Machine Learning presentation

07-09-2017

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

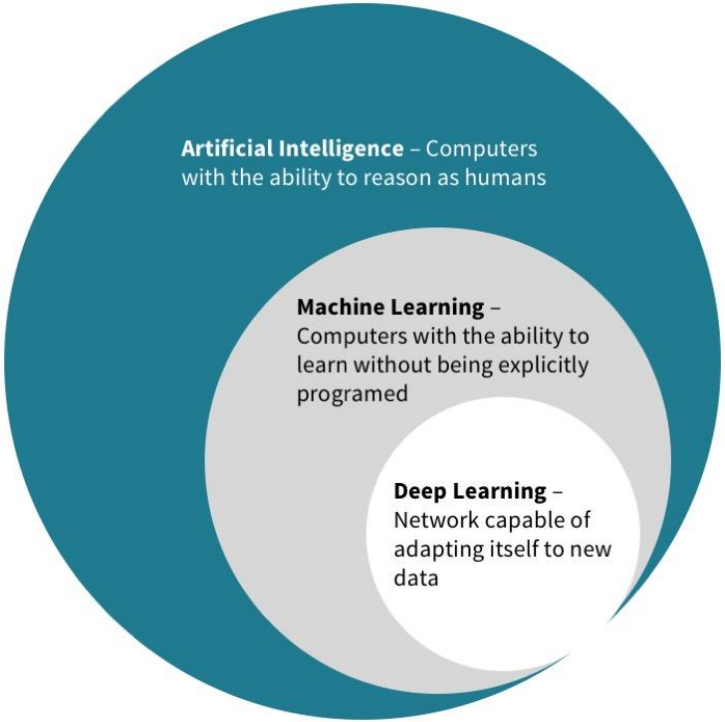
Videos in French

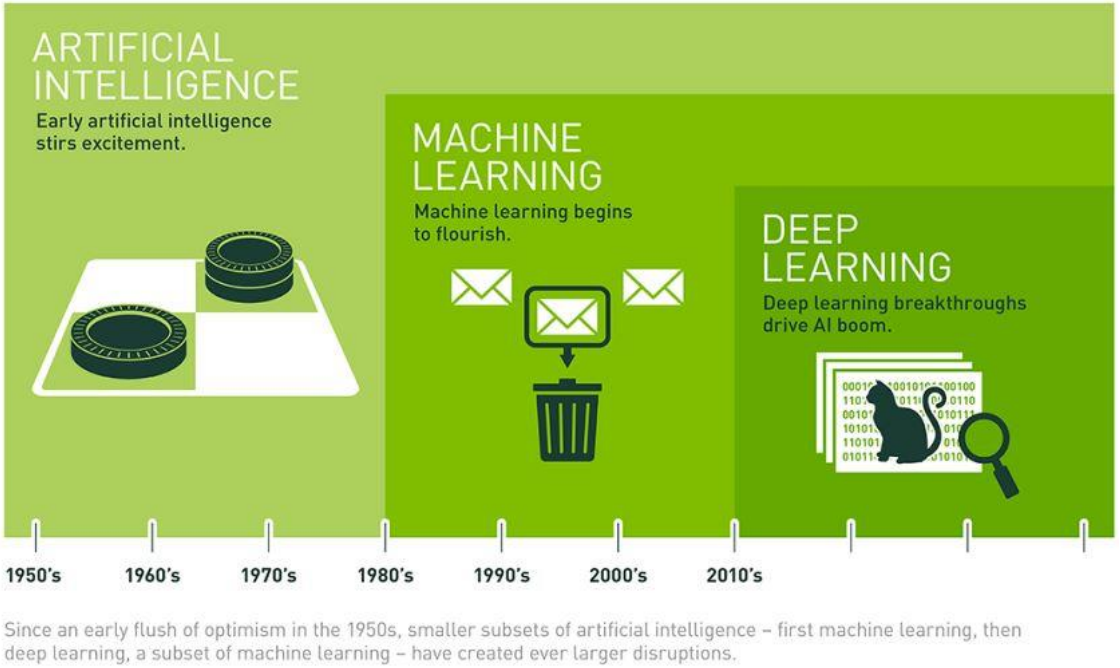
- Intro
  - https://www.youtube.com/watch?v=c7mIXLJESOk&feature=youtu.be
- Deep Learning for CNAF
  - https://www.youtube.com/watch?v=1DZkdrGwSSE&feature=youtu.be
- Feedback Deep Learning school
  - https://youtu.be/vjtVkDFVbNE
- Feedback Sophia conf – AI
  - https://www.youtube.com/watch?v=Ad77CAYFr2U&feature=youtu.be

Introduction to Deep Learning

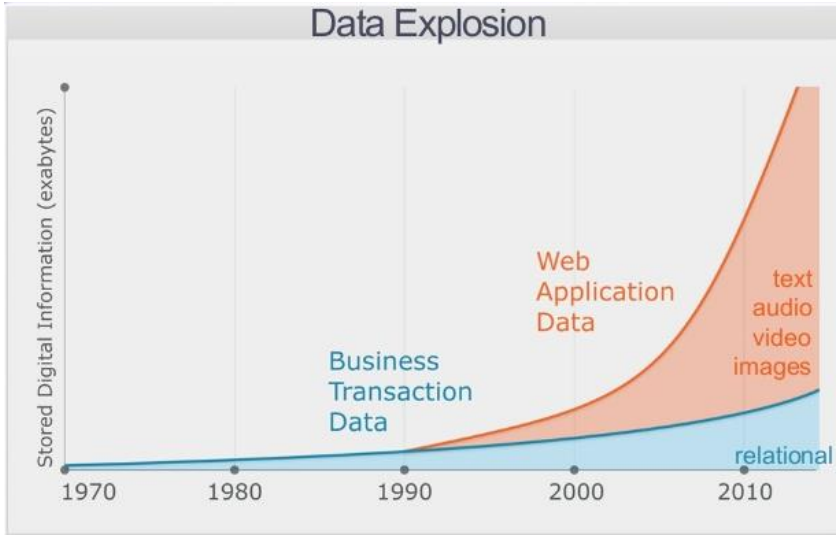
Deep learning ?

