Deep learning for aerospace applications

Alexandre Boulch

2017

Deep Learning

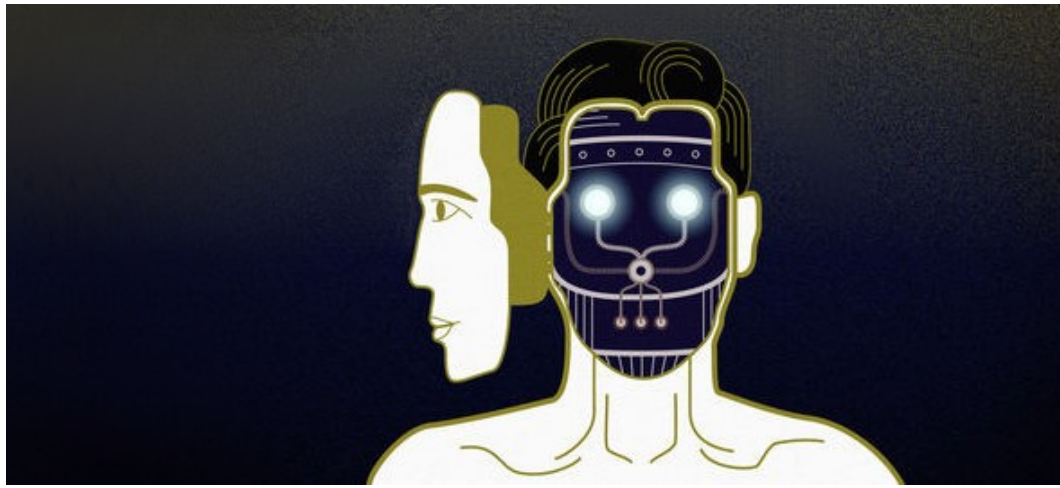
Lee Sedol 2015/10
Ke Jie 2017/05

2017

Deep Learning

Personal assistant

Personalised learning
Recommendations
Réponse automatique



Deep learning and Big data for cardiology

2017

Deep Learning

GM

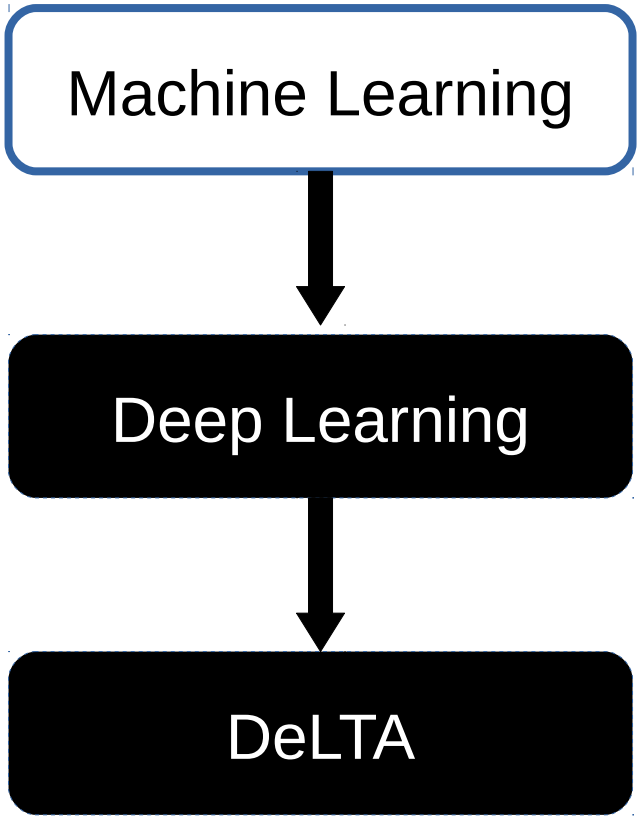
RENAULT NISSAN

PSA PEUGEOT CITROËN

2017

ONERA
THE FRENCH AEROSPACE LAB

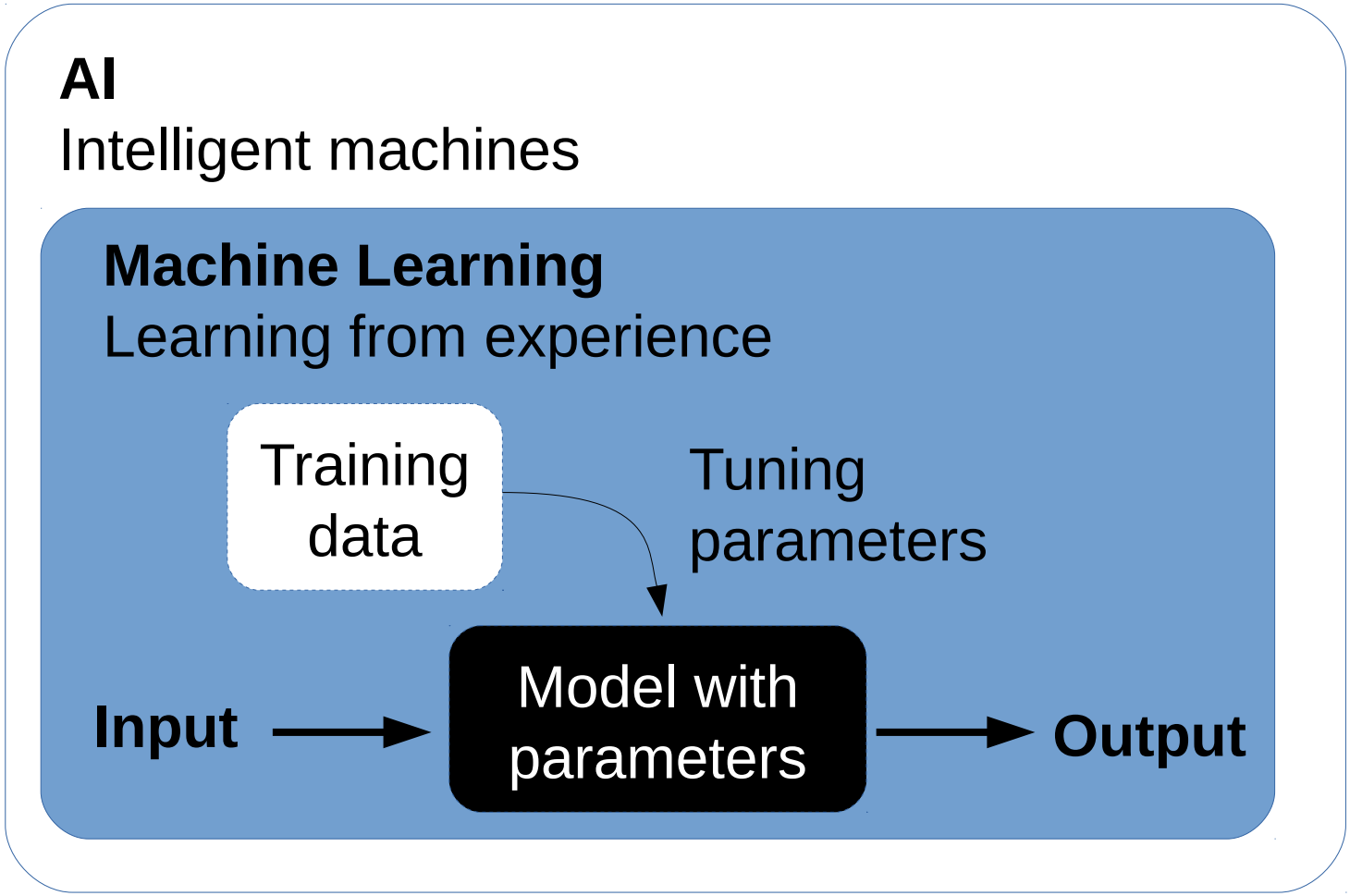
Overview



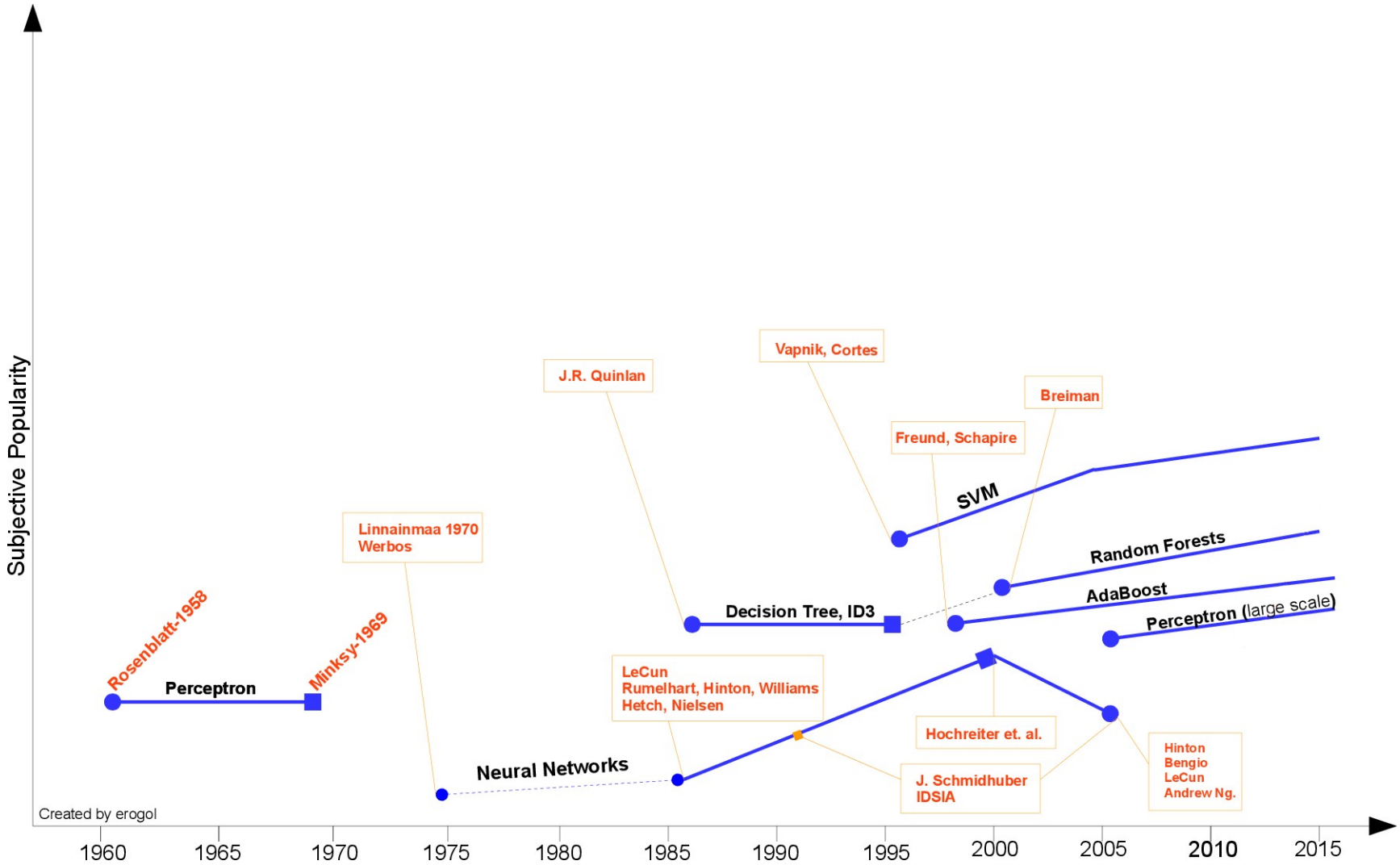
AI

The science and engineering of making intelligent machines.

Logical, search, pattern recognition, planning, inference, learning from experience...

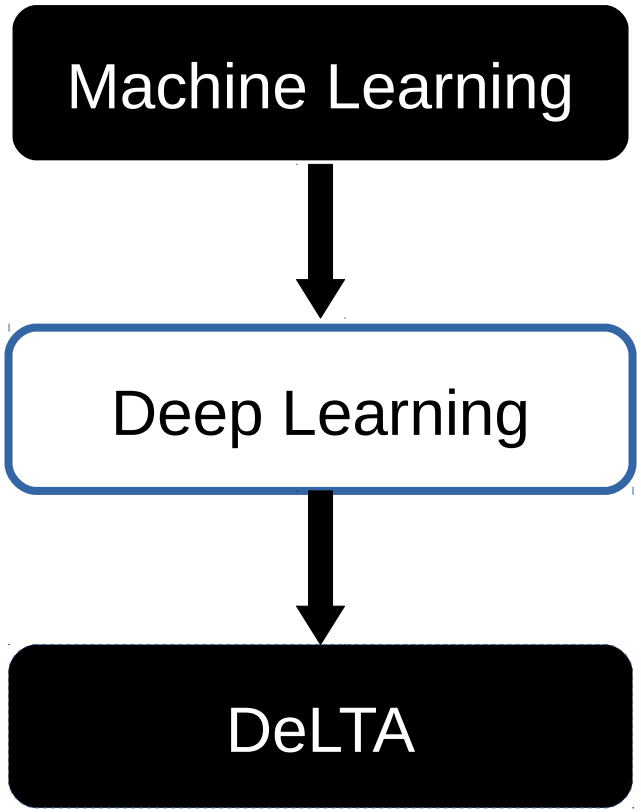

AI
Intelligent machines
Machine Learning
Learning from experience
Training data
Tuning parameters
Input
Model with parameters
Output

