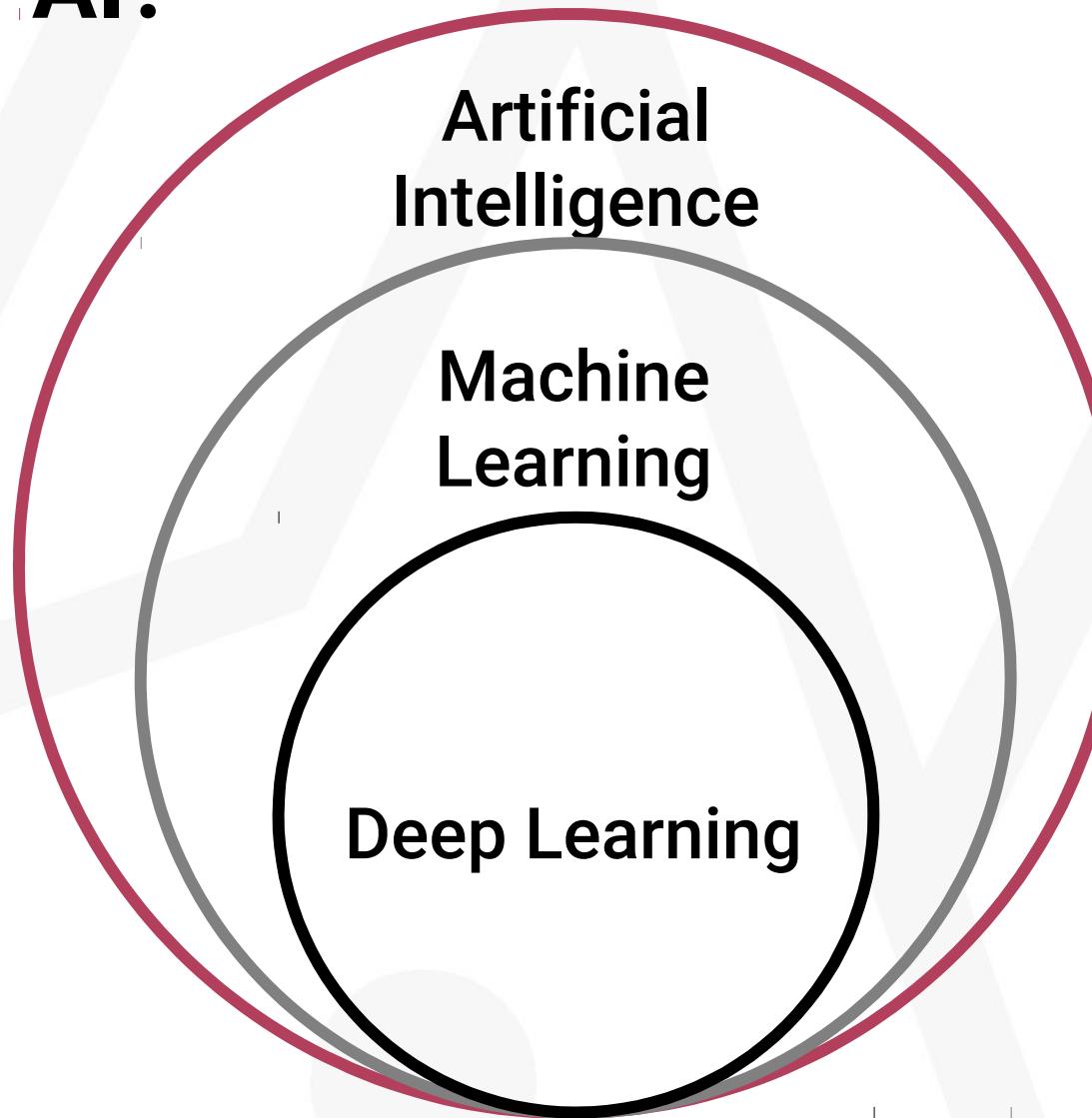


Hepatology at the digital age

Recipe to train a machine learning algorithm