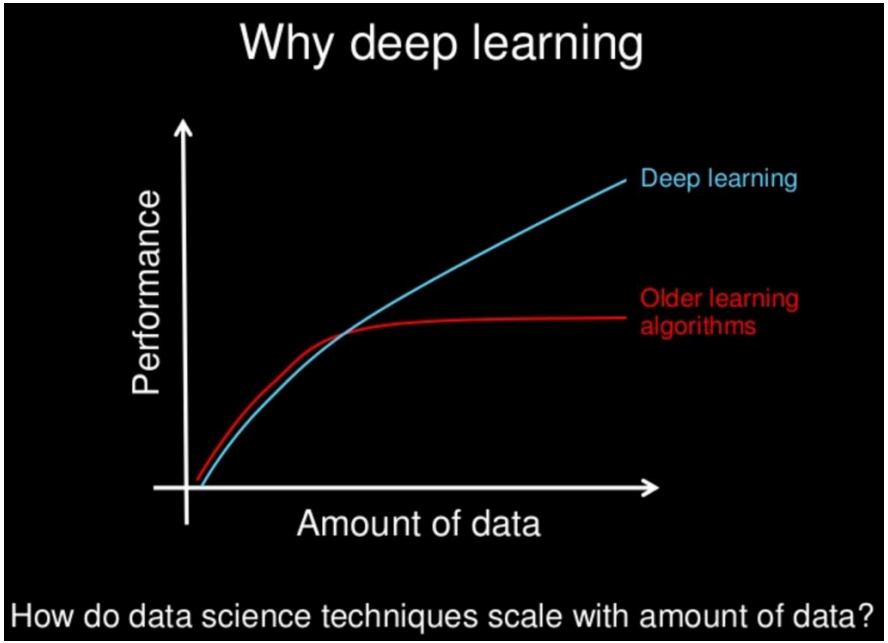
Part of Artificial Intelligence



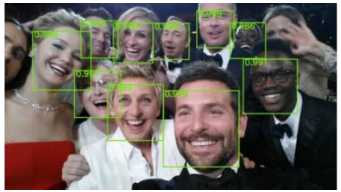


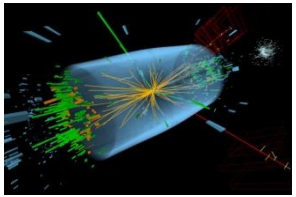
Why deep learning ?