Machine learning starts in the 60's

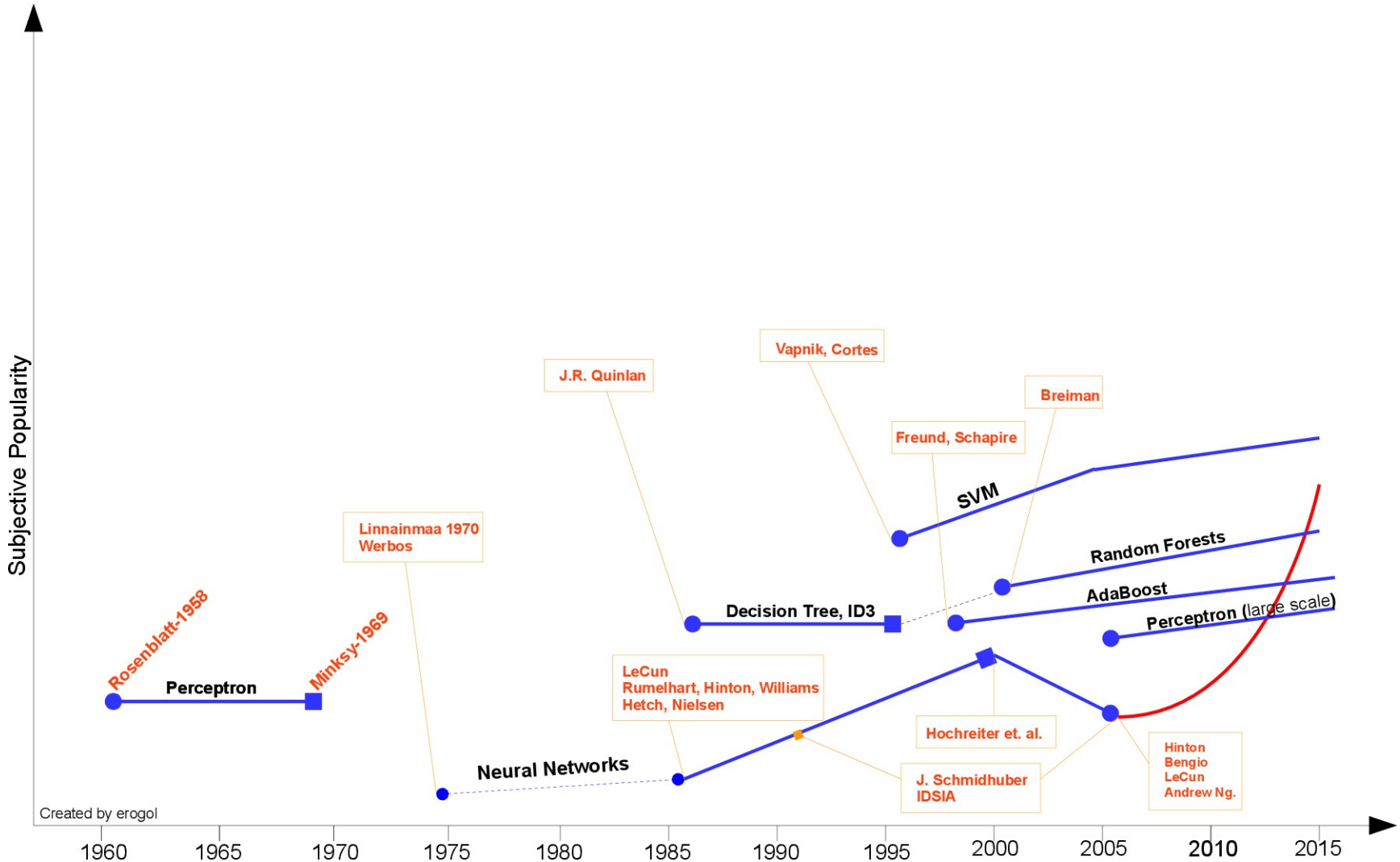


2017

Overview

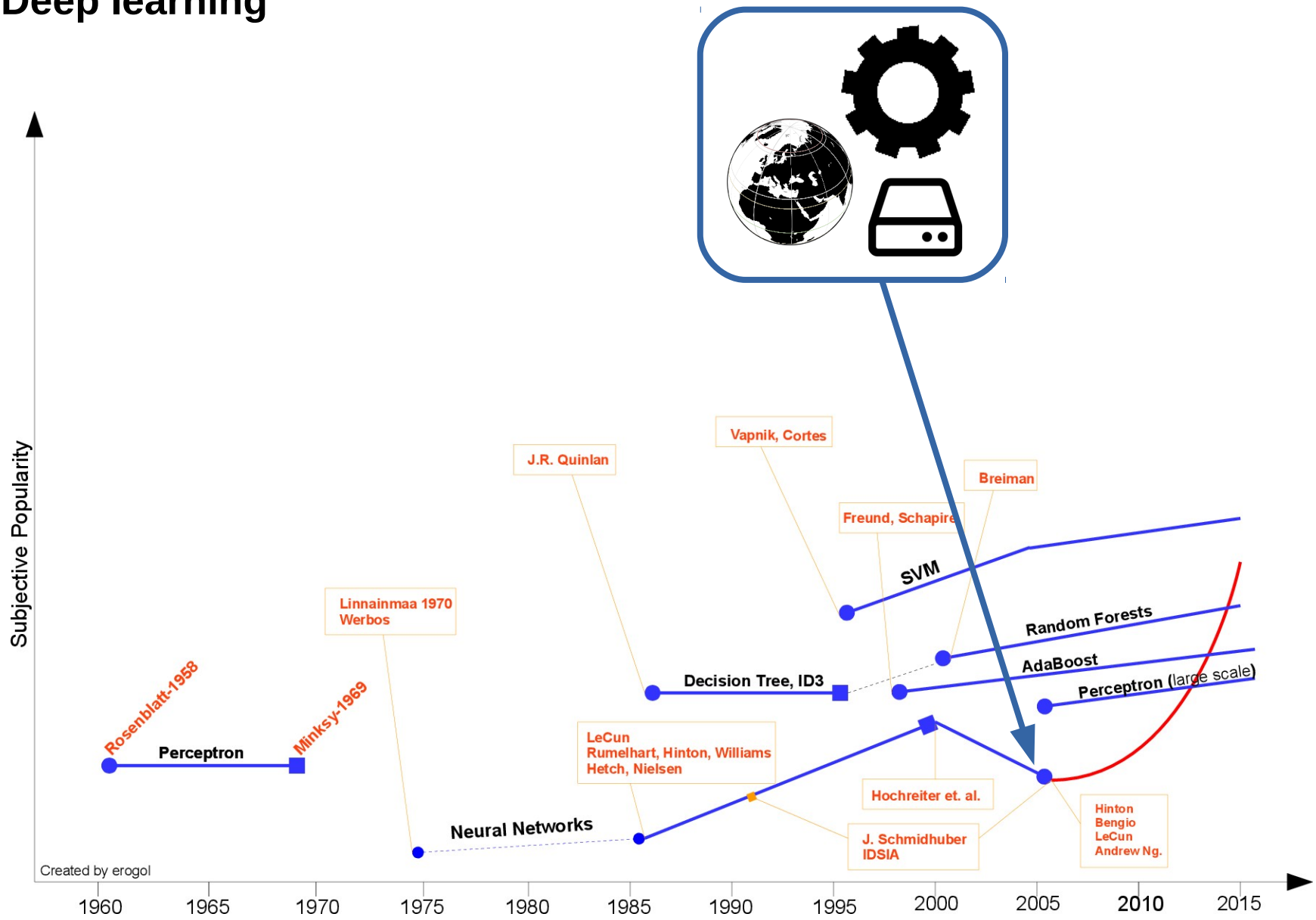


Deep learning



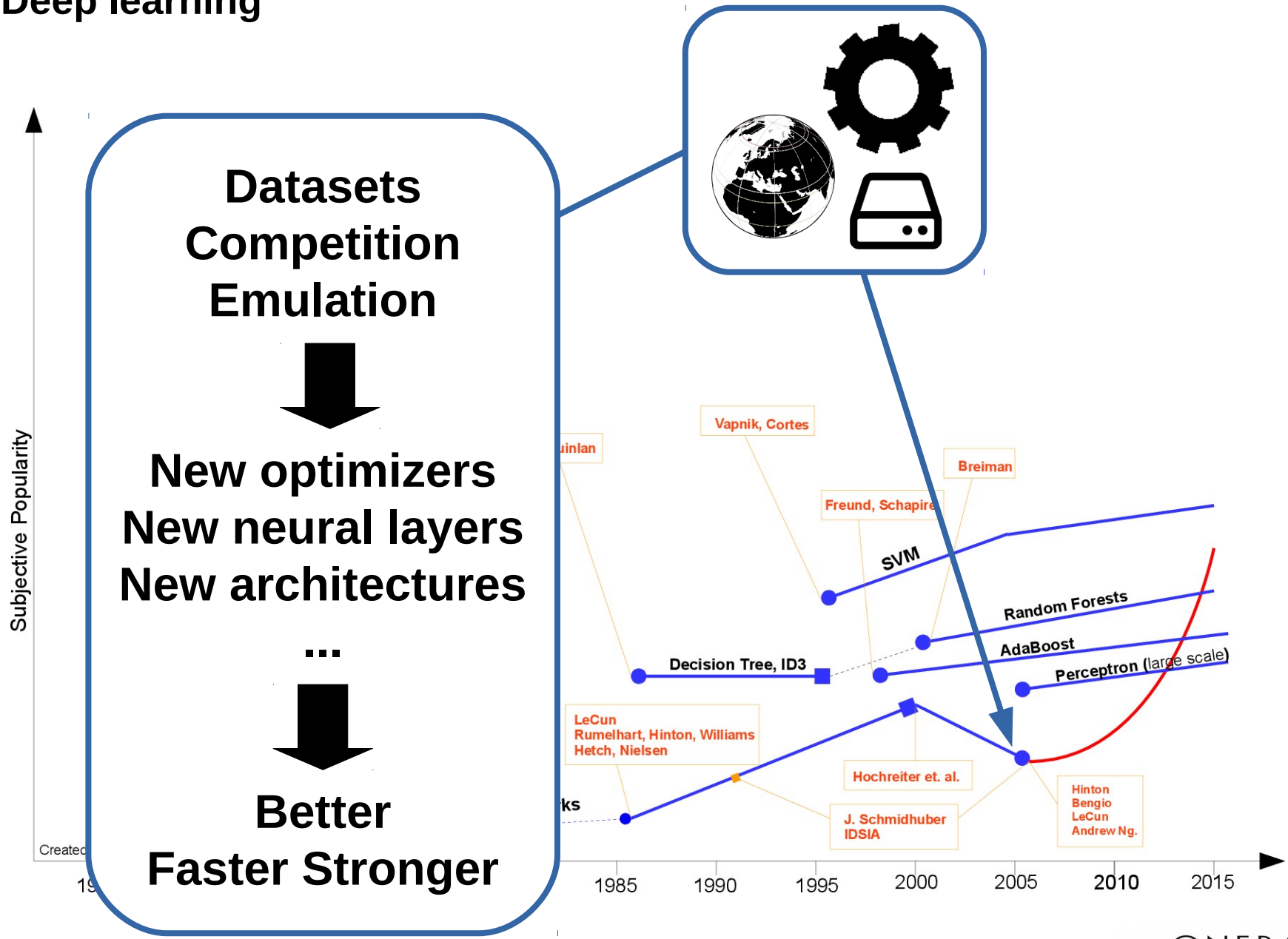
2017

Deep learning



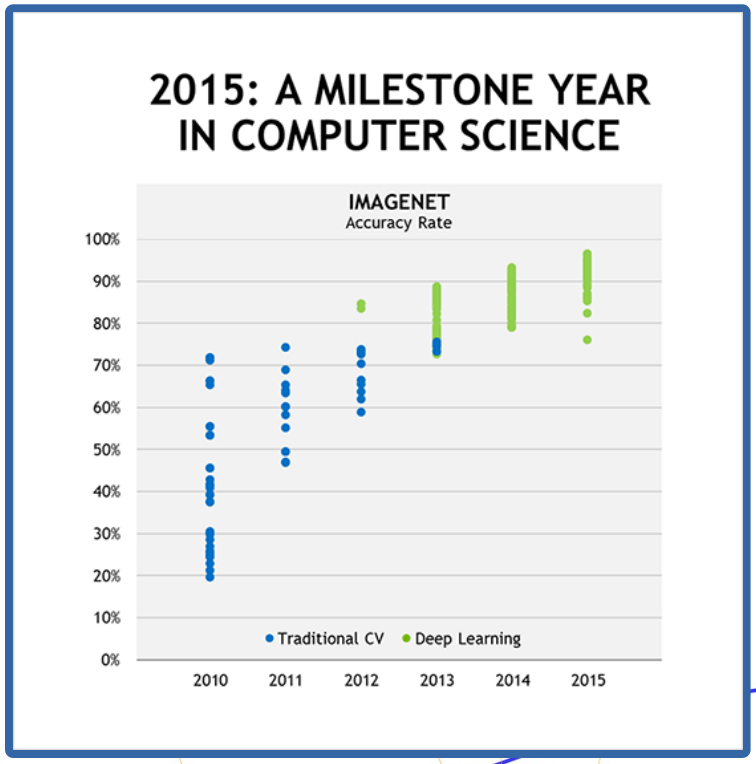
2017

