Feedback on
Deep Learning at Météo-France

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Feedback on Deep Learning at Météo-France

– How do we develop Deep Learning since 2017?
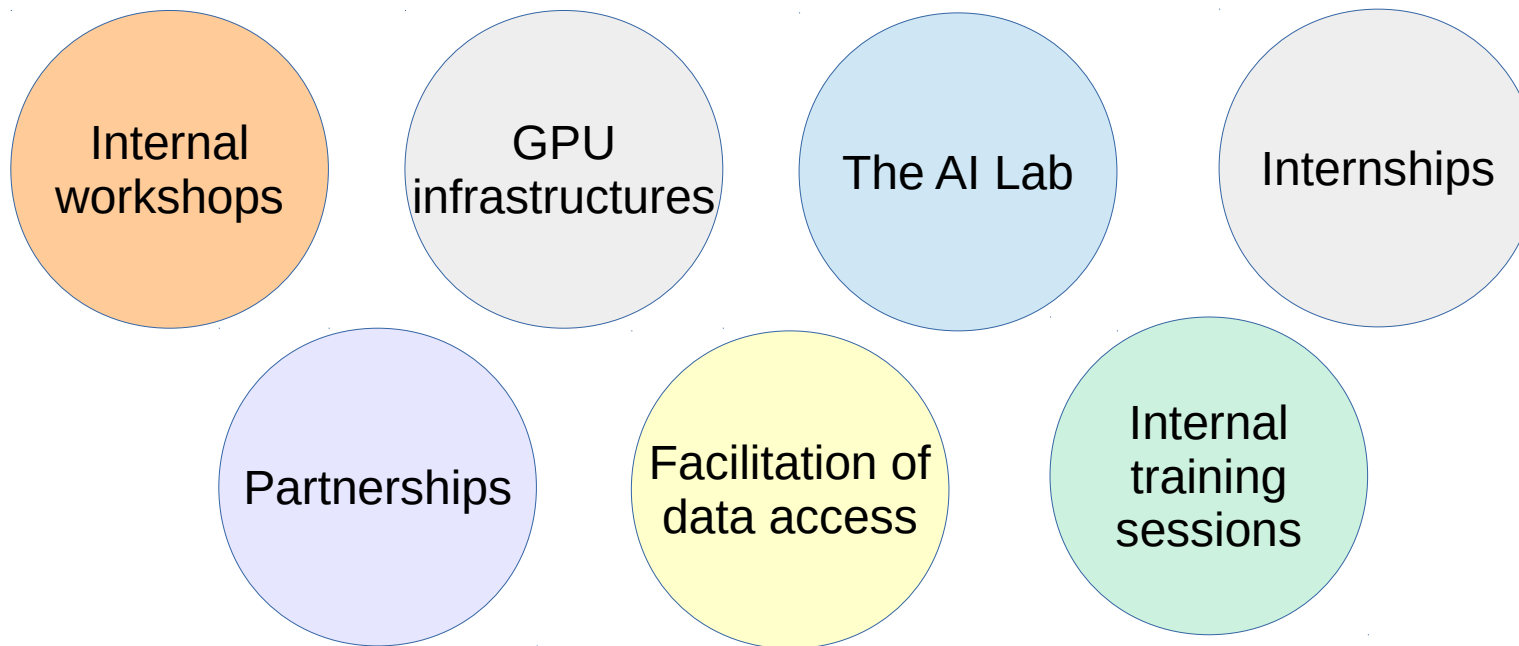
– What lessons did we learn from this experience?

The internal workshops

Internal workshops

The Deep Learning Club

The AI workshop
at the research center

The Deep Learning Club

– Keep the momentum

– 1 meeting every 3 months, since november 2017

– ~30 participants – open to everyone at Météo-France

– Topics:
  ➤ Share the knowledge
  ➤ Showcase projects
  ➤ Create a network between weather experts and DL experts
  ➤ Identify topics which could benefit from Deep Learning
  ➤ Manage the skills
  ➤ Bring expertise to choose the right tools

The AI thematic workshop at the Research Center

- Since 2019

- Create a network of researchers inside and outside the Research Center

- 1 or 2 meetings per year

- First achievement:
  - cartography of AI projects at the Research Center and around

Our GPU infrastructures

GPU infrastructures

2017

Desktop PC with a GPU
(Nvidia GTX 1080Ti)

x 3

$\sim 10^3$ €

2018

Servers with a GPU
(Nvidia GTX 1080Ti)

x 3

$\sim 10^4$ €

2019

2020

Cluster, 5 nodes
20 GPUs
(Nvidia Tesla V100)
+ fast storage server

$\sim 10^5$ €

3 GPU nodes on each HPC (x2)
12 GPUs
(Nvidia Tesla V100)

The AI Lab, a dedicated team

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- 6 specialists with expertise in:

  - Deep Learning

  - GPU administration

  - Data access

  > Goal:
  > to develop products that can be **used in production**

- Achievement:

  - Cloud cover nowcasting product ready for production

  - Other products to come

How do we choose the topics for the AI Lab?