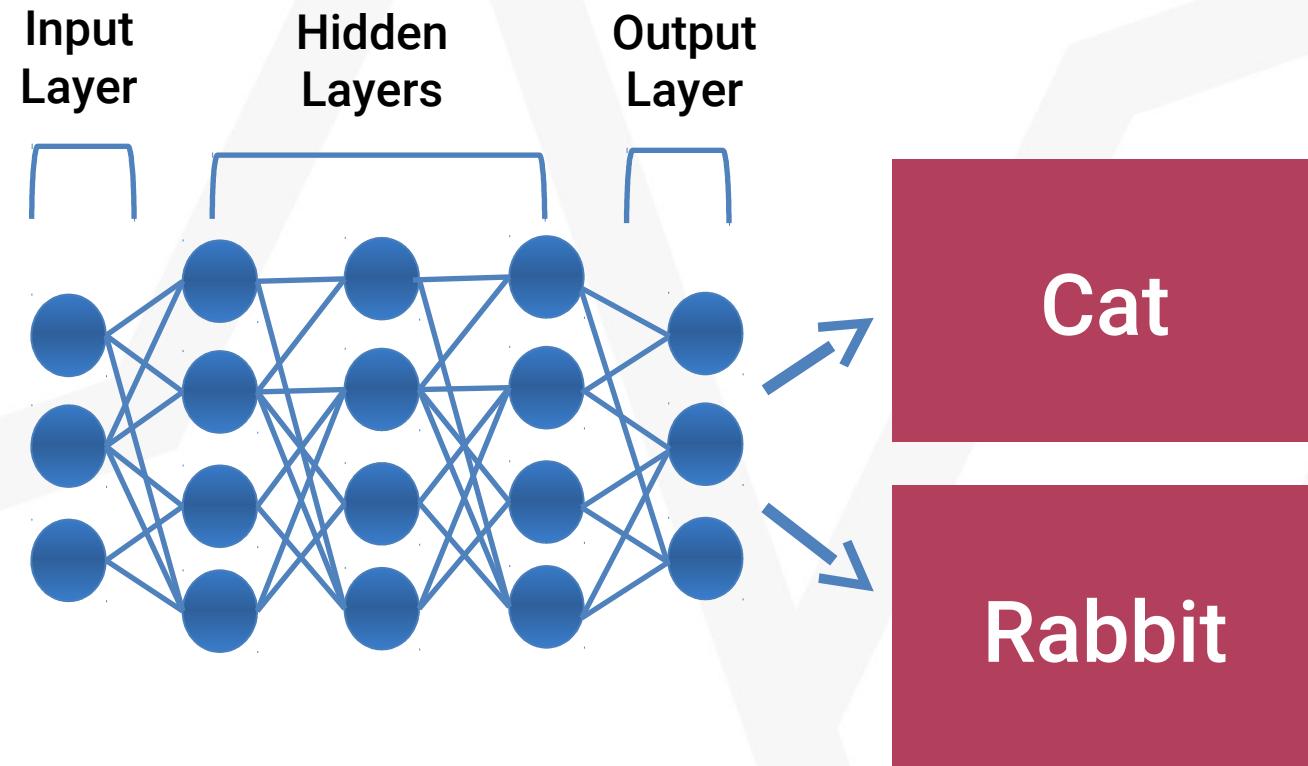
Antoine JOMIER
CEO and co-founder Incepto

Deep Learning? AI?