Deep learning



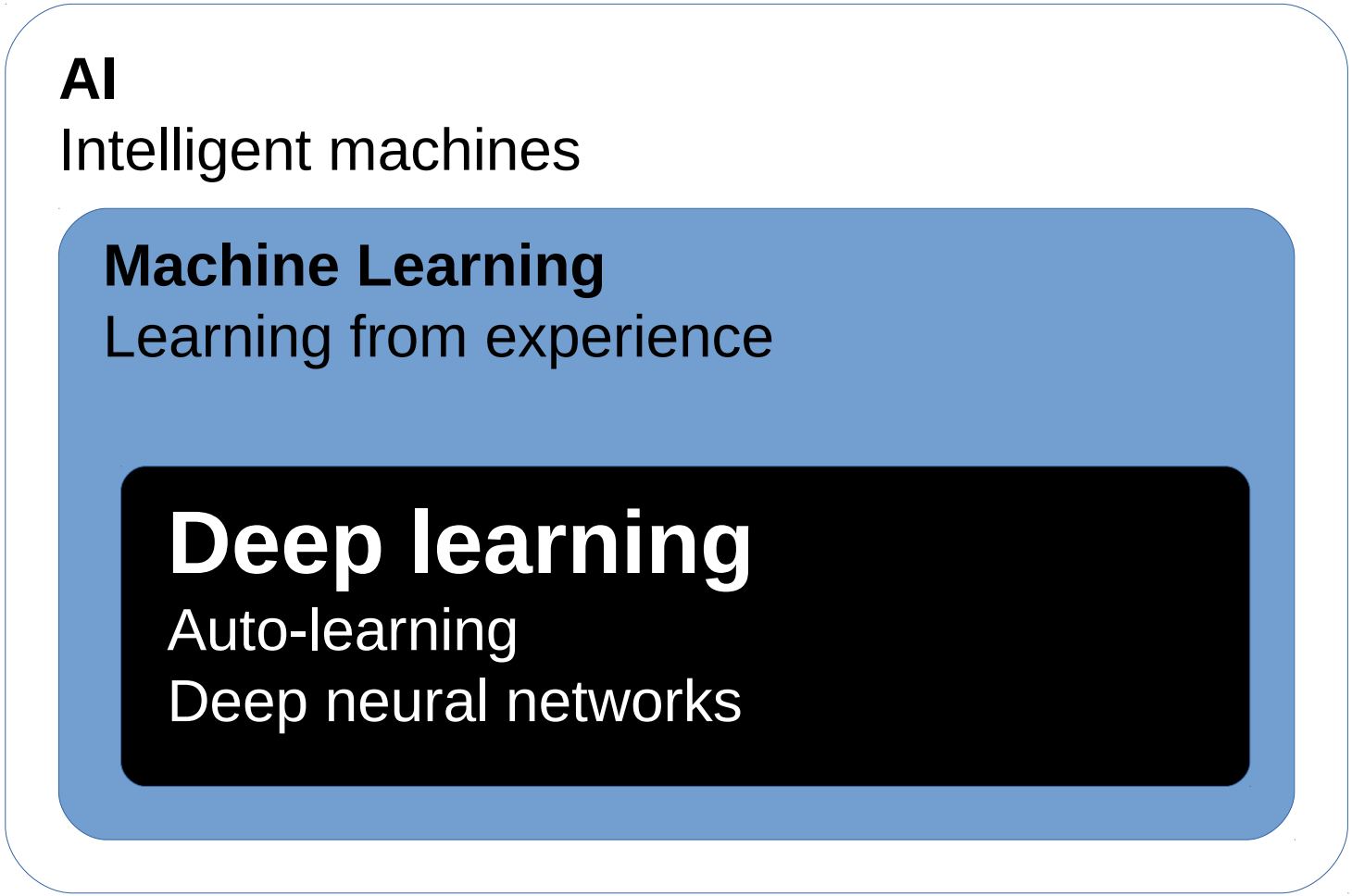
2017

Deep learning



2017

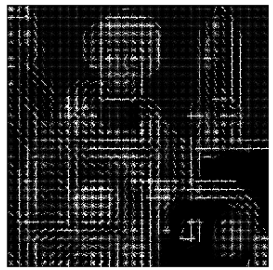
Deep learning

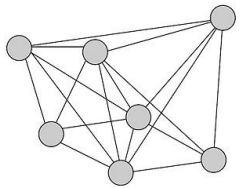


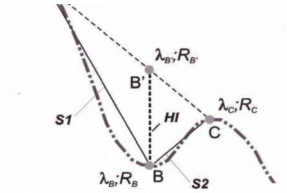
Deep learning

Data

Feature extraction







