trivia/
- http://www.asimovinstitute.org/neural-network-zoo/
- https://www.youtube.com/watch?v=XNZIN7Jh3Sg
- https://www.slideshare.net/RoiBlanco/big-datasantiagov2
- https://www.linkedin.com/pulse/term-frequency-inverse-document-sanjay-singh-1
- https://www.slideshare.net/MasumiShirakawa/www-48698138
- http://keetmalin.wixsite.com/keetmalin/single-post/2017/06/05/TF-IDF-in-the-Field-of-Information-Retrieval

Thanks

For more information please contact:
T+ 33 1 98765432
F+ 33 1 88888888
M+ 33 6 44445678
firstname.lastname@atos.net