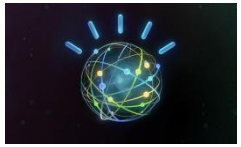


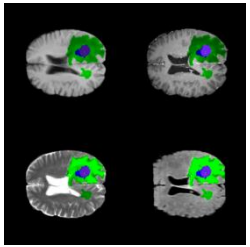


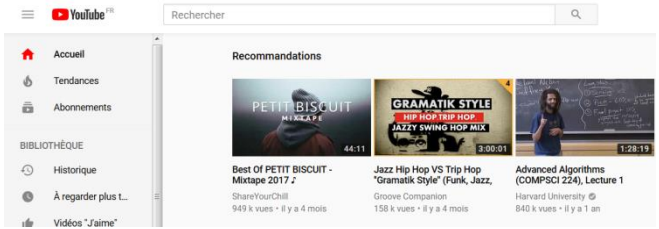
Applications



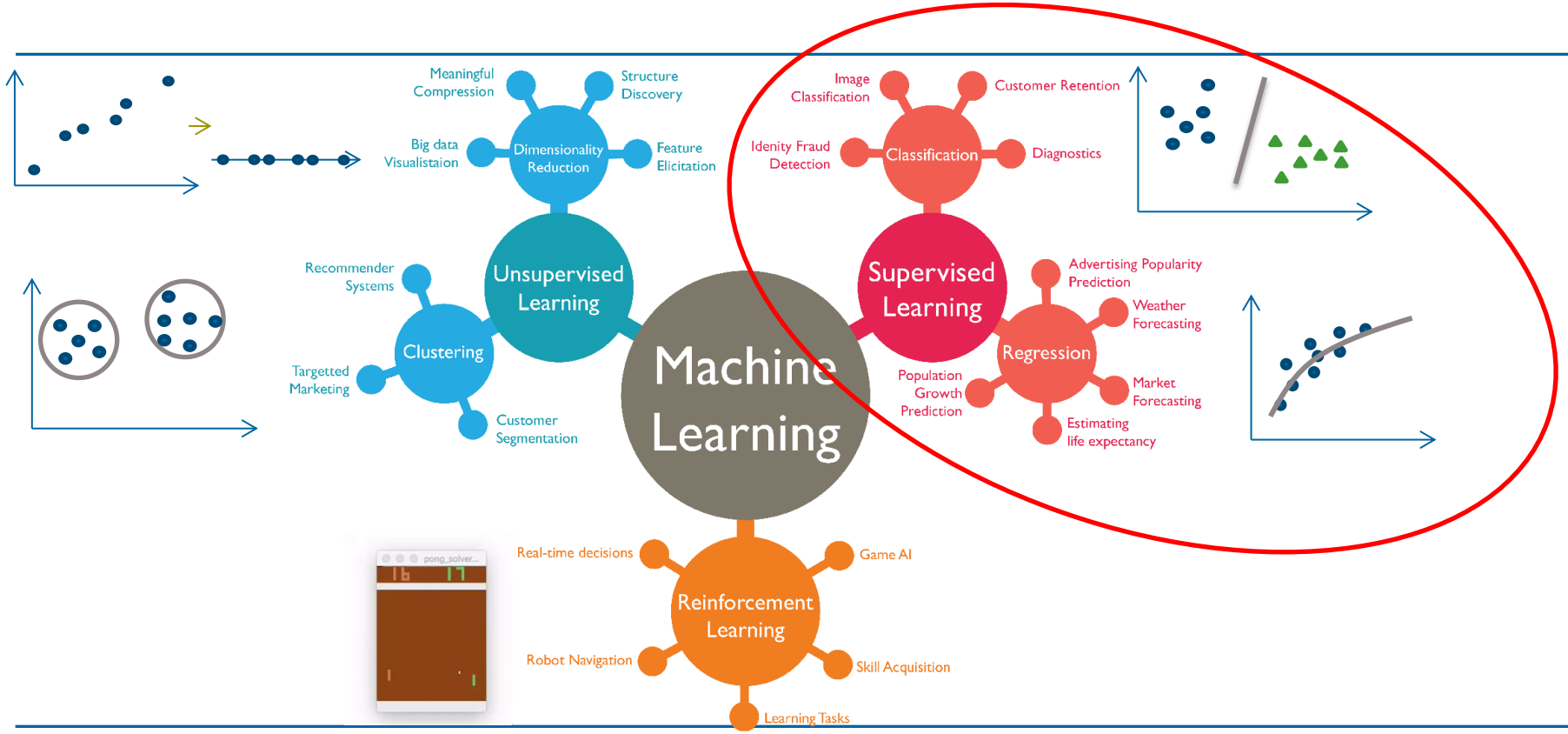




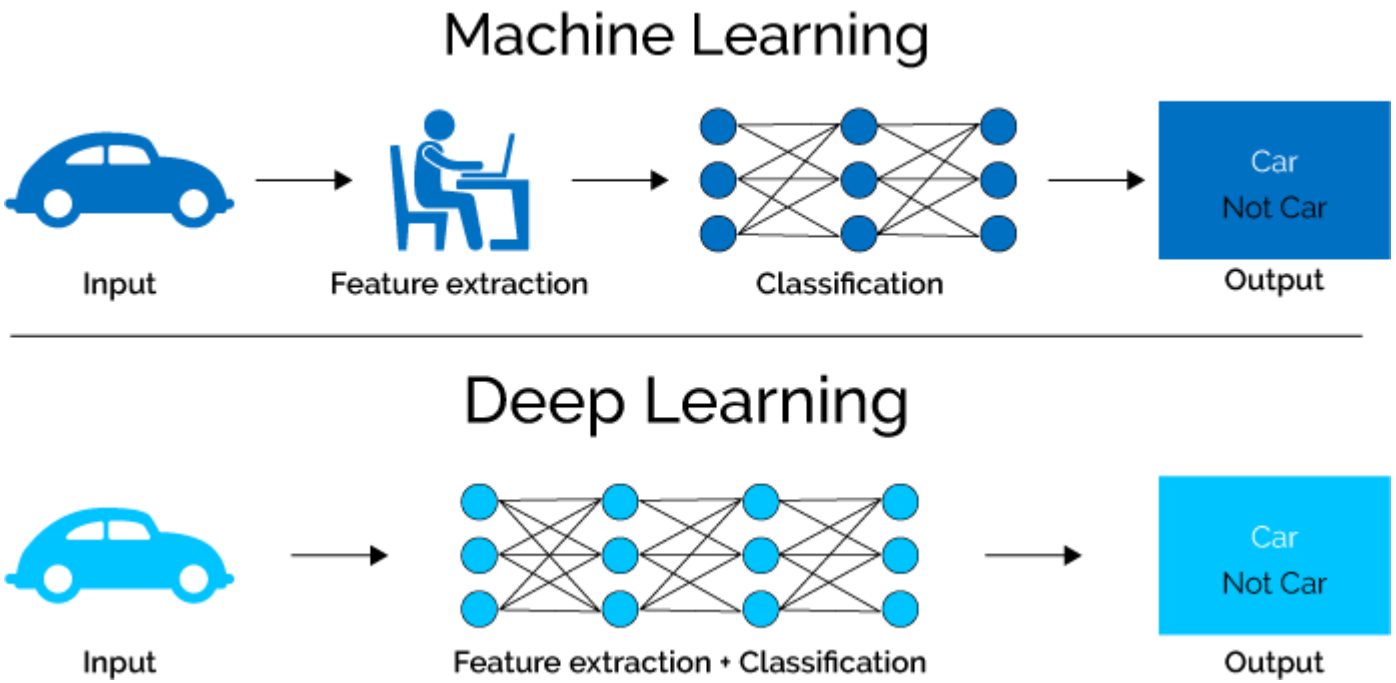




Machine learning basics



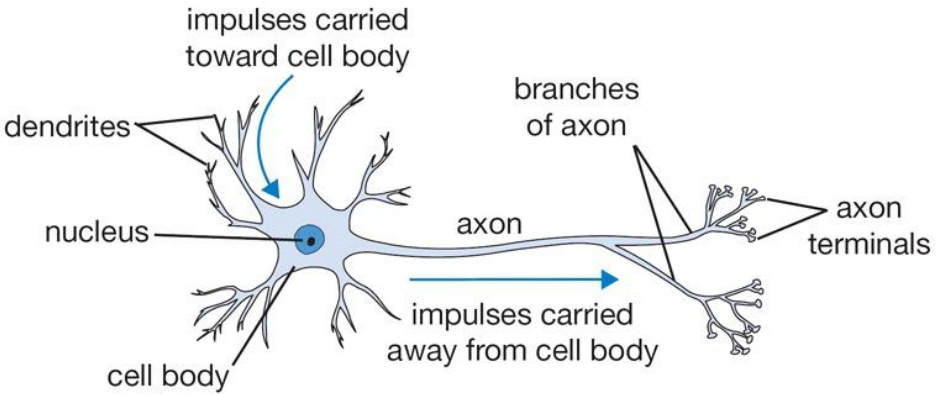
Machine Learning vs Deep Learning

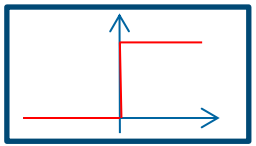


Basics in deep learning

Neuron, called Perceptron

Biological neuron





cell body activation

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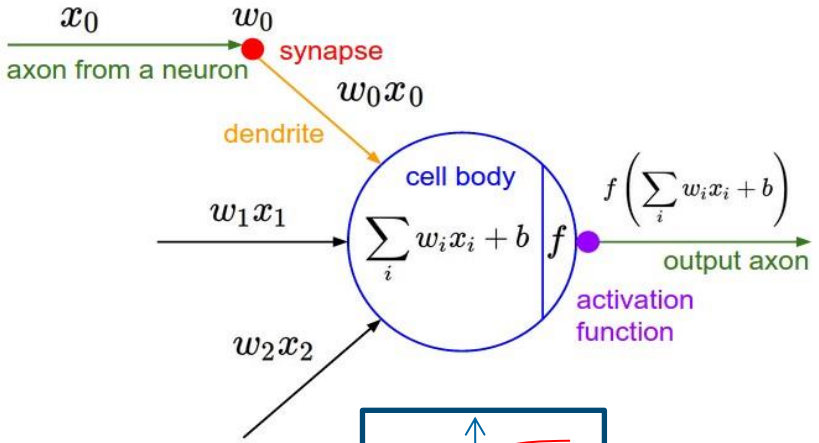
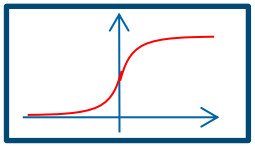
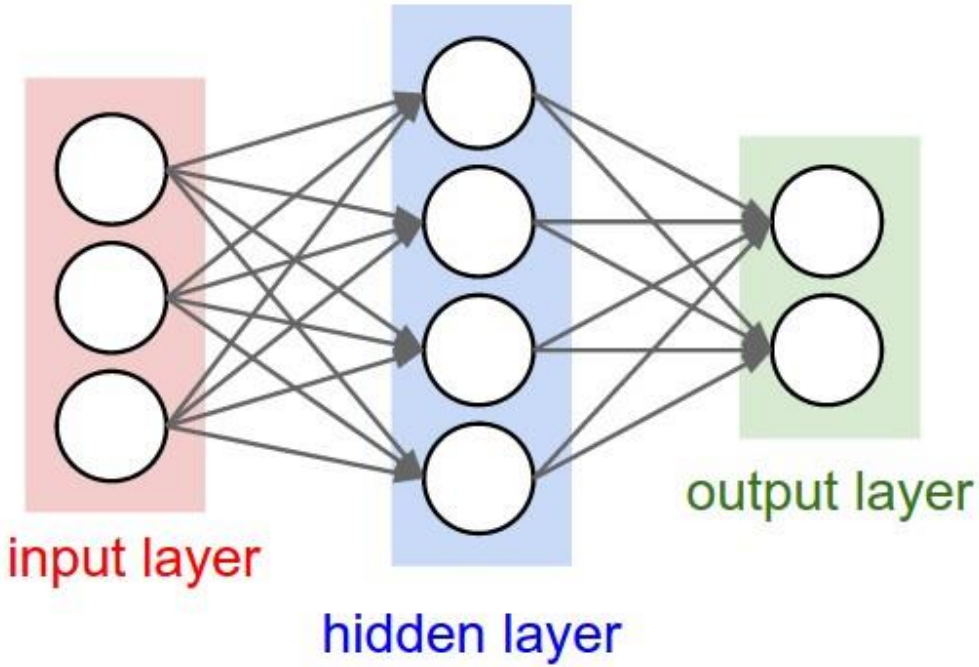
Artificial neuron