Knowledge about data and application

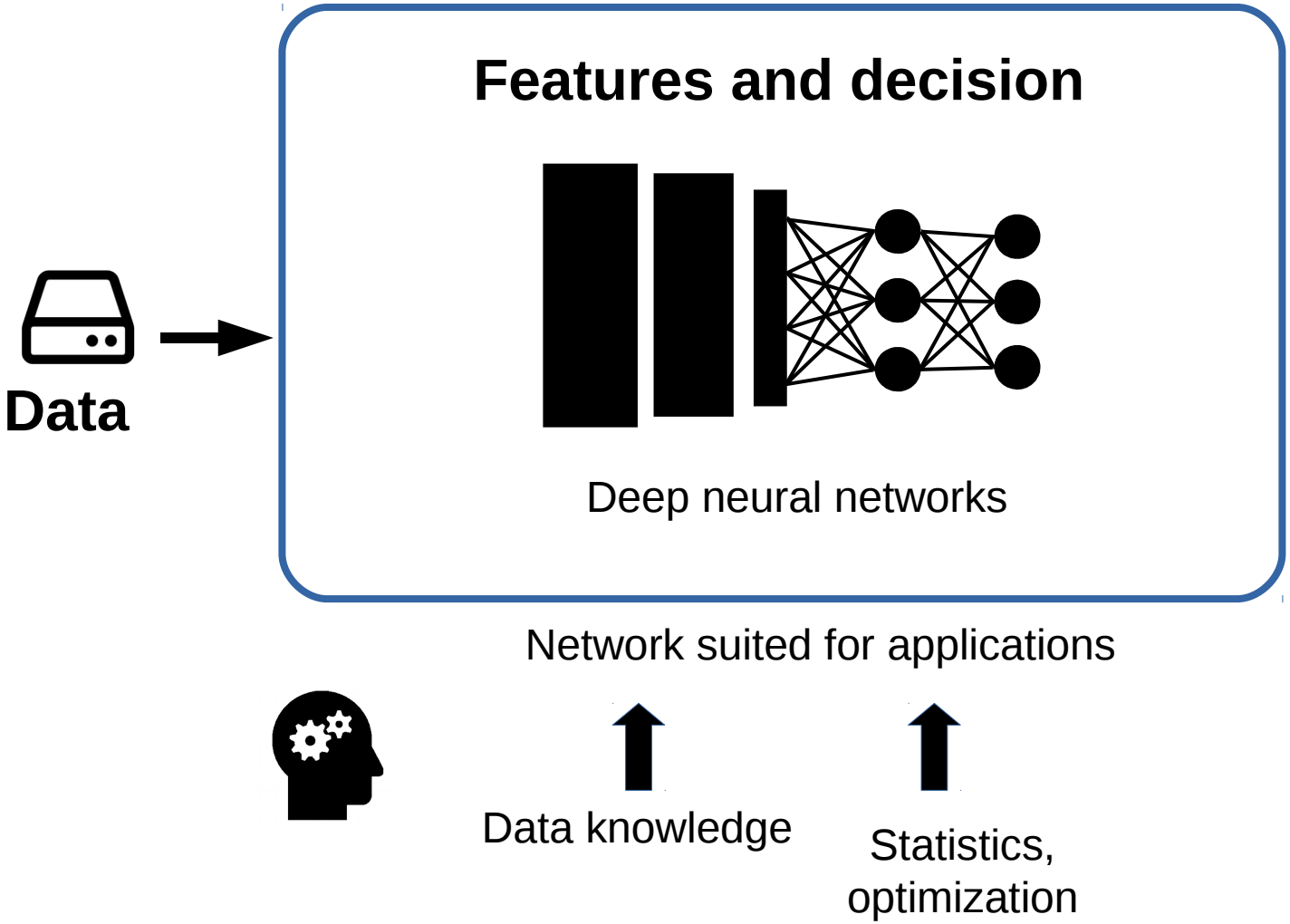
Decision

Expert

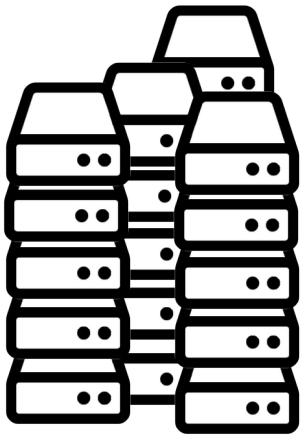
Machine learning

Knowledge about statistics

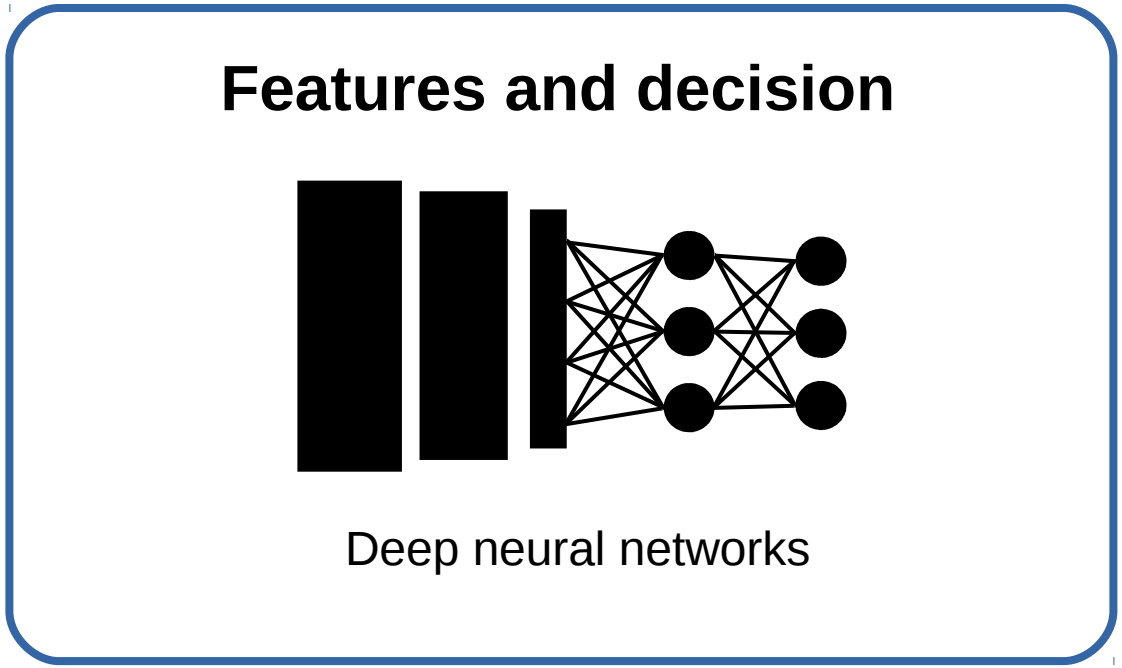
Deep learning: a massively data driven approach