For Data Scientists

For Interns

1) All Meteo-France services propose topics

2) Topics selected by the AI Lab Steering Committee

➤ AI Lab data scientists choose topics freely

Deep learning interns

- Since 2018,
  more than **15 Master students internships**

  - ➤ Huge contribution to explore new topics before investing

- Some requirements for a successful DL internship:

  - ➤ Prepare datasets in advance

  - ➤ Have a ready-to-use GPU infrastructure

  - ➤ Some data scientist time to manage the intern

Partnerships

Partnerships

- Deep4Cast
  - ► R&D project
  - ► Partnership with Labs experienced in Deep Learning (IRT Saint-Exupéry, CIMI, CERFACS)
    - — Skills transfered from our partners to Météo-France:
      - » Deep Learning methods
      - » Data formatting to gain computing time

- ANITI: creation of an AI institute in Toulouse
  - ► The institute has been created
  - ► ...but without us, meteorology has not been selected

    Lack of publications in AI and of visibility?

Facilitation of data access

Facilitation of data access

- Creation of MeteoNet: an open weather dataset

  - **https://meteonet.umr-cnrm.fr/**

  - Used for internships

- Documentation, toolbox and example notebooks for data access

Internal training sessions

Internal training sessions ML / DL

- **Introduction to Machine Learning / Deep Learning for beginners and project managers**

  - 2 days training, 5 sessions until now
  - **50 people trained**

- **1/2 day training sessions on specific topics**

  - **How to use the GPU cluster**
    - 14 people trained

  - **MeteoNet open dataset**
    - 65 people trained (internal and external)

  - **ML Flow** (monitoring of ML / DL experiences – alternative to tensorboard)
    - 10 people trained

Other training sessions

Soon...

- **Training for the General Management**
  - ➤ **1/2 day**
  - ➤ Feedback from other organizations
  - ➤ Goals:
    - — Understand the challenges of ML / DL
    - — Factors of success or failure of ML / DL projects

Where are we now?

Regular users of the GPU infrastructure

11

DL projects and PhD thesis in progress

~10

DL algorithms used in production or pre-production

2

Conclusion
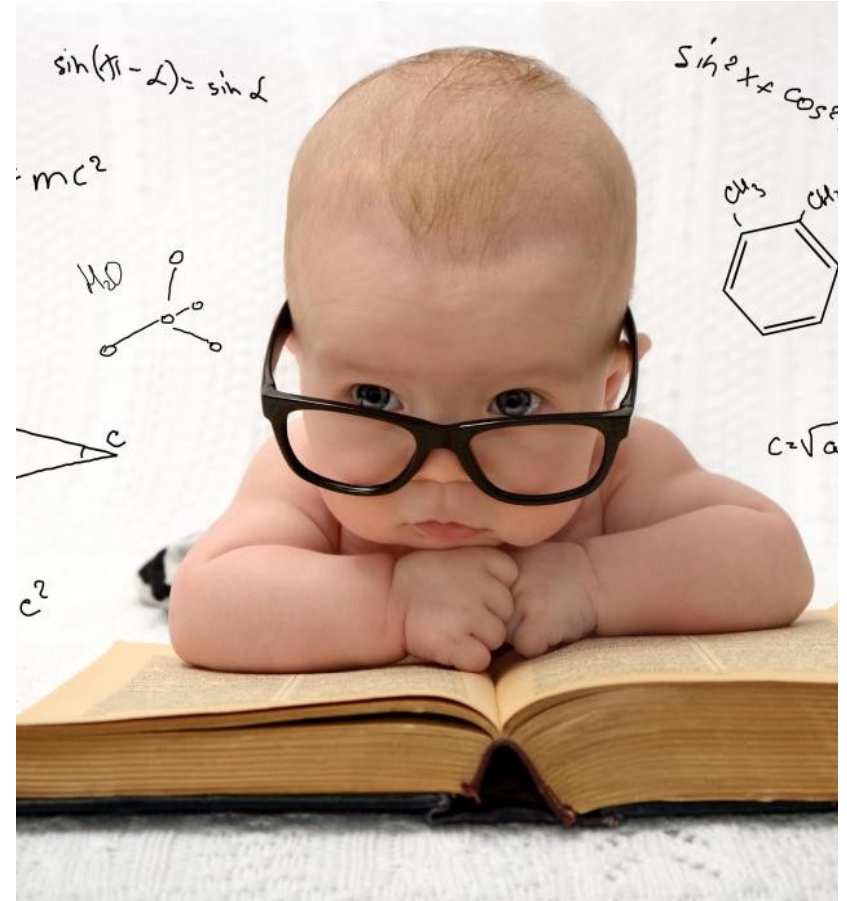
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Deep learning is promising!

… but only a few projects are ready for production today.

It's not as simple as it sounds.

It needs a real investment at the organization level.

What lessons did we learn from our experience?

Example: Cloud Cover nowcasting DL project

Success factors:

– A will carried by the top management

  ➤ With a defined goal to go to production

– Selection of topic which is mature for Deep Learning

– Strong implication of weather experts

  ➤ Project management

  ➤ Bringing weather expertise

  ➤ Providing training and scoring data

  ➤ Benchmarking and validation of scores

– A full-time deep learning expert on the project

– A high-performance GPU infrastructure