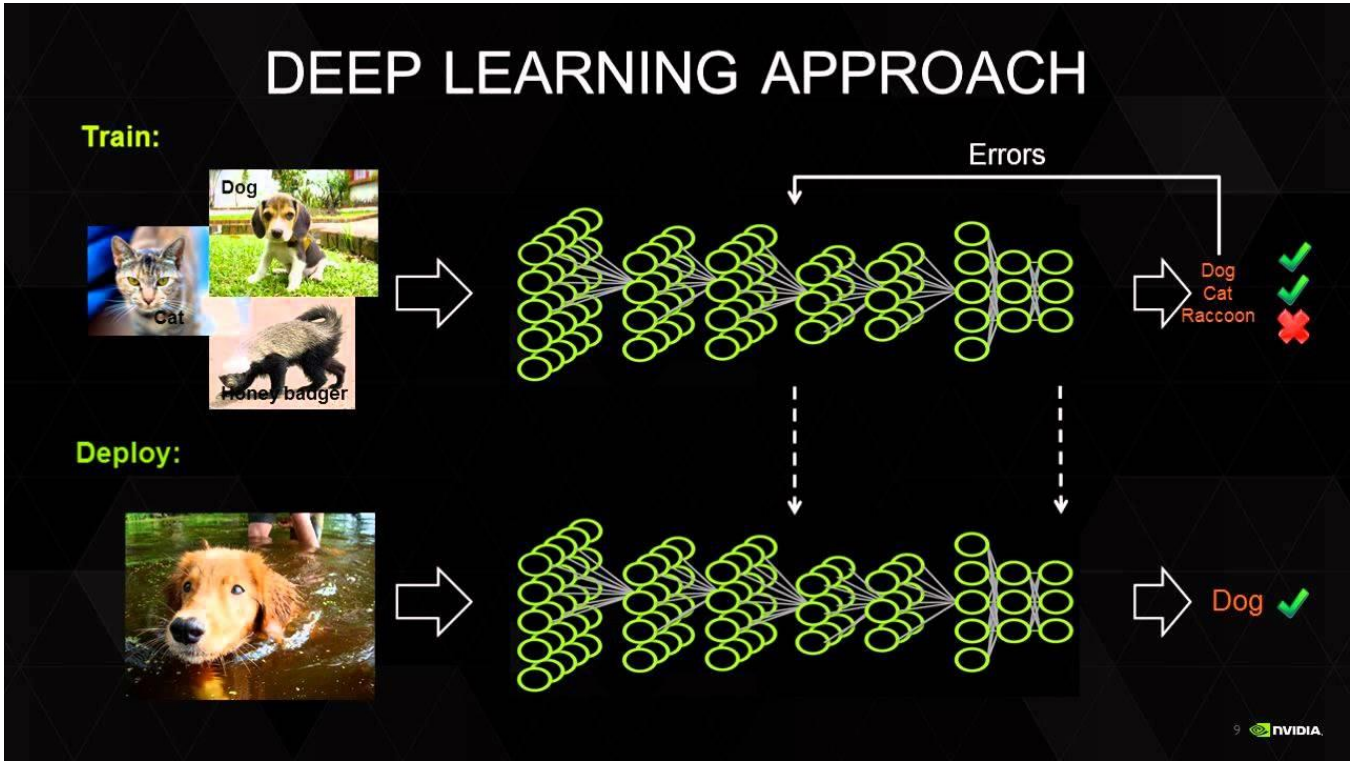


cell body activation

Neural network

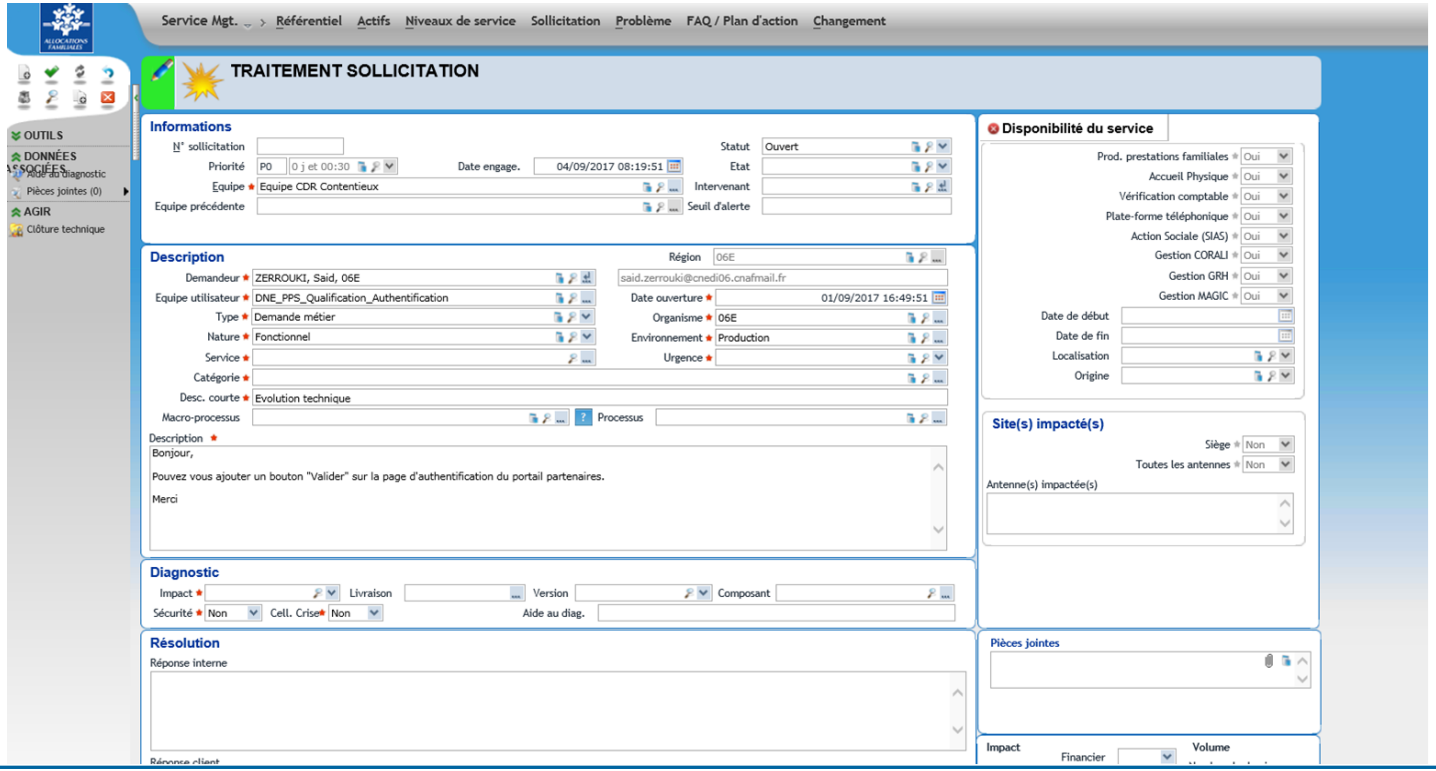


Deep learning



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

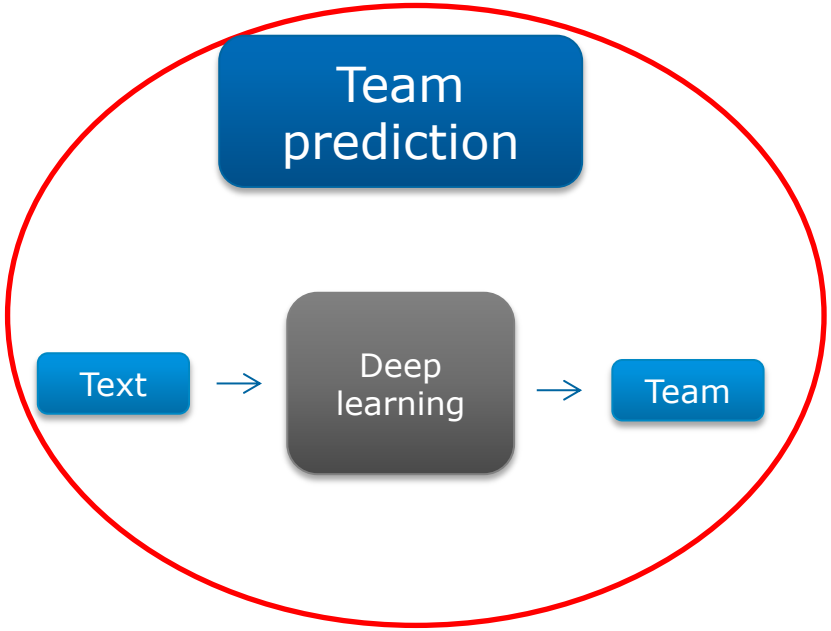
The purpose of every solution suggested is to help decision

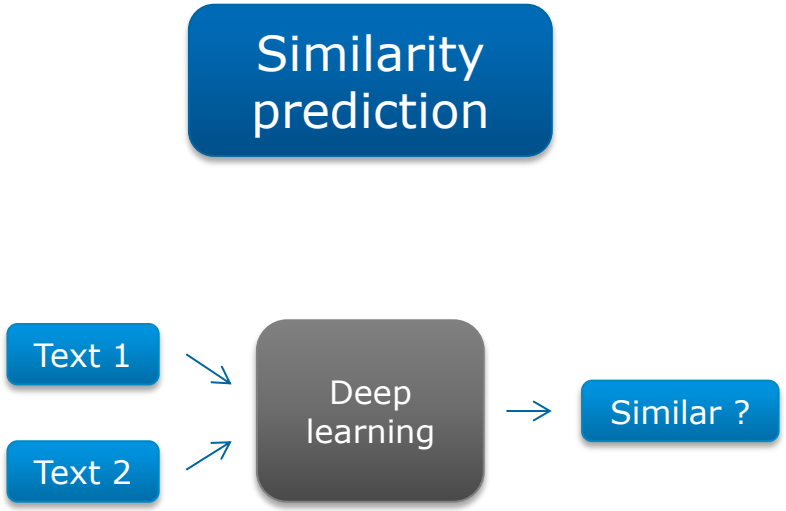
Using only text of a ticket

