

We call ourselves *Homo sapiens* -man the wise- because our intelligence is so important to us. For thousands of years, we have tried to understand how we think; that is, how a mere handful of matter can perceive, understand, predict, and manipulate a world far larger and more complicated than itself.

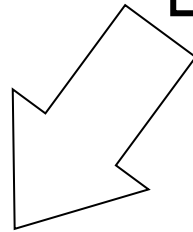
The field of artificial intelligence, or AI, goes further still: it attempts not just to understand but also to build intelligent entities.

<p>Thinking Humanly</p> <p>"The exciting new effort to make computers think ... machines with minds, in the full and literal sense." (Haugeland, 1985)</p> <p>"[The automation of] activities that associate with human thinking, activities such as decision-making, problem solving, learning ..."</p> <p>(Bellman, 1978)</p>	<p>Thinking Rationally</p> <p>"The study of mental faculties through the use of computational models" (Charniak and McDermontt, 1985)</p> <p>"The study of the computations that make it possible to perceive, reason and act"</p> <p>(Winston, 1992)</p>
<p>Acting Humanly</p> <p>"The art of creating machines that perform functions that require intelligence when performed by people" (Kurzweil, 1990)</p> <p>"The study of how to makes computers do things at which, at the moment, people are better" (Rich and Knight, 1991)</p>	<p>Acting Rationally</p> <p>"Computation Intelligence is the study of the design of intelligent agents" (Poole et al., 1998)</p> <p>"AI ... is concerned with intelligent behavior in artifacts" (Nilsson, 1998)</p>