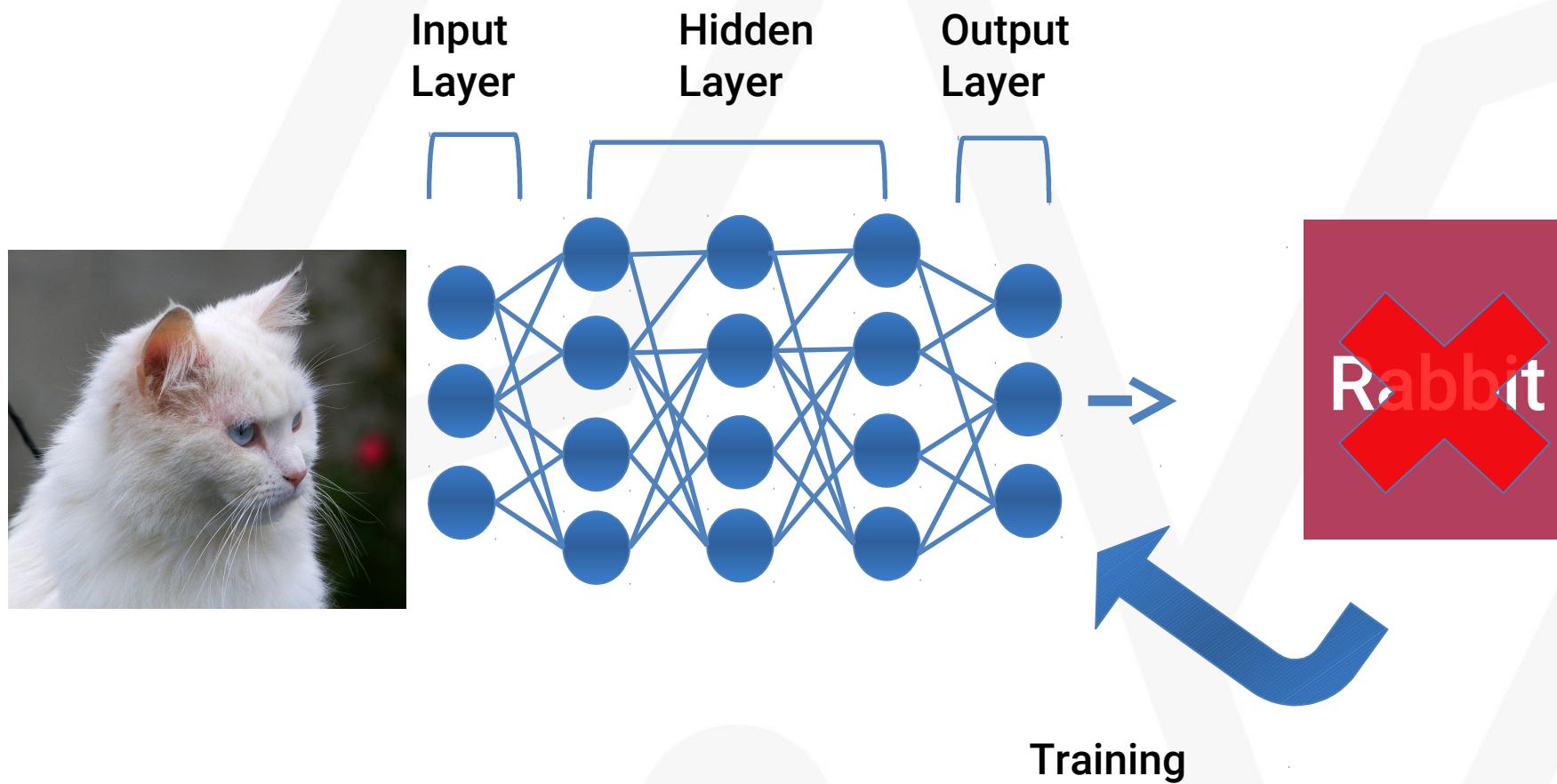


Deep Learning
=
Deep Neural Network

Deep Learning used as a Super Classifier

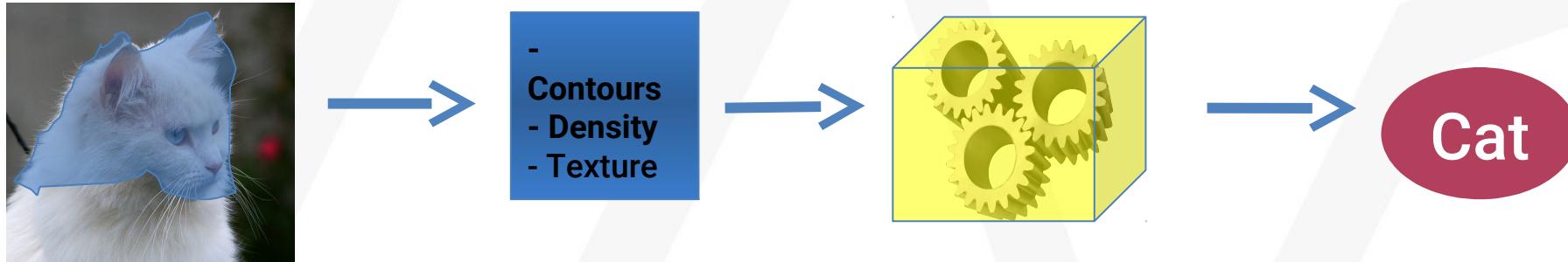


Deep Learning used as a Super Classifier

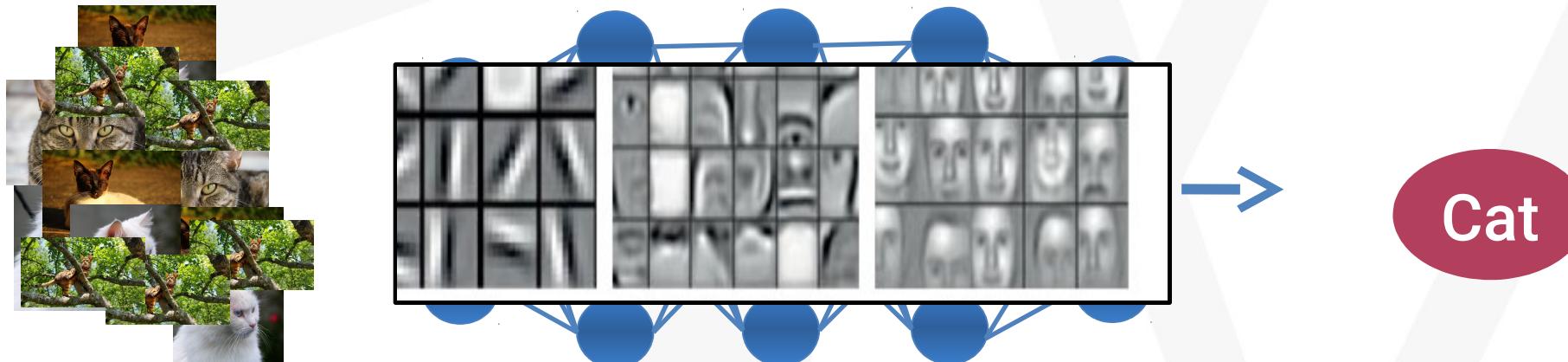


Classical Image Processing vs Deep Learning

Classical Image Processing



Deep Learning

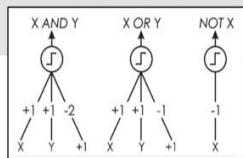


1. Algorithms

Backpropagation



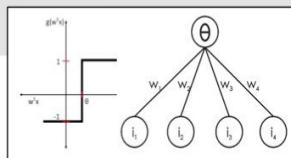
S. McCulloch - W. Pitts



- Adjustable Weights
- Weights are not Learned



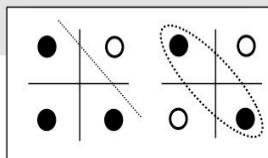
F. Rosenblatt B. Widrow - M. Hoff



- Learnable Weights and Threshold



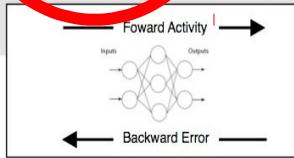
M. Minsky - S. Papert



- XOR Problem



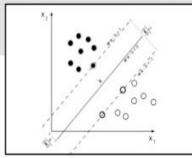
D. Rumelhart - G. Hinton - R. Williams



- Solution to nonlinearly separable problems
- Big computation, local optima and overfitting