- 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



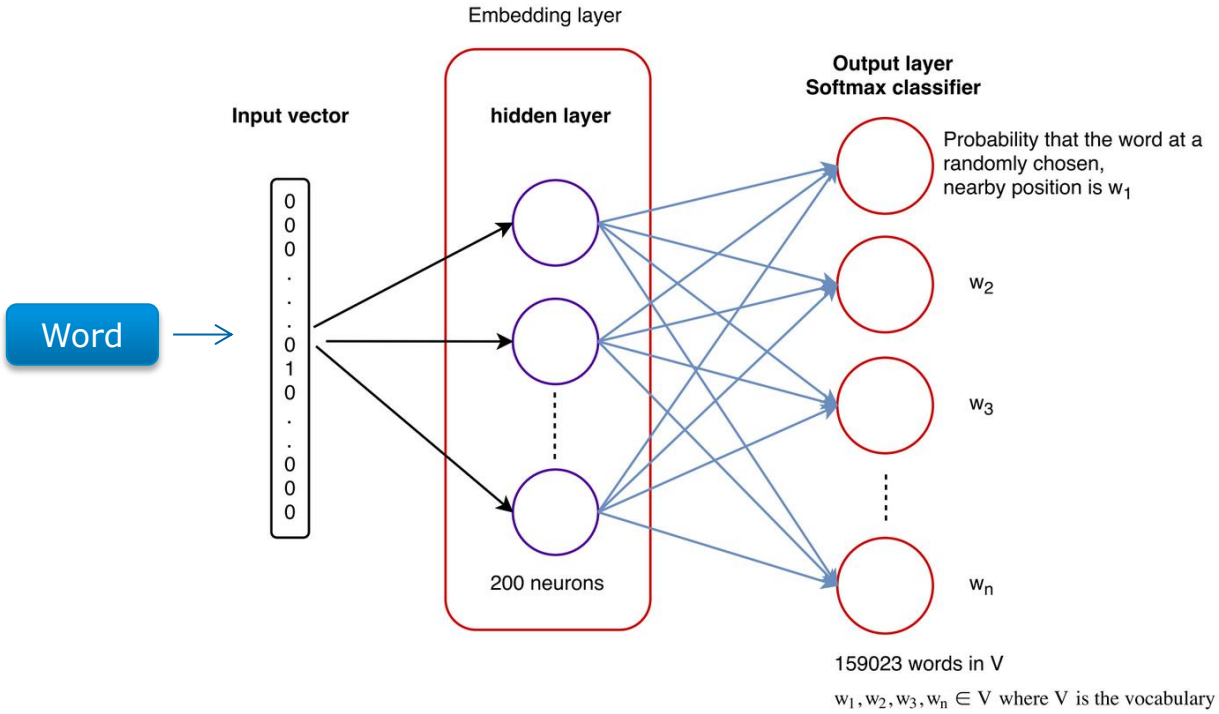


Deep learning solution proposed

From words to vectors

Embedding model (Skip gram)

NOT DETAILED IN THIS PRESENTATION

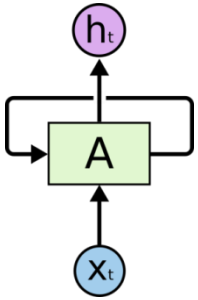


- Fake task: predict surrounding words of the input
- hidden layer is the representation by a vector of reals of the input word