Deep learning: a massively data driven approach



Data

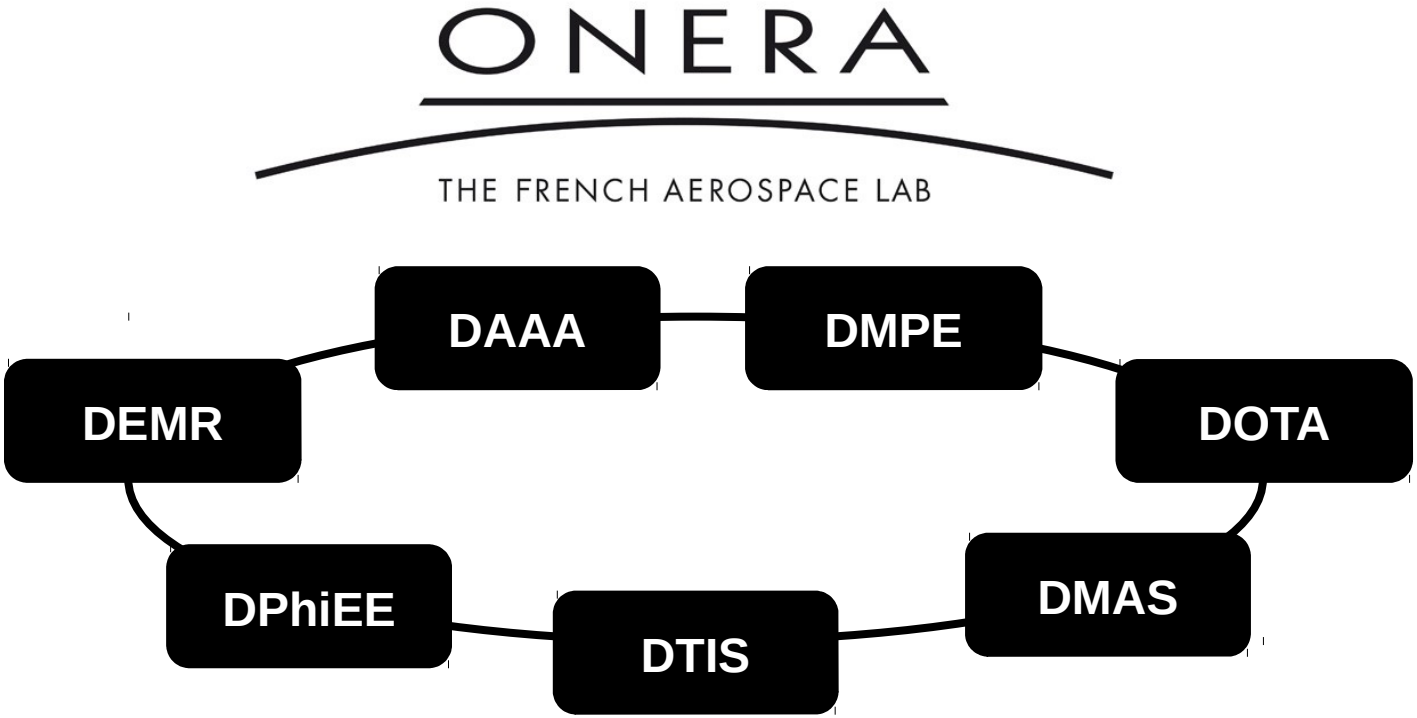


Network suited for applications

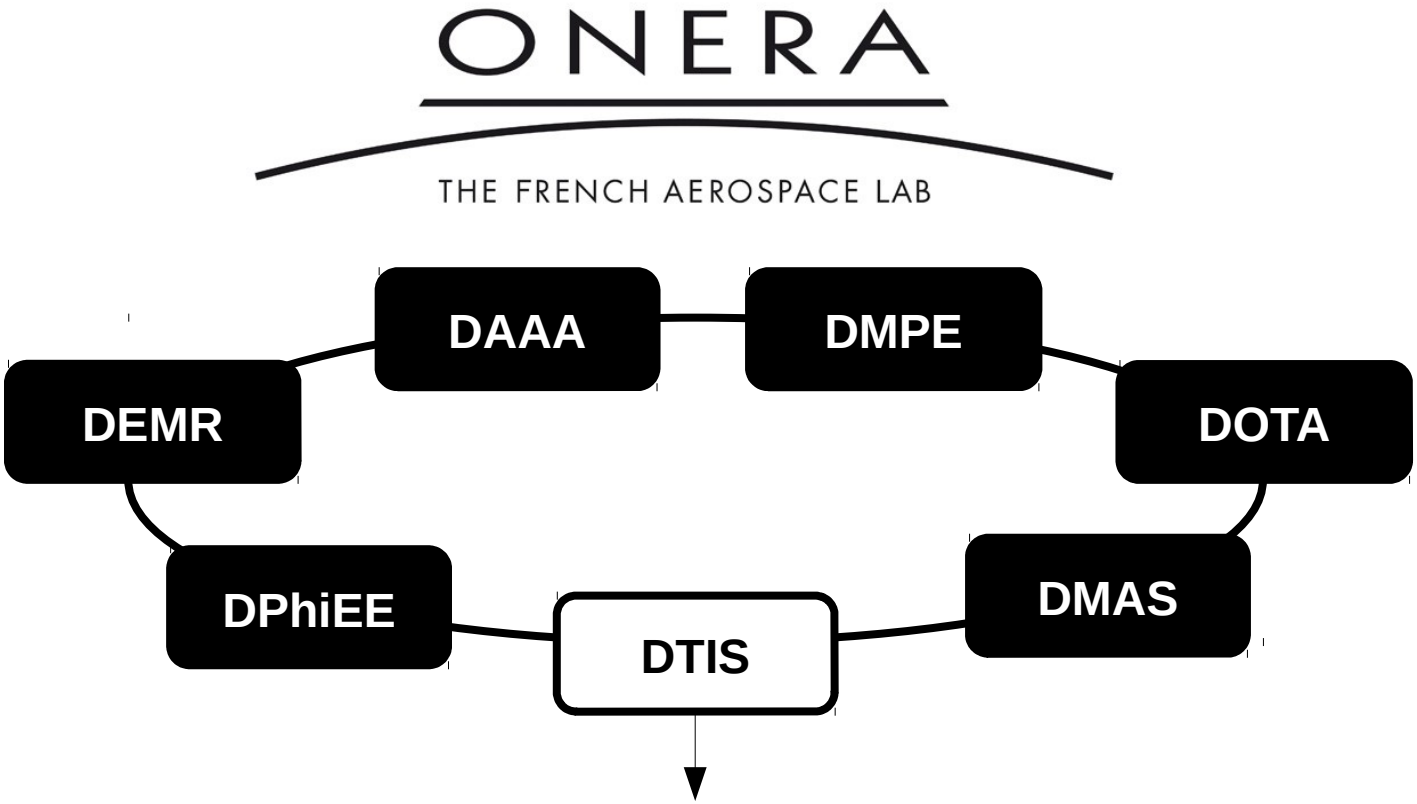
Data knowledge

Statistics,
optimization

Machine learning at ONERA



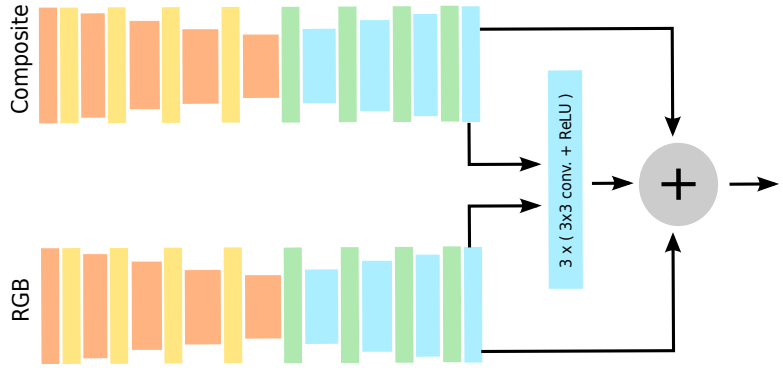
Deep learning at ONERA

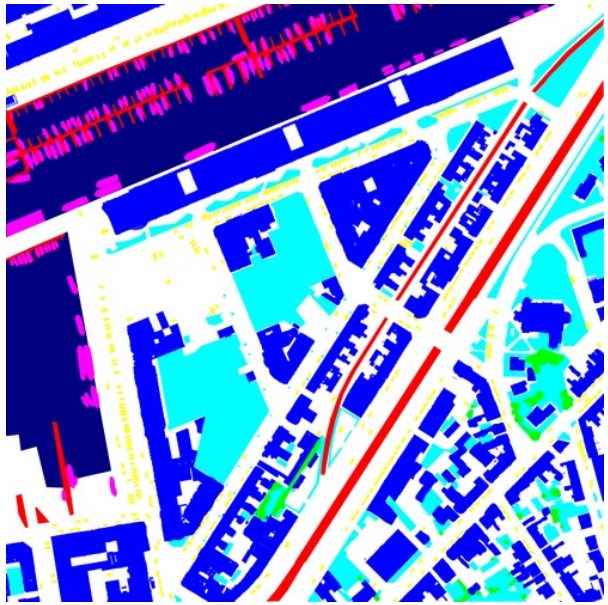


A. Chan-Hon-Tong, S. Herbin, B. Le Saux, A. Boulch ...

2017

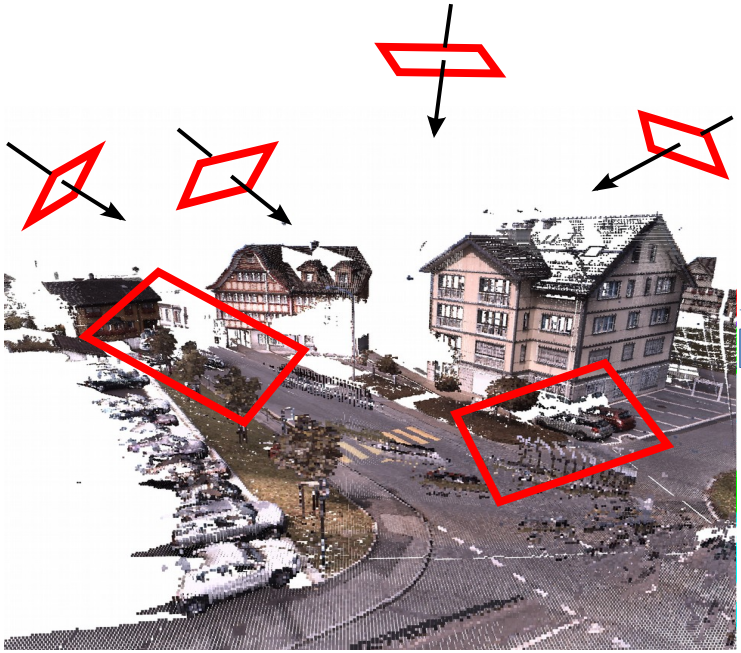
Semantic Map labeling

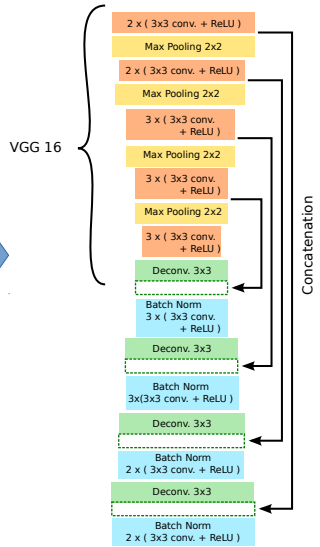


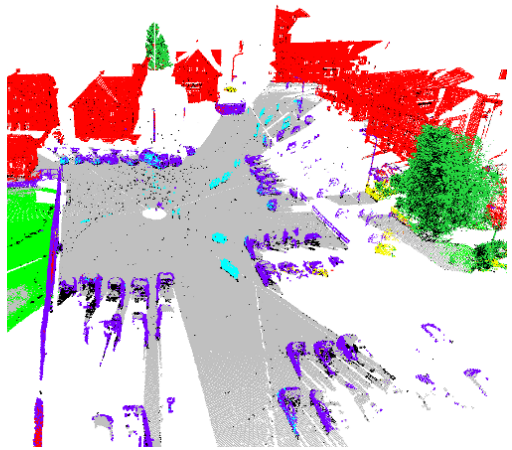


Aerial images, multimodal (RGB, IR, DSM, ...)
Fusion networks
PhD Nicolas Audebert (nicolas.audebert.at)