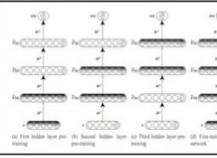
V. Vapnik - C. Cortes



- Limitations of learning prior knowledge
- Kernel function: Human Intervention

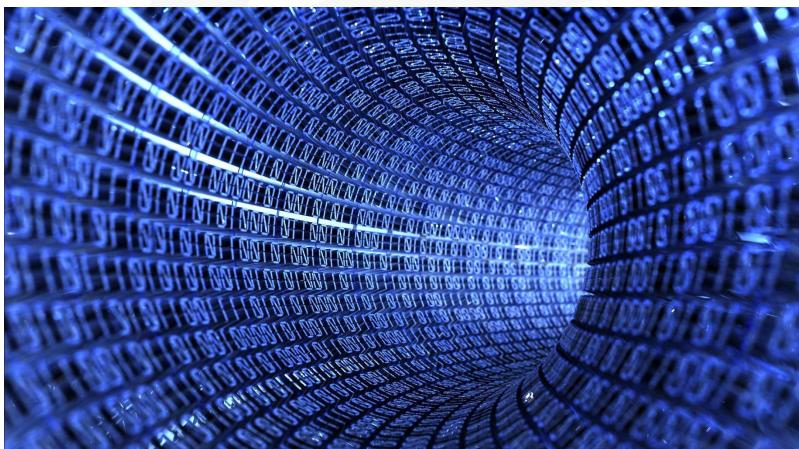


G. Hinton - S. Ruslan



- Hierarchical feature Learning

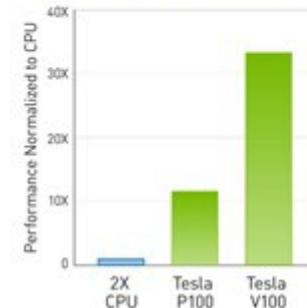
2. Data



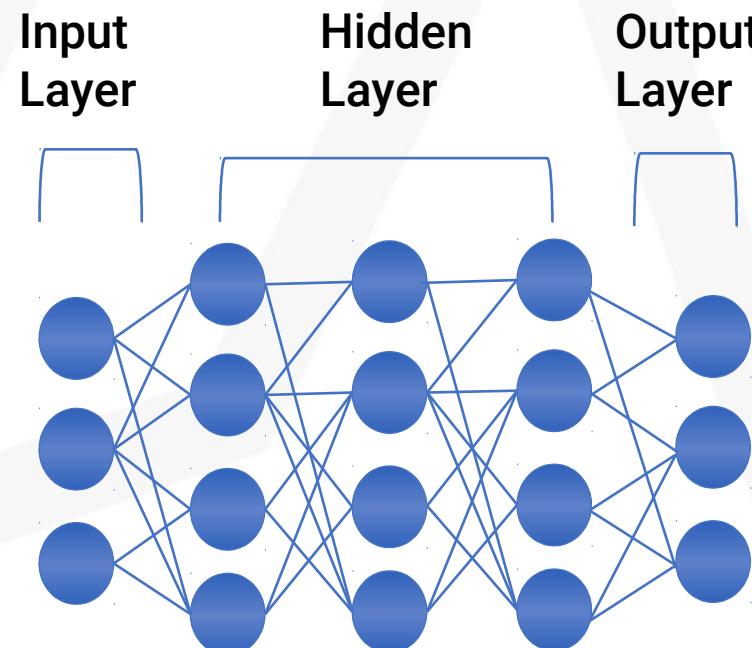
3. GPU

Nvidia Tesla V100 avec processeur GV100 :
21,1 milliards de transistors, 12 nm, 120 TFLOPS, 5376 coeurs, 815 mm²

30x Higher Throughput than CPU
Server on Deep Learning Inference



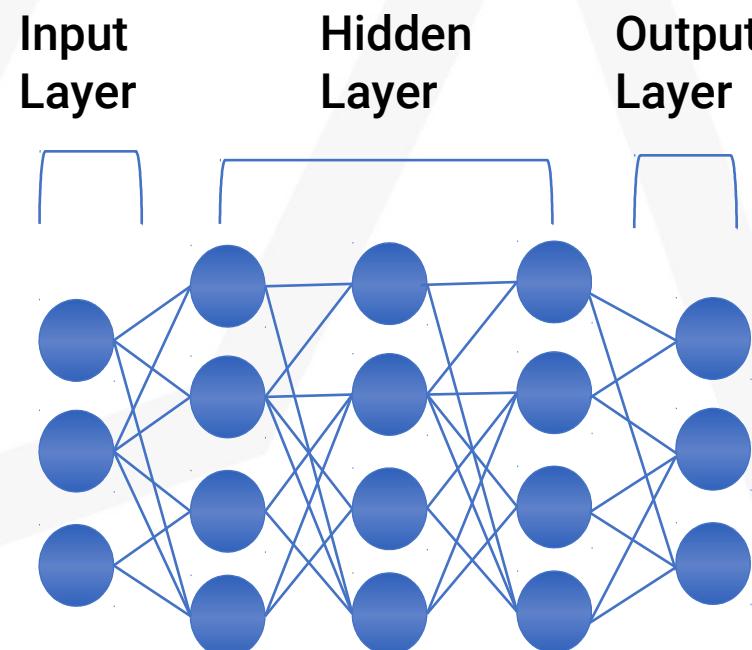
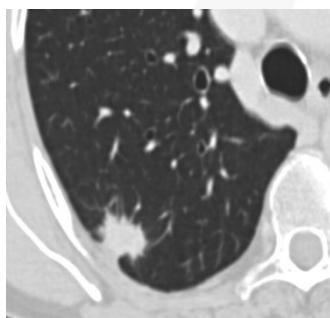
Deep Learning used as a Super Classifier