PREREQUISITES

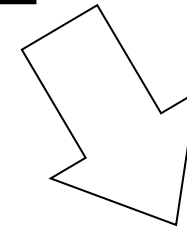
LINEAR ALGEBRA

1. Dot Product
2. Singular Value Decomposition
3. The Moore-Penrose Pseudoinverse



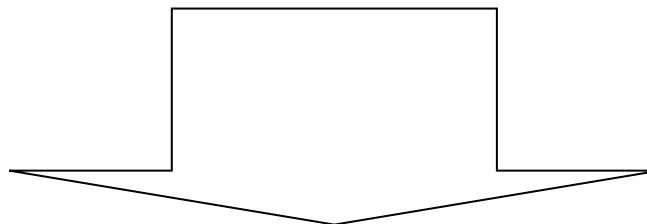
PROBABILITY THEORY

1. Conditional Probability
2. Expectation, Variance and Covariance
3. Bayes' Rule
4. Common Probability Distribution



NUMERICAL COMPUTATION

1. Gradient-Based Optimization
2. Linear Least Squares



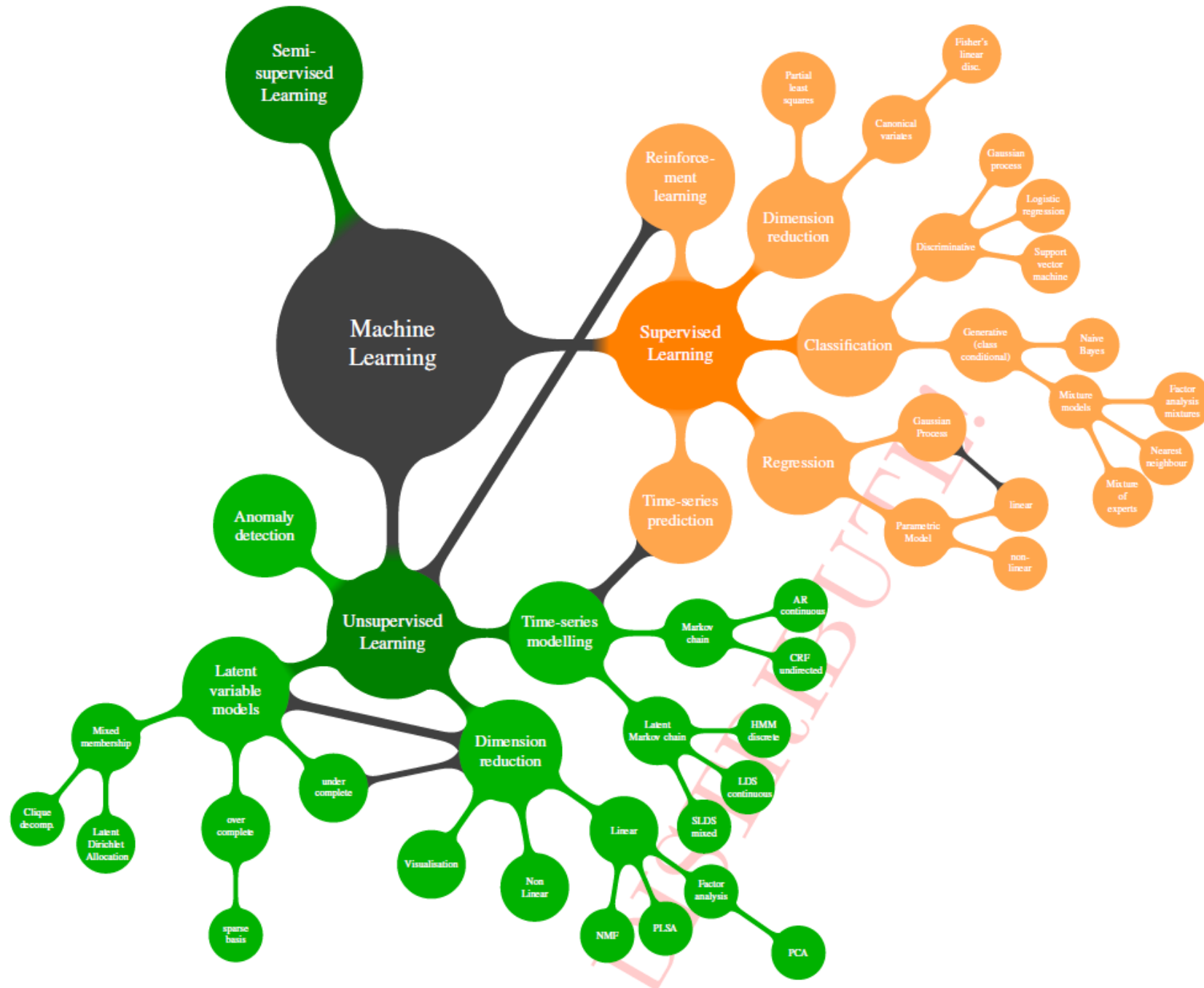
THE INTELLIGENT SYSTEMS CURRICULA

based on "*Computer Science Curricula 2013*" proposed by "The Joint Task Force on Computing Curricula ACM, IEEE Computer Society", 2013

<http://www.acm.org/education/CS2013-final-report.pdf>

In this document, page 121/124 proposes a list of courses / knowledge that an AI specialist should have followed. Starting from this list, the sub-domains of the IA outline as content, expertise, natural, as follows:

- 1) Machine learning
- 2) Natural Language Processing
- 3) Perception and Computer Vision
- 4) Representation and Reasoning - Expert Systems
- 5) Robotics
- 6) Agents



CONTENTS

1. THE NATURE OF MACHINE LEARNING

1.1. General Model of Learning from Examples

- 1.1.1. The Theory of Inductive Inference
- 1.1.2. How to Analyze the Learning
- 1.1.3. Validity Conditions for the ERM Principle

1.2. The Bias-Variance Tradeoff

1.3. Regularization Methods

1.4. Evaluation of the Learning Performances

- 1.4.1. A Posteriori Empirical Evaluation
- 1.4.2. Practical Selection of the Model
- 1.4.3. Estimation of the Hypothesis Real Risk
- 1.4.4. Algorithms Tuning by a Validation Set

2. SUPERVISED LEARNING OF A PERCEPTRON

2.1. Error Correction Rules

- 2.1.1. Perceptron Learning Rule
- 2.1.2. Generalizations of the Perceptron Learning Rule
- 2.1.3. The Perceptron Criterion Function
- 2.1.4. May's Learning Rule
- 2.1.5. Widrow-Hoff Learning Rule