Point cloud labeling







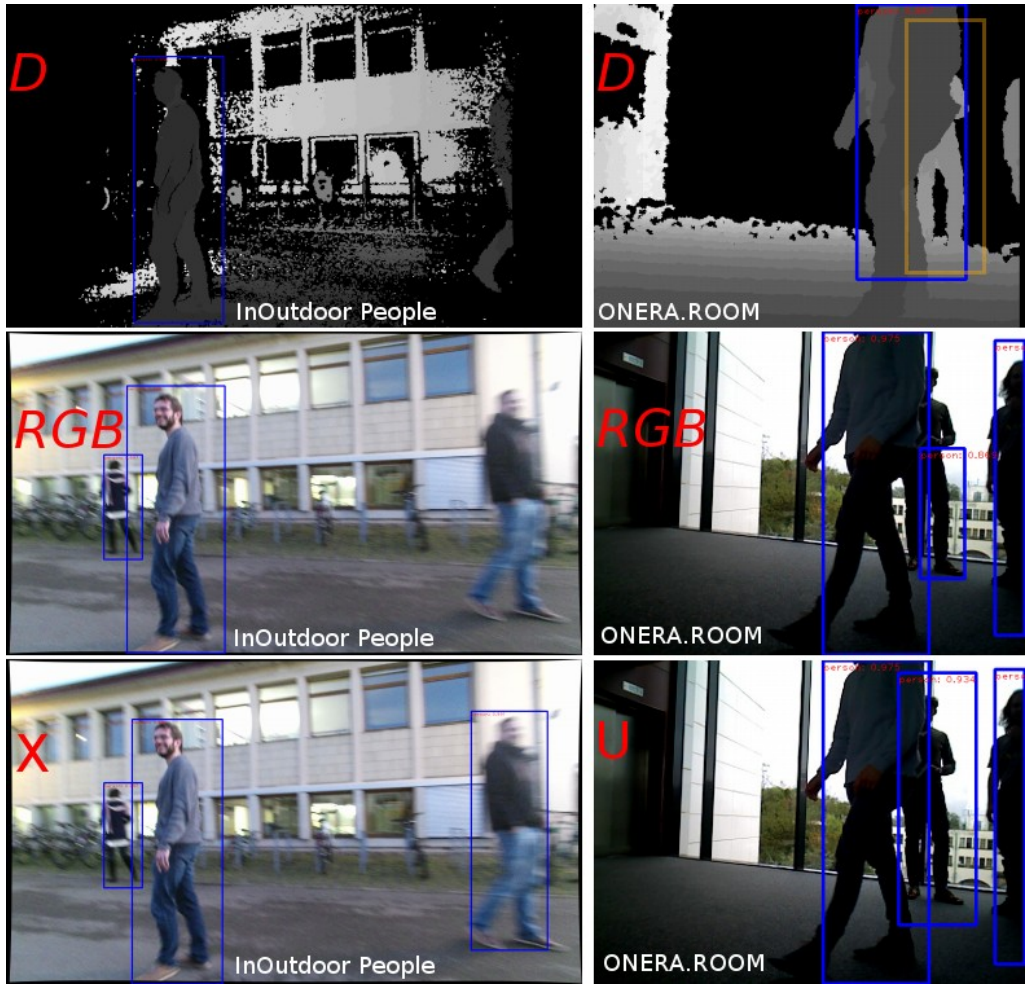
Leader on Semantic 8 LIDAR dataset
Transfer to photogrammetry
Code available online (DeLTA website)

2017

Detection

RGB and Depth for person detection improvment

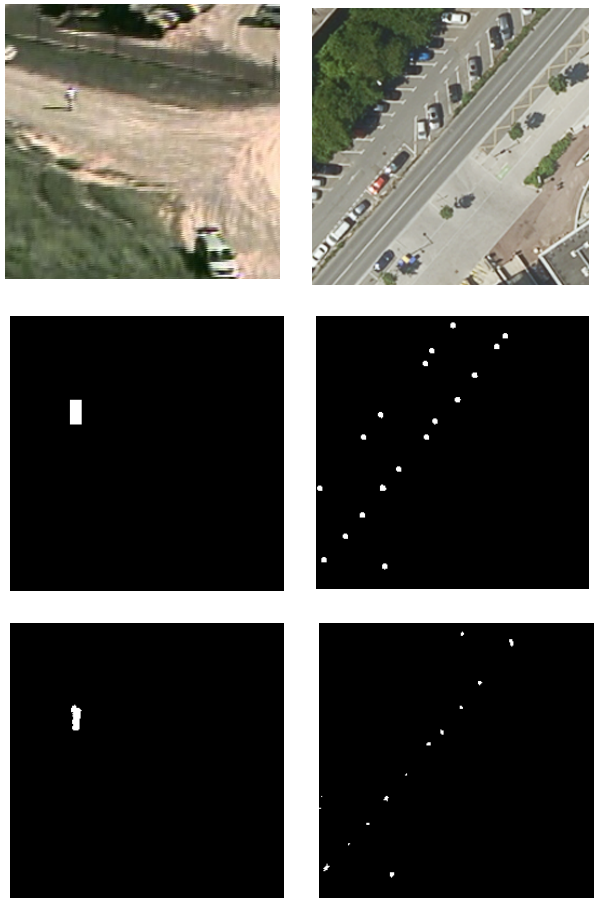
PhD Joris Guery
jorisguerry.fr



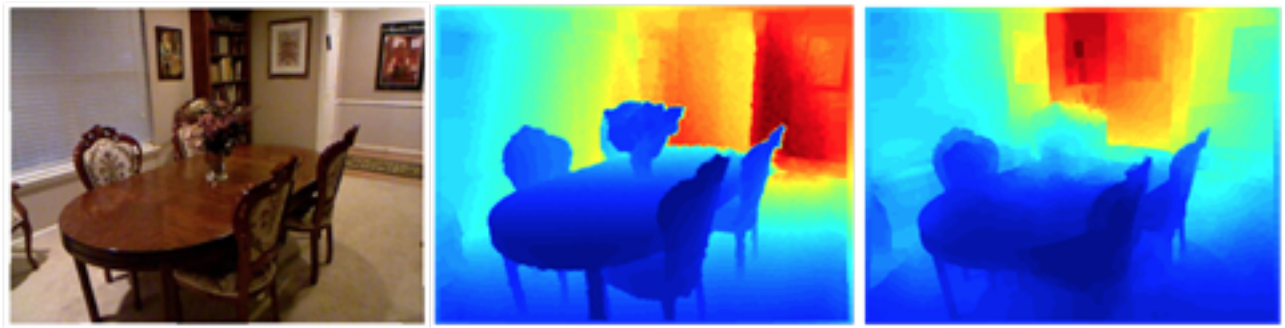
Detection

Detection in low resolution
Images
Exploitation of images
Sequences for detection

Juliette Chataigner (Intern)



Depth from defocus



Sensor specific processing Depth from de focus.
PhD Macella Carvalho

Zero Shot Learning

American Goldfinch

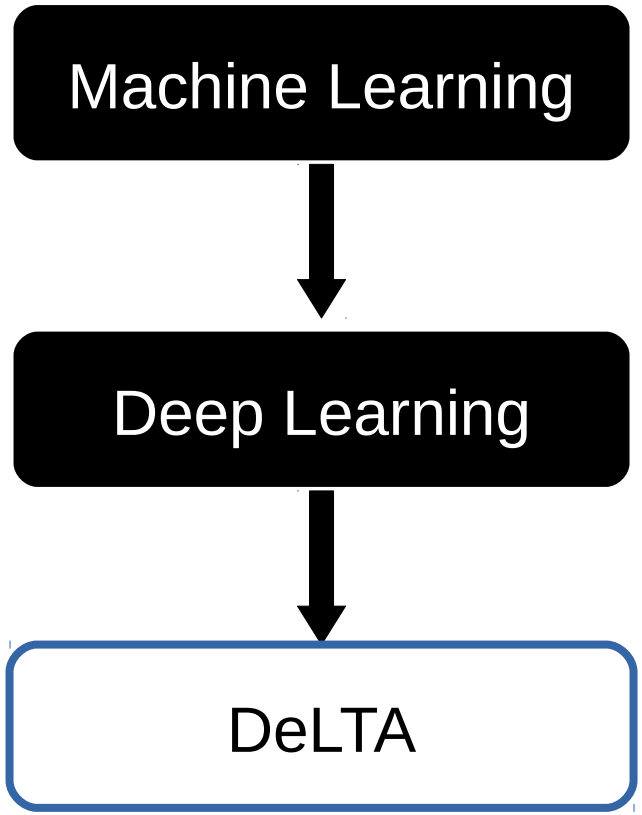
Intuitive!