Siamois

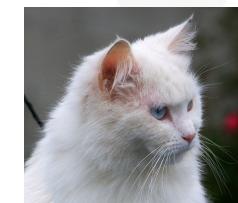
Angora  INCEPTO

Deep Learning used as a Super Classifier



No
lesion

lesion

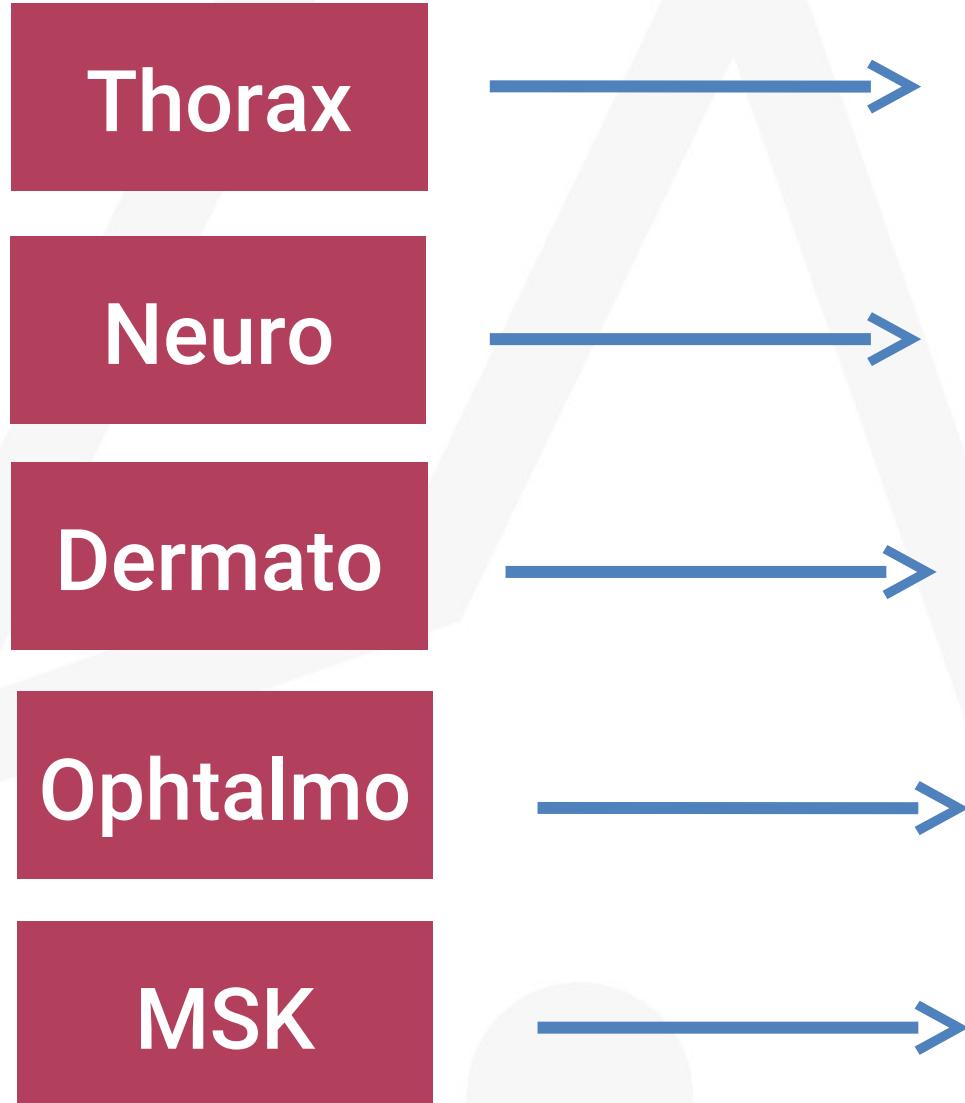


Benin



Malignant

Examples



Tuberculose

Lajhani et al. Radiology 2017

Deep Learning at Chest Radiography: Automated Classification of Pulmonary Tuberculosis by Using Convolutional Neural Networks¹

Purpose: To evaluate the efficacy of deep convolutional neural networks (DCNNs) for detecting tuberculosis (TB) on chest radiographs.

MicroBleed

Dou Q et al. Trans Med Imaging 2016



Melanoma

(Esteva A. Nature 2017)

Retinopathy

(Gulshan V et al, JAMA 2016)

Fracture

Olczac J et al. Acta orthopaedica 2017

...