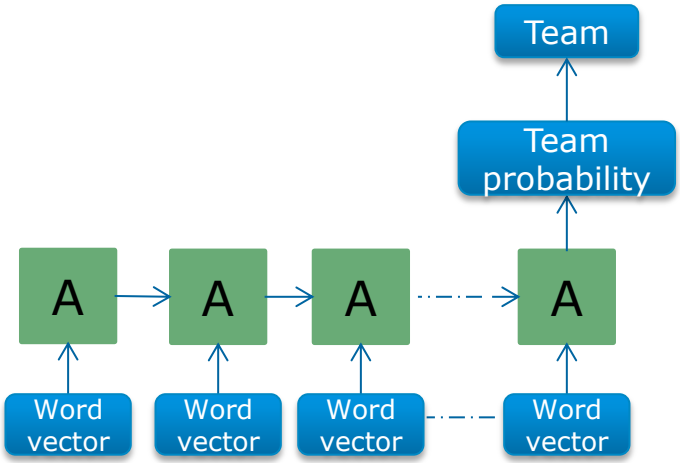
Predictive model

Recurrent Neural Network (RNN) and bidirectional RNN

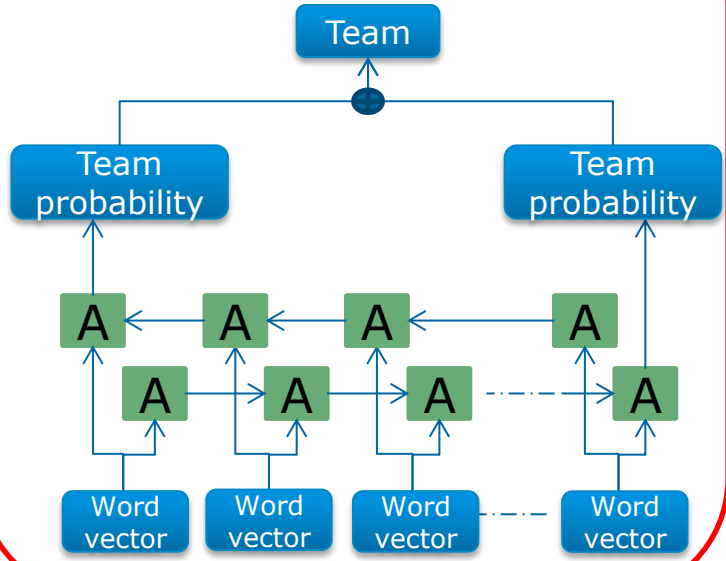
Recurrent neuron



Recurrent neuron unrolled



Bidirectional neuron unrolled



Team prediction

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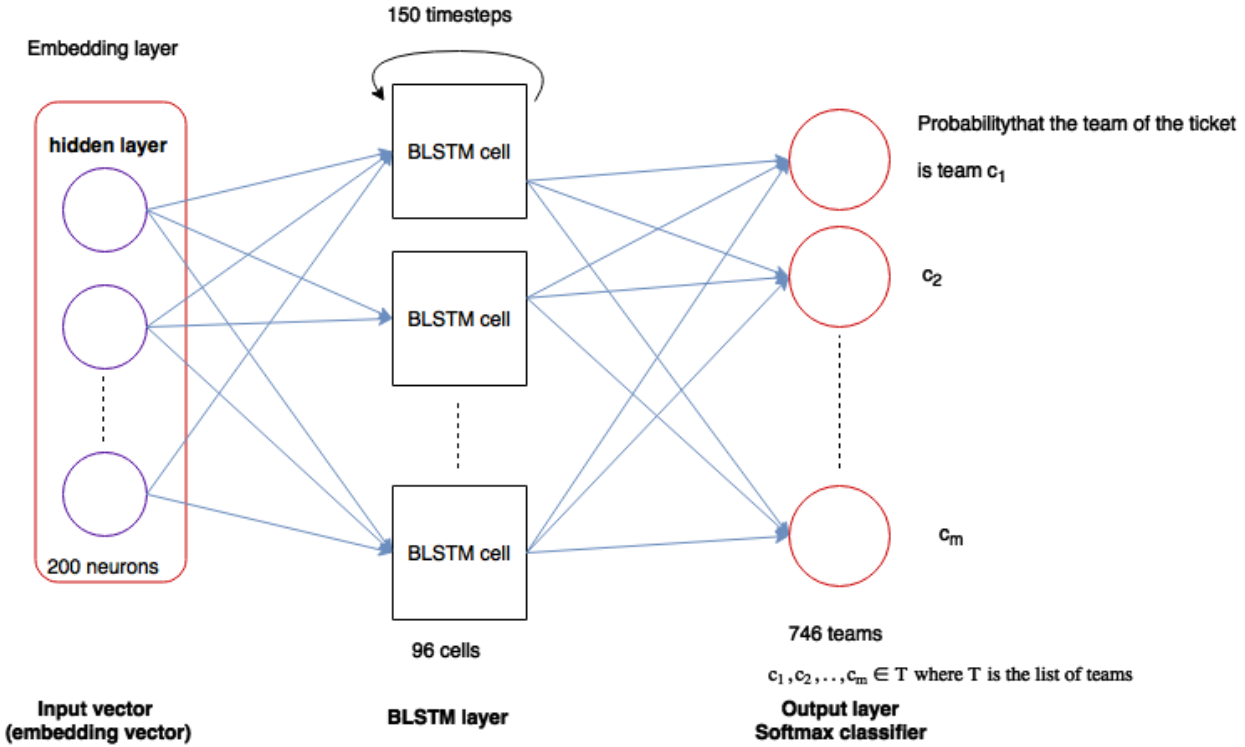

Results

- +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 ?

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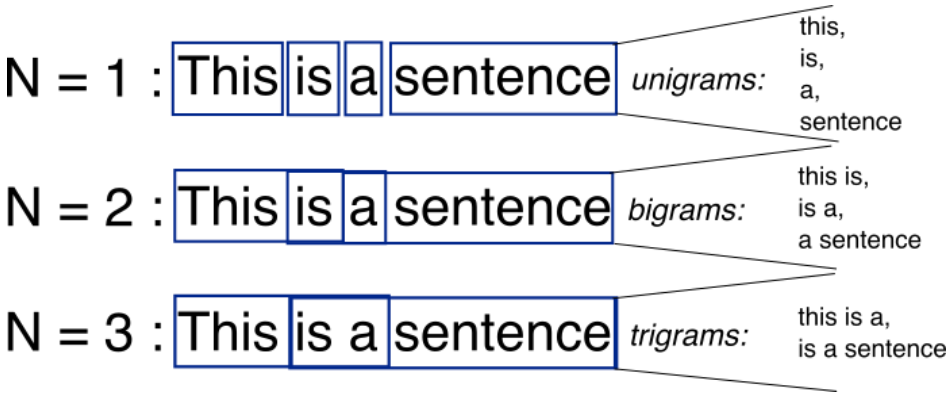


Term-Frequency Metric	Term(1)	Term(2)	Term(3)	Term(4)	Term(5)	Term(6)	Term(n)
Document(1)	225	300	0	0	0	25	0
Document(2)	78	87	0	92	0	175	0
Document(3)	58	137	0	0	237	0	21
Document(4)	0	12	101	0	0	0	0
Document(5)	3	15	0	24	0	48	87
Document(6)	0	0	71	0	0	0	0
Document(n)	109	0	901	221	331	441	551

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

t = term

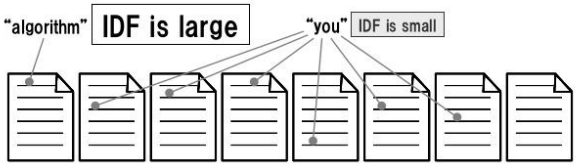
d = document

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/Text_classification
  full project (private): https://github.com/turpaultn/CnafSAXO

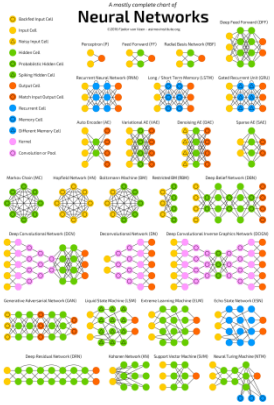
- Research report available (deep learning basic knowledge required)
  send a mail to: turpaultn@gmail.com