Attribute	Has?
Beak longer than head	✗
Solid yellow belly	✓
Black and white wings	✓
⋮	⋮

Zero-Shot Learning via Visual Abstraction
Stanislaw Antol, Larry Zitnick, Devi Parikh

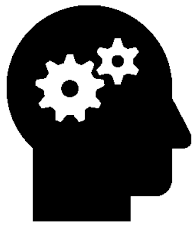
Zero Shot Learning
Learning based on attributes
PhD Maxime Bucher

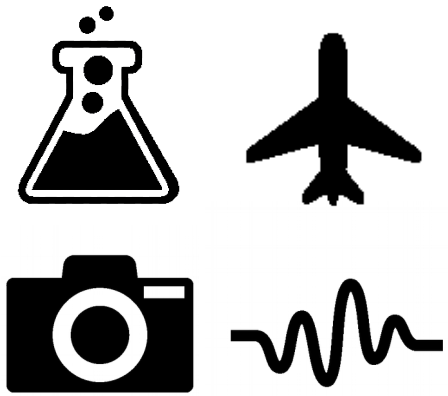
Overview

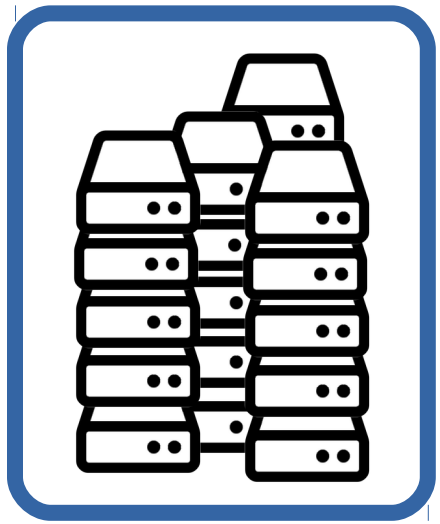


Deep learning for aerospace ⇒ ONERA

ONERA
THE FRENCH AEROSPACE LAB







2017

Deep learning for aerospace ⇒ ONERA

Frameworks

ONERA
THE FRENCH AEROSPACE LAB

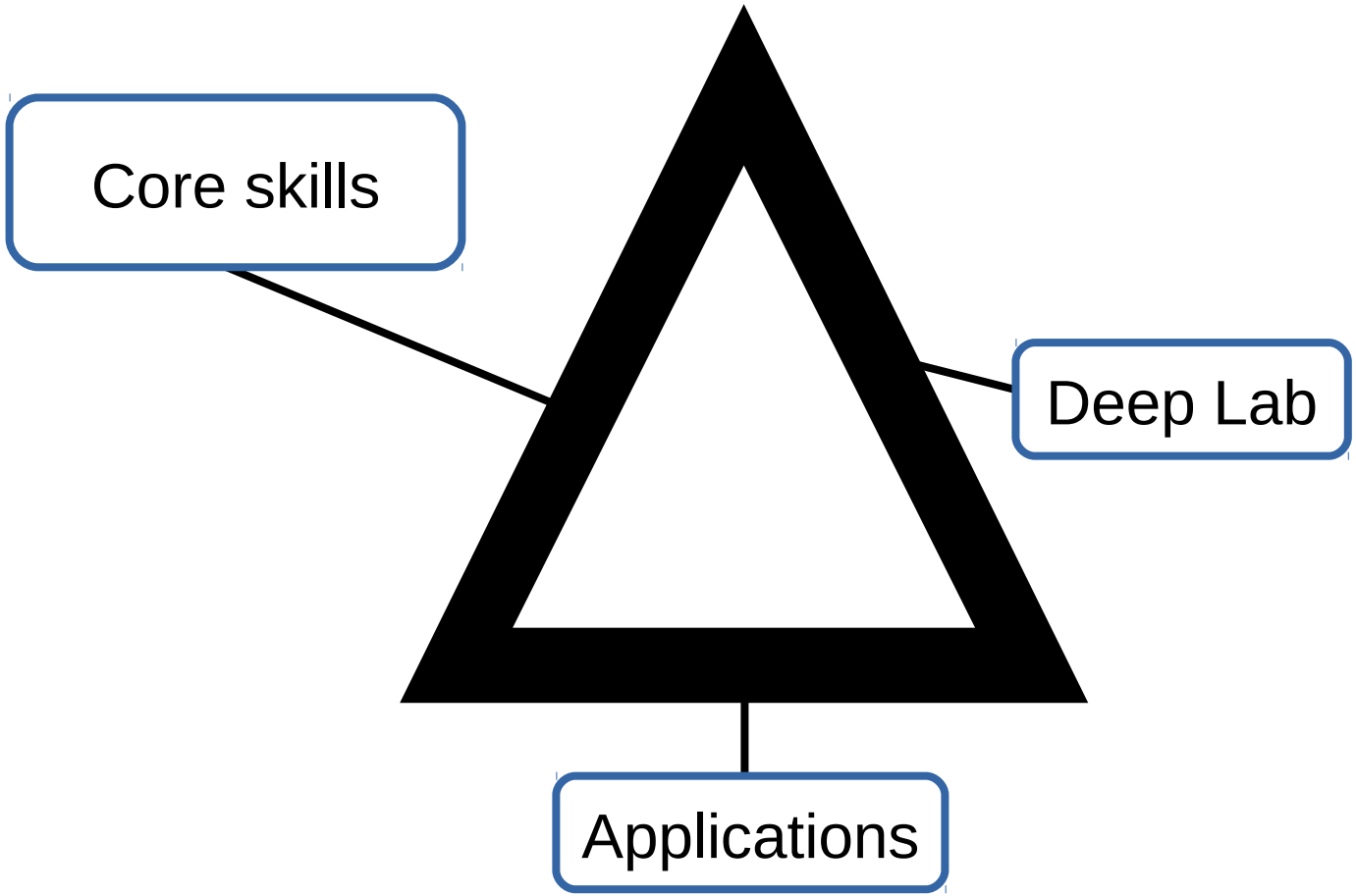
Data

R&D for aerospace and defense

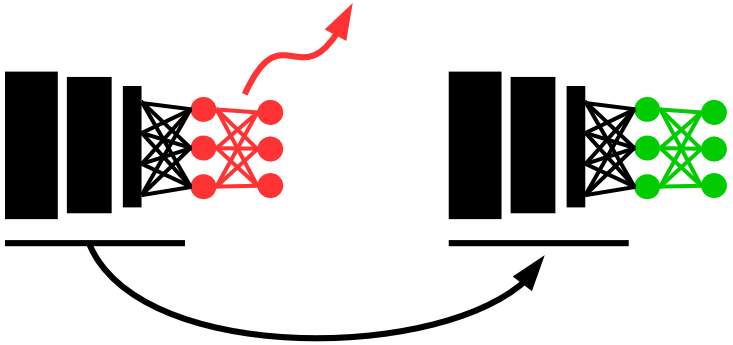
Development

2017

LE PRF DeLTA

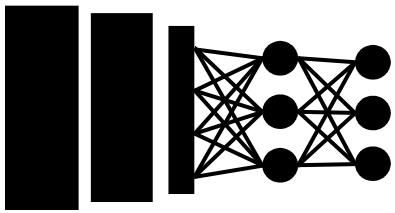