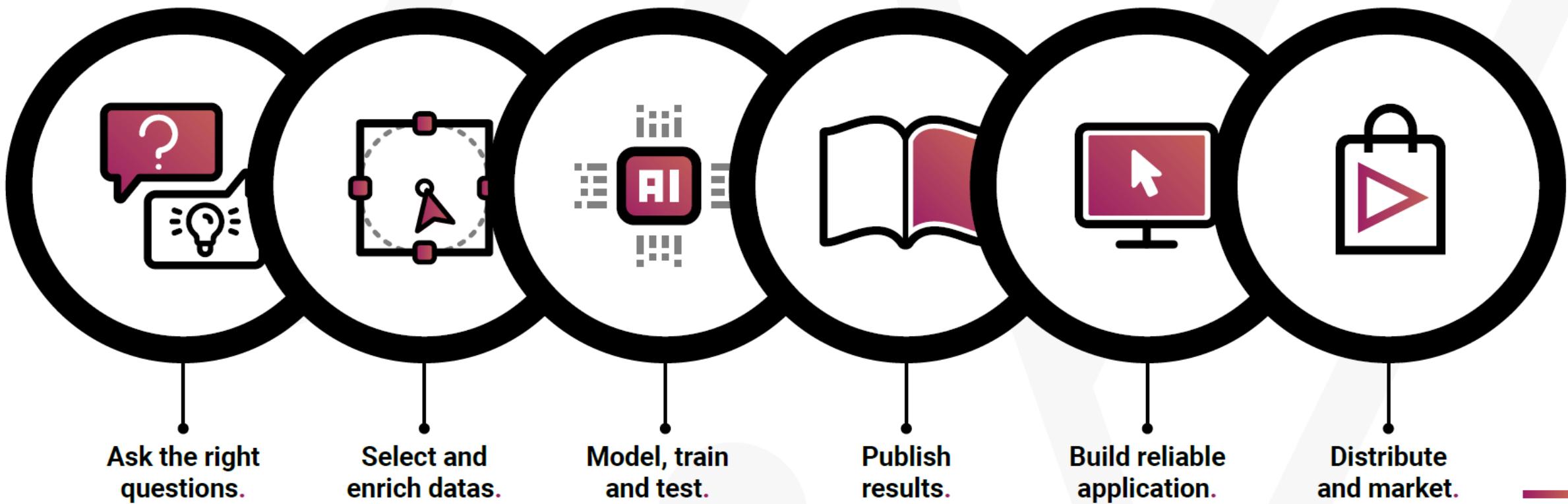
INCEPTO PREMIER

Co-creating deep learning application.



STEPS TOWARDS MEDICAL DEVICE

A proven flow.



Data Curation and Enrichment

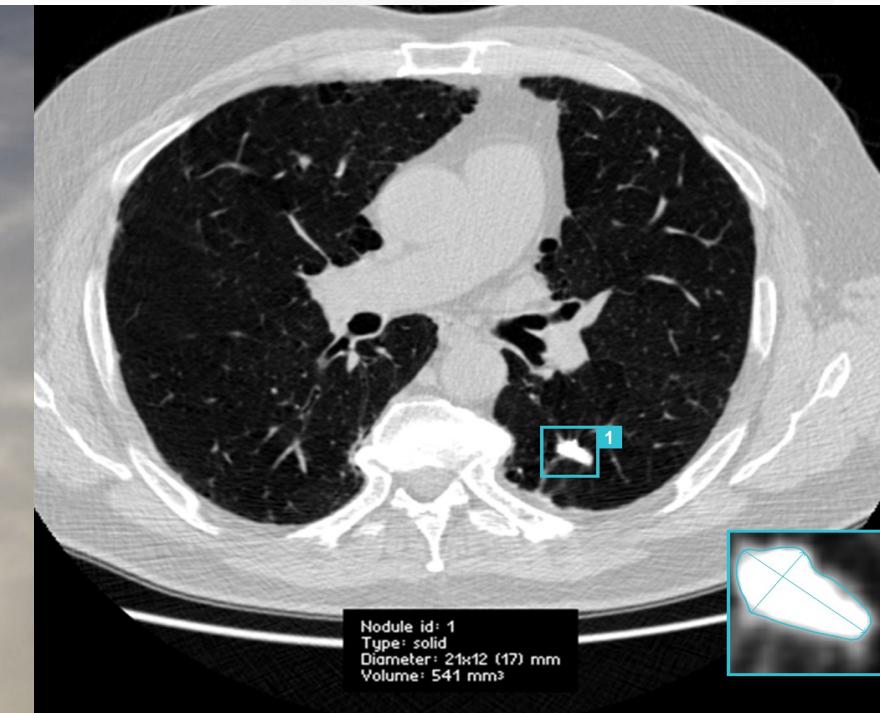
Data Collection



De-identification



Annotation





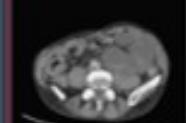
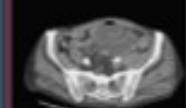
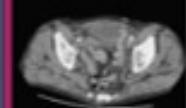
PID-BVoLRoqi9ed374e0m6cVj25RsHQEU_f46fsrKPXiH...

Temps Portal

Sex: M

Age: 62

I: 52



1.3
0.7 / 0.7
WW/WC: 400/40

No report found for this exam

PID-BVoLRoqi9ed374e0m6cVj25RsHQEU_f46fsrKPXiH...

Abdo Sans IV

Sex: M

Age: 62

I: 72



1.3
0.7 / 0.7
WW/WC: 400/40

Occlusion intestinale mécanique

Examen éligible Oui

Zone de transition

Occlusion Non

Signes d'ischémie

Infiltration mésentérique diffuse

Défaut de rehaussement des anses

Rejected New Ongoing Done

Natural Language Processing on reports

Indication:

Traumatisme à ski en valgus/rotation externe du genou droit.

