



AI (r)evolution

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Remarks

- [Hans Moravec](#) in a [1978 underground pamphlet](#): impossible to achieve AI because of insufficient computing power, a 10^9 increase was required, expected by 40 years
 - ✓ AI recent breakthroughs are due to:
 - Adequate processing power
 - Larger amounts of annotated data
 - Better algorithms
 - ✓ Techniques have become successful
 - ✓ Software is available
 - ✗ Lack of talent
 - ✗ Lack of annotated data
 - ✗ Lack of widespread computational resources
- Deep Learning systems are growing at a **non-linear rate**:
 - ImageNet 2012: **13 layers**
 - 2013: **39**
 - 2016: **152**
 - Corinna Cortes, Google NY, says “[huge computational costs for optimizing DNN architectures](#)”
 - GAFAM lead but China has plan to become leader in AI by 2030
 - AI will impact all aspect of society

AI Winter and Grand Challenges

- “AI Winter” (1984-2012)
- Discipline has been neglected
- “AI” not even mentioned in European FP programs
- https://en.wikipedia.org/wiki/AI_winter
- Challenges by the US government, gave raise to new industrial products:
 - DARPA Grand Challenge
 - ImageNet Large Scale Visual Recognition Challenge (ILSVRC)
 - NIST su Speech Recongition
 - NIST su Search
 - NIST su Machine Translation

4 Strategic Pillars

1. Computing Resources
2. Data
3. Talent
4. Capital

Initiatives

- AgID Task Force on AI
 - Ai.italia.it
- MISE
 - Call for AI Experts
- Report by Cedric Villani
 - AI For Humanity
- ELLIS
- [CLAIRE](#)
- Similar Recommendations:
 - Public compute platform for AI development
 - « Metter en place un supercalculateur conçu spécifiquement pour les applications d'IA »
- Application areas:
 - Healthcare
 - Justice
 - Transportation
 - Agriculture/Food

CLAIRE in a Nutshell

➤ **The CLAIRE Network**

A collaborative network of research labs and organisations across Europe. They will jointly identify fundamental research questions, discuss the most promising approaches, and participate in collaborative approaches to address them.

➤ **CLAIRE Centres of Excellence**

A selection of research labs in the CLAIRE Network, located strategically throughout Europe. These will play strong

➤ **The CLAIRE Hub**

A facility that serves as a highly visible focal point for the CLAIRE collaborative network. Here, excellent scientists at all levels and from all partners will work together for periods of time and find outstanding infrastructure, research support and research environment, particularly for the needs for AI.

CLAIRE New Central Facility

1. Physical location, not just virtual, in order to attract researchers and to provide the necessary computational resources with participation by all European Nations
 - Necessary for European sovereignty
 - Design and build next generation computational facilities for AI, including Inference chips
2. A structure with a stable budget, rather than funded through short term projects with different aims at each call
3. Lead by researchers themselves would work better than one directed by external officers
4. Provide salary incentives for researchers to stay in Europe

Article on the Economist on CLAIRE

- To be successful in the global push for AI, Europe needs to stand united; weakly coordinated national AI initiatives are insufficient to compete globally.
- Machine learning is important, but other areas of AI are also crucial for many of the most promising applications, such as self-driving cars. Europe has strength across many areas of AI, notably in automated reasoning - another key ingredient for many next-generation AI applications.
- Merely investing in networks of existing groups and research institutes is insufficient.
- China and the USA are pushing two extreme and flawed models of pursuing AI, creating an excellent chance for Europe to define a middle way, balancing the interests of individuals, society and industry.

CLAIRE Funding

- Research infrastructure and support, including
 - the CLAIRE Hub
 - the CLAIRE Network laboratories

- Innovation in AI through collaboration with industry
- Training and education in AI, including (1) summer schools, (2) courses and seminars, (3) curriculum development
- Outreach and public engagement activities, including pre-university AI education;
- Awards for outstanding research

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CLAIRE Hub

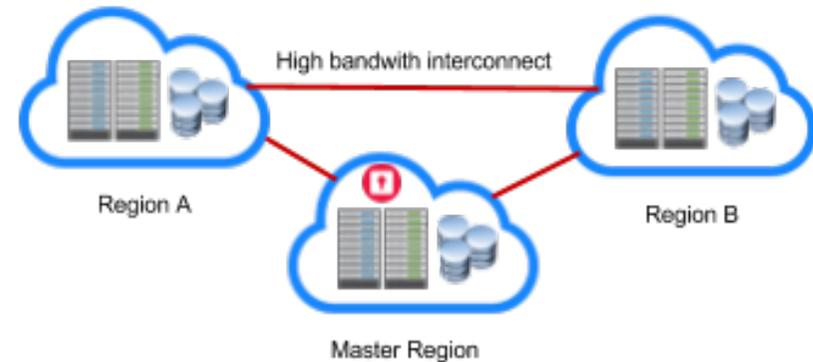
- Outstanding **infrastructure**, research support and research environment, particularly for the needs for AI
- A large ("Google-scale"), state-of-the-art **data and computer centre**
- cutting edge robotics **laboratories**, test facilities for key application areas
- **Support staff**, including programmers and hardware experts.
- The centre will also maintain a
- Responsible for a number of large, mission-oriented AI projects
- Host excellent scientists for periods of time
- Run summer schools, seminars, public outreach activities and workshops

CLAIRE Network

- Incentives to establish **joint research projects** among researchers in the network, under the lead of top researchers in the field.
- Support for developing and running high-quality **study programmes** focussed on AI.
- Supported by strong **computing infrastructure**, **big data storage**, and **networking** as well as infrastructure for maintaining joint AI platforms and services.
- Benefit from (1) outstanding research infrastructures that encourages **collaboration** across many areas of AI, (2) state-of-the-art collaboration infrastructures, such as conference and working environments, (3) innovation infrastructures that facilitate industry
- **collaboration** and entrepreneurship, including pre-incubators, innovation advisors, and well-developed relationships with governmental innovation support and investor organisations.
- Centres of Excellence in AI have roles as regional environments

GARR Containet Platform for AI

- One stop shop for:
 - AI Computing **resources**
 - Annotated **training data**
 - Repository of **algorithms** on those data



- Fostering use of the platform by researchers in any scientific domain
i.e. **democratize AI**
- **Submit** training **data**, get back trained **model**



To understand a complex system, you have to build it

Still Many Research Challenges, e.g.

- **Improve learning from observations**, reducing needs of annotated data
- Insights on mathematics **theory of model learning**
- **Overcome the dichotomy** between perception and reasoning:
 - **Perception** through Deep Learning
 - **Reasoning** through symbolic logic
- **Neural Reasoner**
 - capable of extracting deep semantics representations

Raccomandazioni

- investire in programmi di formazione di alto livello di specialisti in AI
- rendere più attraente lavorare in Italia/Europa, rendendo competitivi i salari dei ricercatori
- investire in infrastrutture di elaborazione adeguate a livello nazionale/europeo con hardware e dispositivi specializzati (GPU)
- investire nella creazione e condivisione di raccolte di dati annotati e modelli allenati su di esse
- integrazione di tecnologie (es. Deep Learning and Robotics), di multitask (es. perception e reasoning) e di domini
- sviluppare tecniche per (1) realizzare modelli di ML comprensibili e accurati, (2) fornire spiegazioni della logica degli algoritmi di ML
- stimolare le aziende a realizzare soluzioni di AI da mettere in esercizio a fronte di commesse pubbliche, anche con il meccanismo del Pre Commercial Procurement