Databases



Domain adaptation

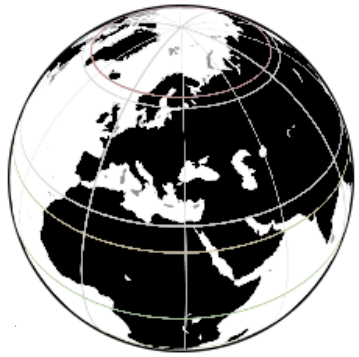
State of the art



New architectures

Core skills

LE PRF DeLTA



Academics and industrials

Improve ONERA research exposure

Tutorials

Networks

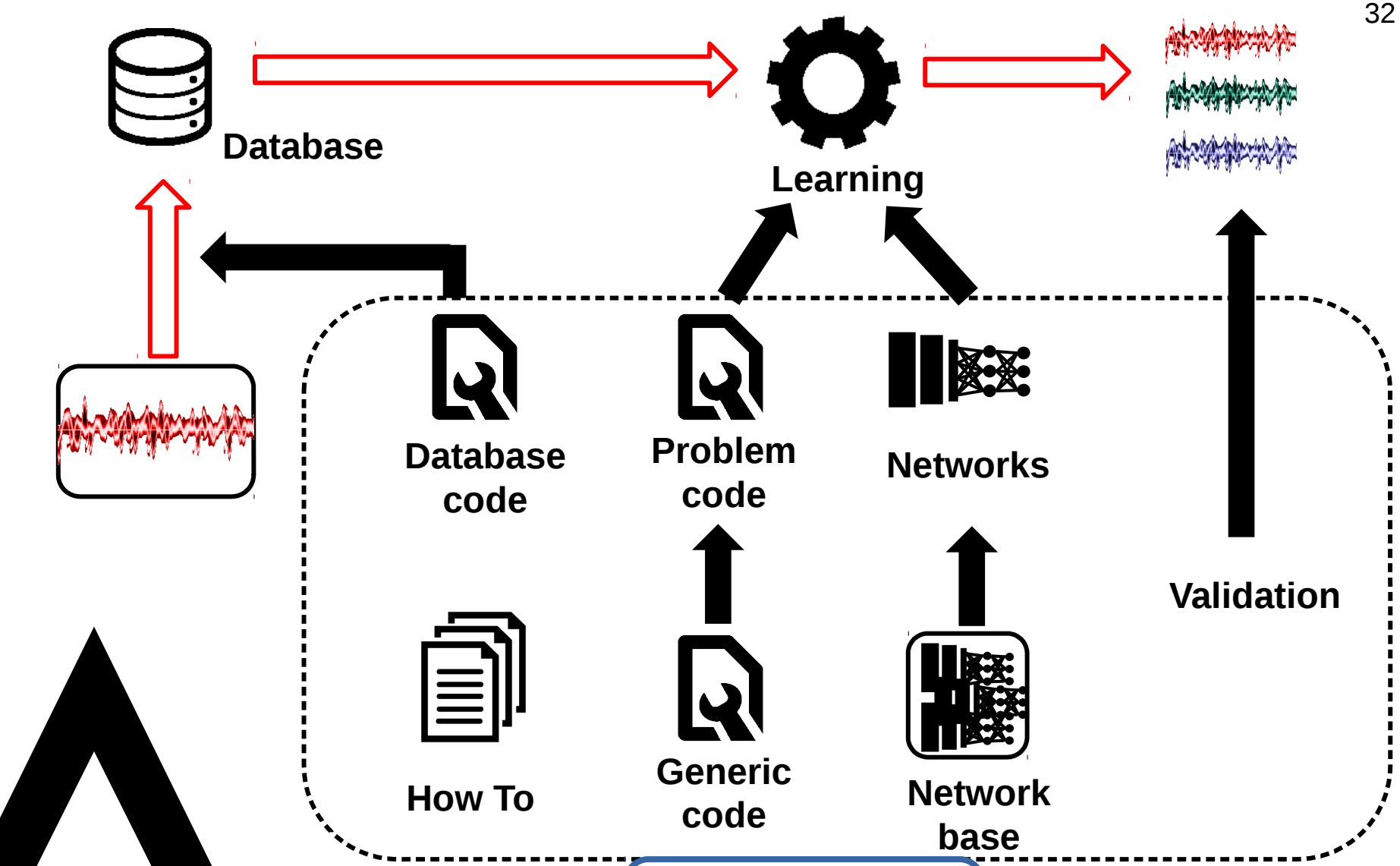
Code

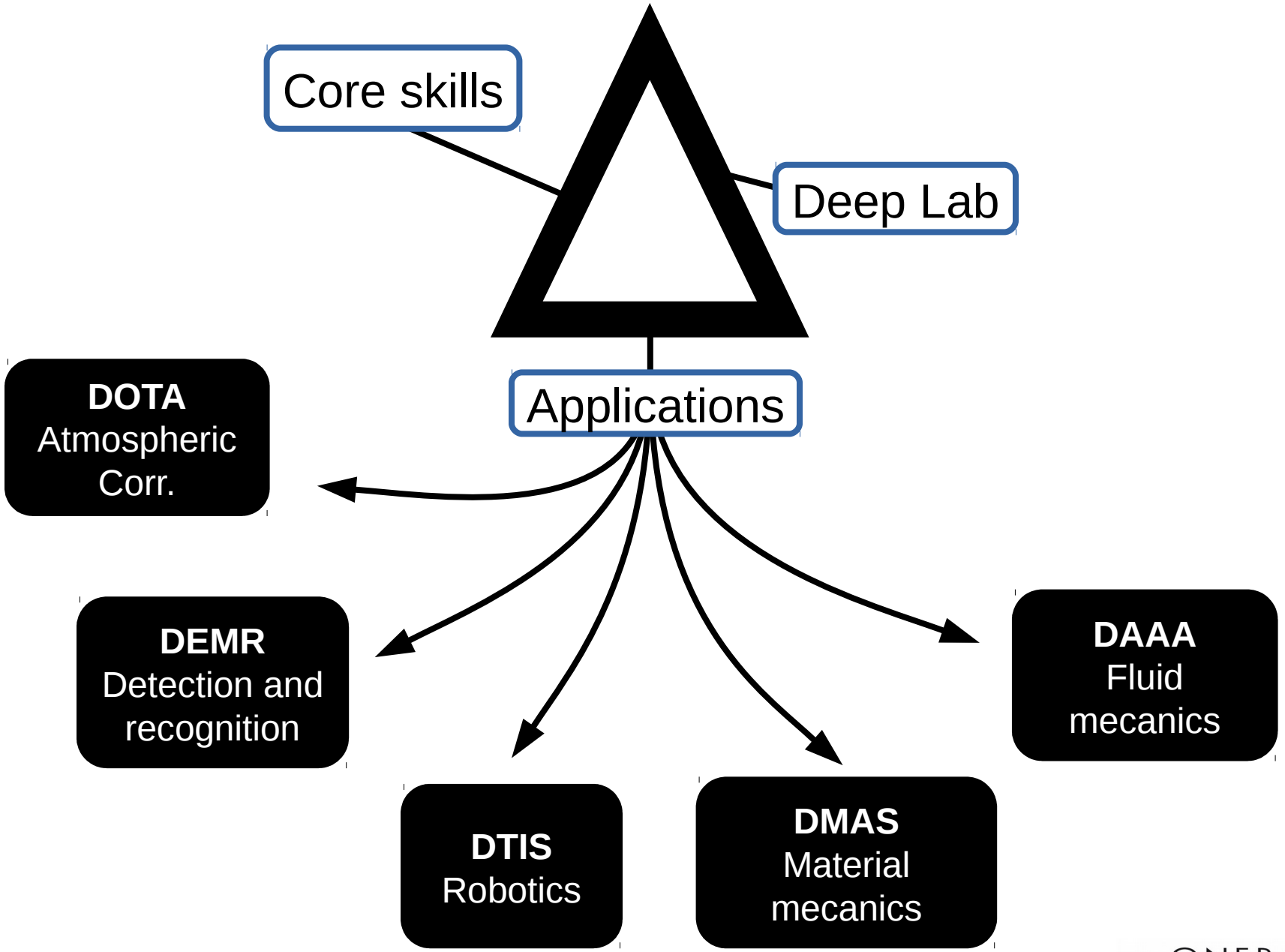
Datasets

Results

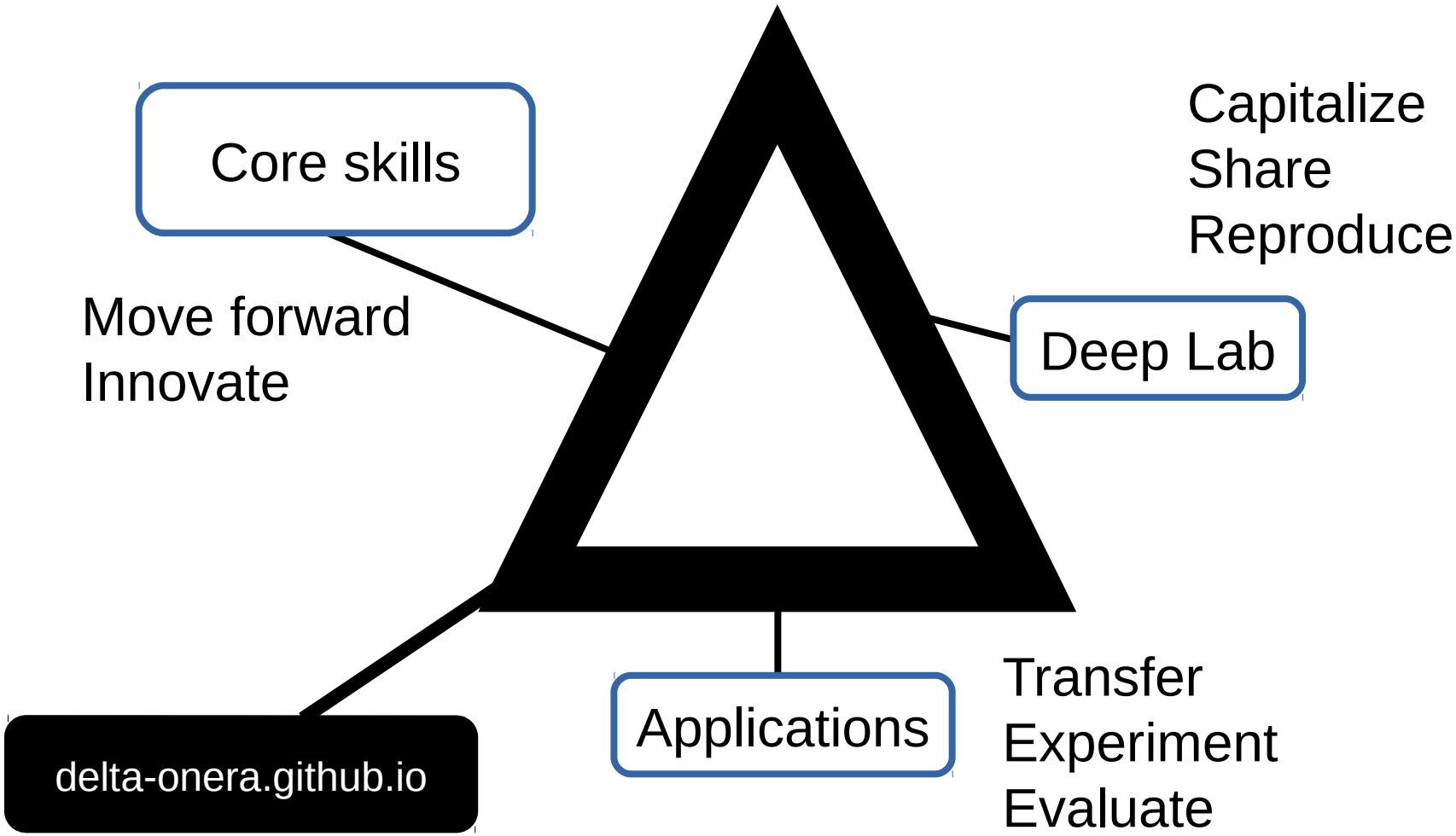
Software and help to solve problems with machine learning

Deep Lab




Core skills
Deep Lab
Applications
DOTA
Atmospheric
Corr.
DEMR
Detection and
recognition
DTIS
Robotics
DMAS
Material
mecanics
DAAA
Fluid
mecanics

4 year project



“We chose it because we deal with huge amounts of data. Besides, it sounds really cool.”

Larry Page - Google