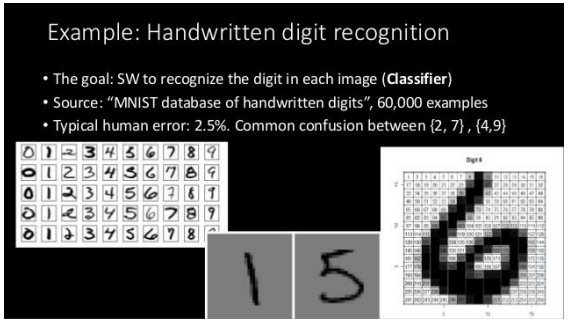
Deep Learning School
June, 12-15

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

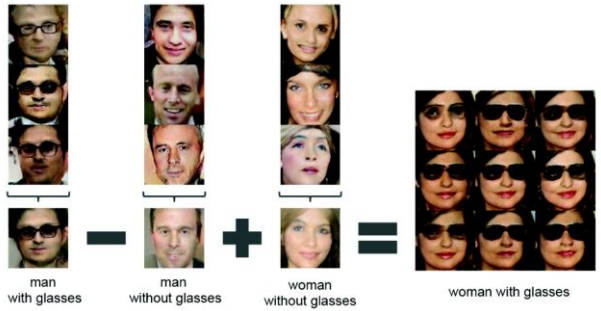




Mardi 13 Juin

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

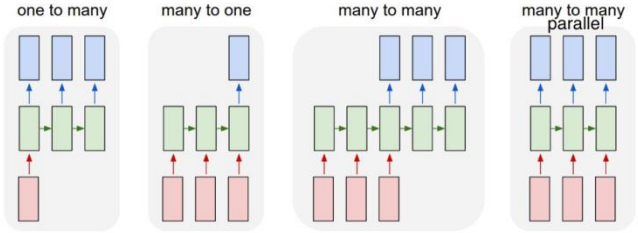


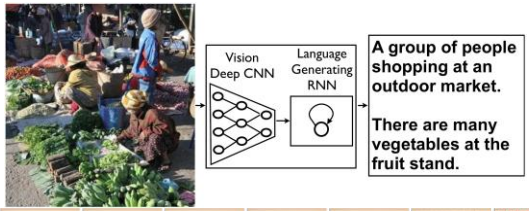
Fictional celebrity faces generated by a variational autoencoder.