Suspicion d'atteinte du ligament latéral interne et du ligament croisé antérieur du genou droit.

Résultat:

Os et cartilage : chondropathie de grade II des deux versants de la patella, plus marquée sur le versant interne. Chondropathie focalement de grade IV de la marge postérieure du plateau tibial externe, avec œdème médullaire sous-chondral.

Ménisques : déchirure oblique à l'insertion de la corne postérieure du ménisque interne.

Ligaments croisés : intacts.

Ligaments latéraux : intacts.

Tendons : sans altération.

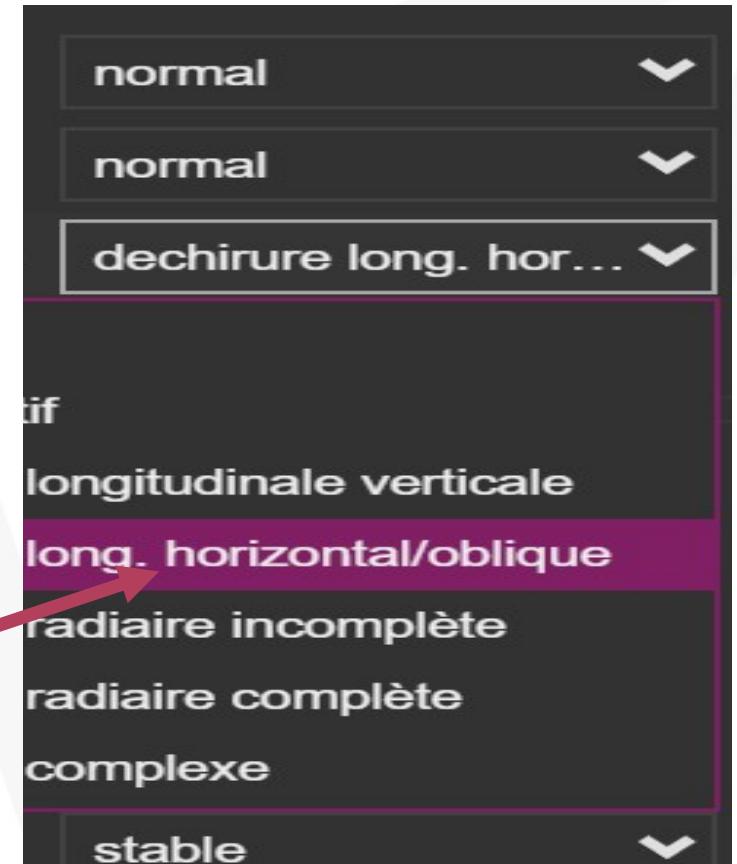
Parties molles : sans altération.

Synoviale : pas d'épanchement significatif. Kyste de Baker mesurant 16 x 10 x 31 mm de diamètre.

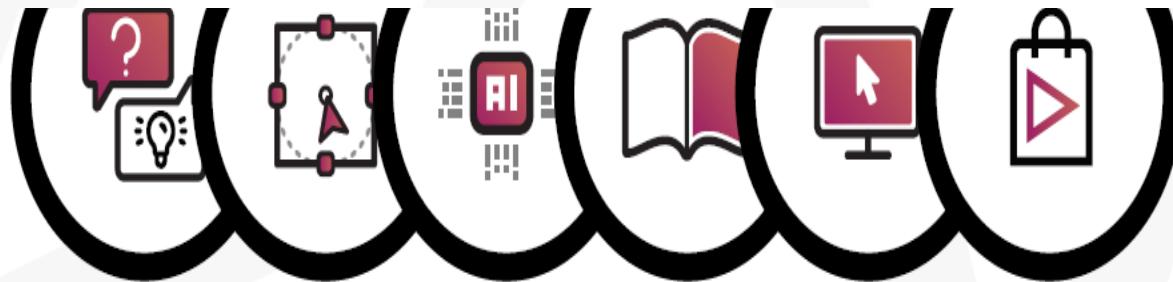
Conclusion:

IRM du genou montrant :

- l'absence de déchirure ligamentaire
- une déchirure oblique à l'insertion de la corne postérieure du ménisque interne,
- une chondropathie de grade II des deux versants de la patella, plus marquée sur le versant interne,
- une chondropathie focalement de grade IV de la marge postérieure du plateau tibial externe,
- un kyste de Baker.



Co-creating deep learning application



Incepto Premier
powered by **DeepFlow**

- Simple Contract
- Co-investment
- Clinical partner owns annotated data set
- Incepto owns AI model
- Incepto give back royalties on generated revenues



INCEPTO

**Doing it
Together.**