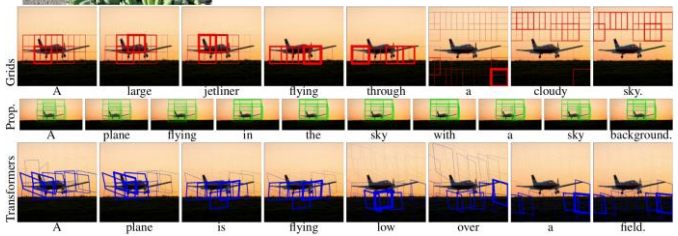
Mercredi 14 Juin

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



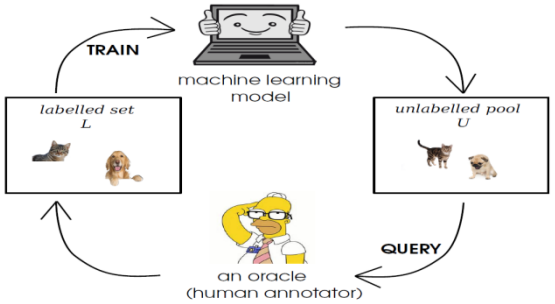


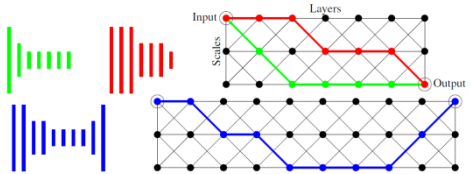


Jeudi 15 Juin

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



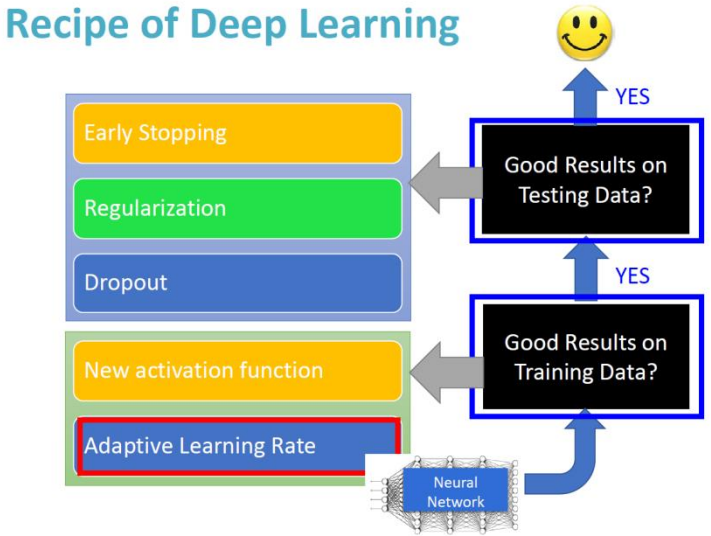


Conclusion and resources

- 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

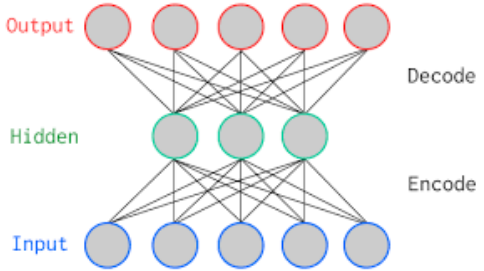


Sophia Conf – July, 5
Artificial Intelligence

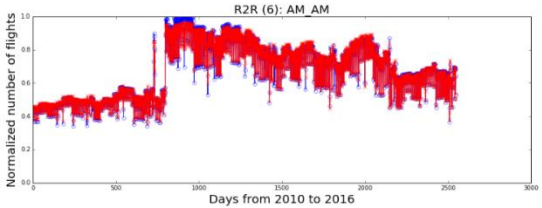
Anomaly detection

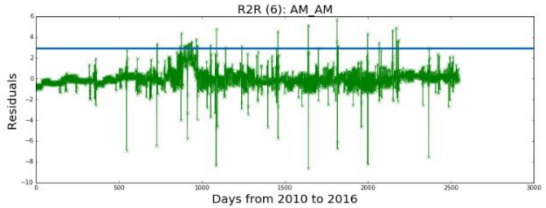
Asmaa FILLATRE - Amadeus

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



- **Unsupervised learning**

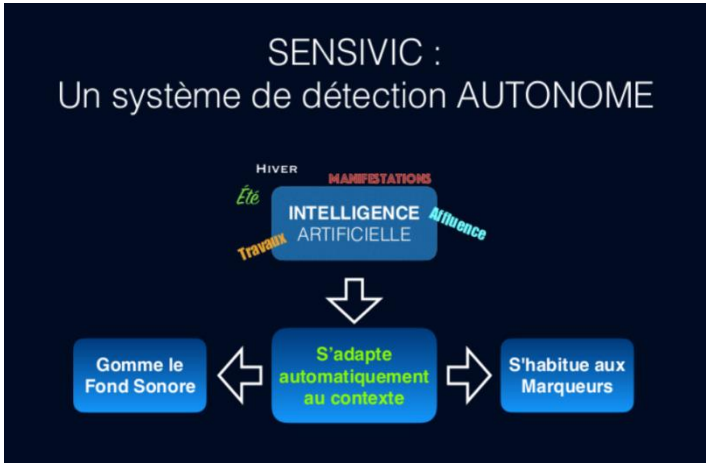




Anomaly detection in sound for security

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

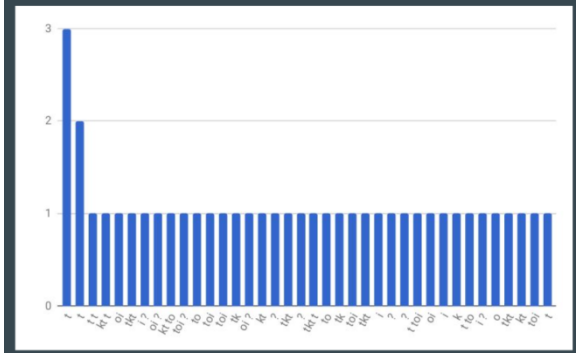


Language identification in (very) short texts

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 ?" ngrams



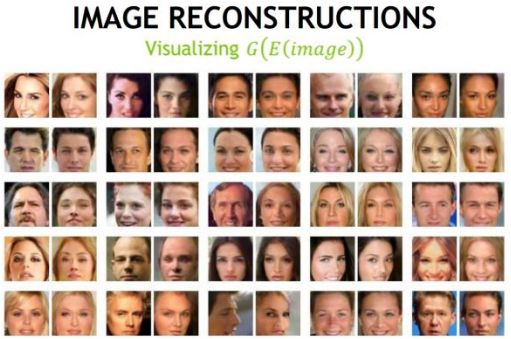
"Tkt toi ?" out-of-place distance

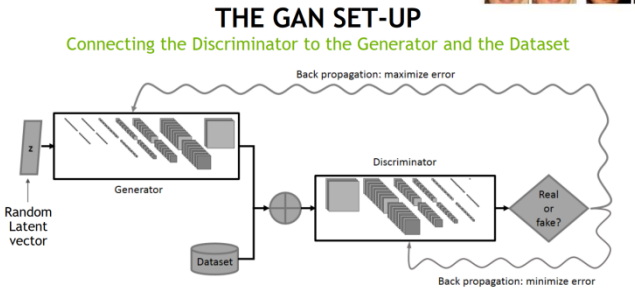
English	87300
Dutch	87541
French	87553
Italian	87753
German	87926
Spanish	88444
Russian	88845
Arabic	90000

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

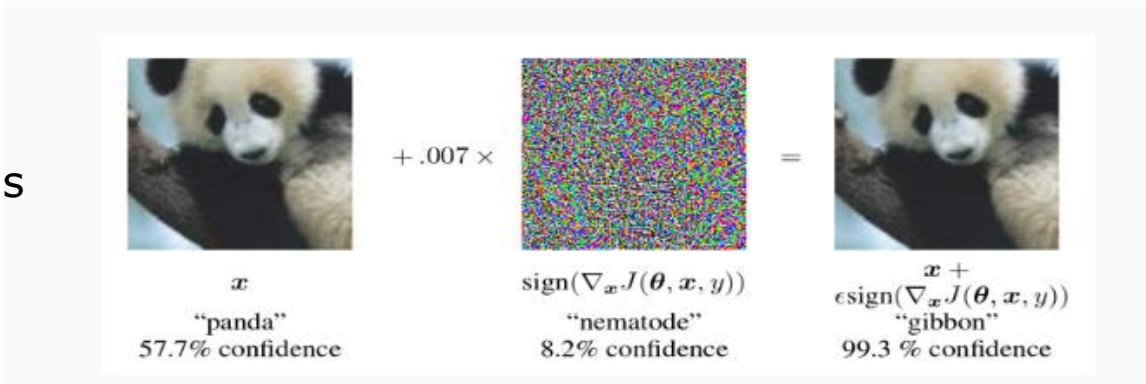




Fooling Deep Netwoks

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

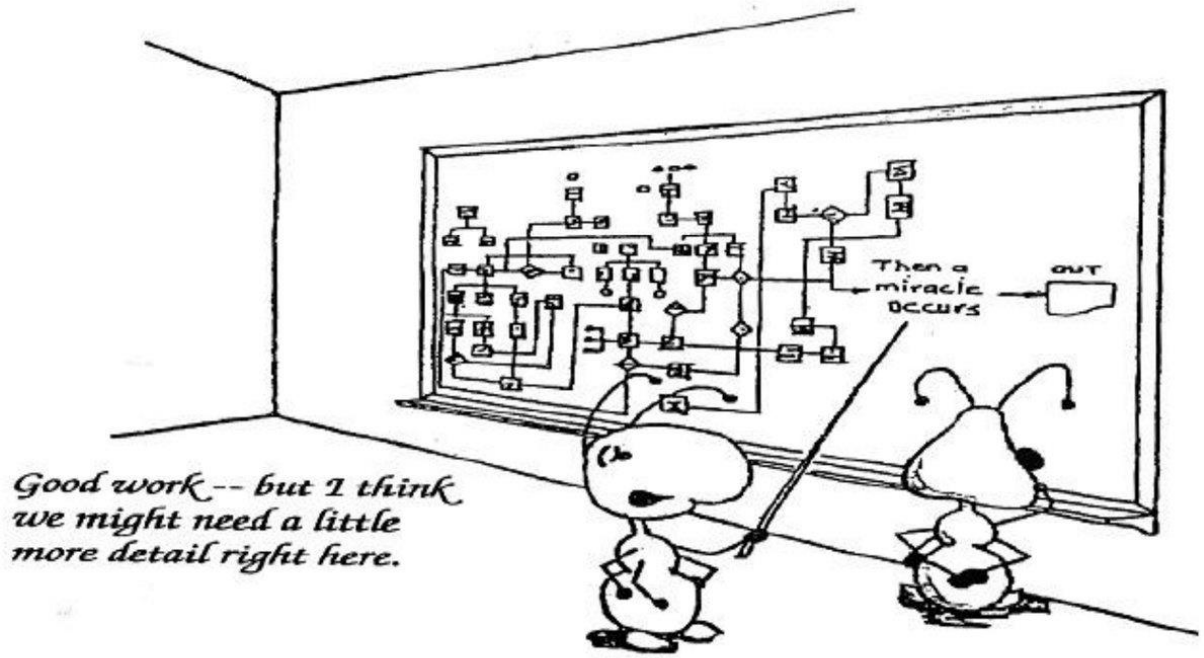


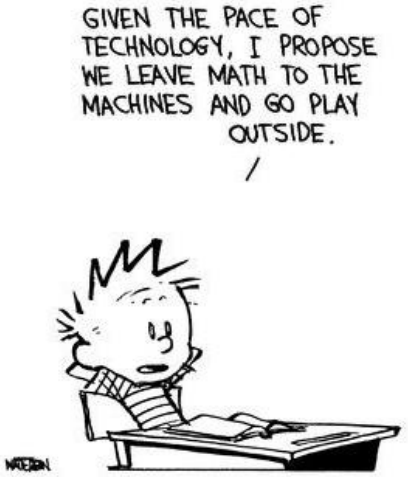
Conclusion

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

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Thanks

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