2.2. The Delta Rules

2.3. Other Criterion Function

2.4. Computation Capabilities of a Perceptron

3. LEARNING RULE FOR MULTILAYER FEEDFORWARD NEURAL NETWORKS

3.1. Error Backpropagation Learning Rule Global-Descent-Based

3.2. Error Backpropagation Backprop Enhancements and Variation

3.2.1. Weights Initialization

3.2.2. Learning Rate

3.2.3. Momentum

3.2.4. Activation Function

3.3 Computation Capabilities of a MFN

BIBLIOGRAPHY

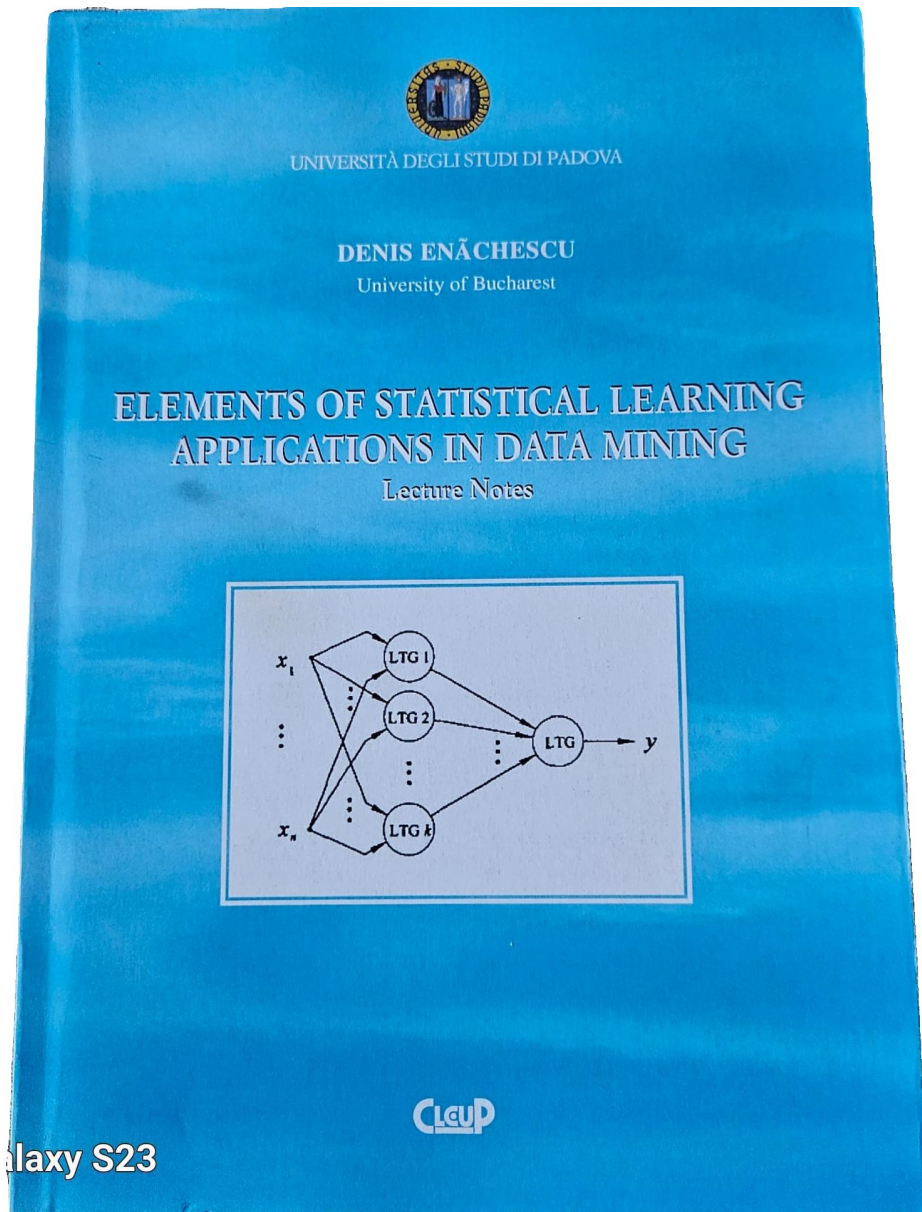
D. Enachescu, *Elements of Statistical Learning. Applications in Data Mining*. Lecture Notes
CLEUP, Padova, 2003, ISBN 88-7178-951-2

S.J. Russel, P. Norvig, *Artificial Intelligence. A Modern Approach*, Third Edition, Pearson
Education Ltd, 2014

T. Fine, *Feedforward Neural Network Methodology*, Springer, 1999

S. Haykin, *Neural Network and Learning Machines*, Third Edition, Pearson Education
Ltd,

M.T. Hagan, H.B. Demuth, M. Beale, O.de
Jesu, *Neural Network Design*



Follow up

- Master studies
- PhD studies
- Employment in big companies

- <https://www.humanbrainproject.eu/discover/the-project/research-areas>

The screenshot displays the Human Brain Project website. The browser's address bar shows the URL <https://www.humanbrainproject.eu/en/>. The website header includes the Human Brain Project logo, a note about being co-funded by the European Union, and a navigation menu with links to SCIENCE, PLATFORMS, COLLABORATE, FOLLOW HBP, EDUCATION, FOR YOU..., and ABOUT.

The main content area features a large image of a brain with the following text:

The Human Brain Project is a [H2020 FET Flagship Project](#) which strives to accelerate the fields of neuroscience, computing and brain-related medicine.

This acceleration will be achieved by a strategic alignment of scientific research programmes in fundamental neuroscience, advanced simulation and multi-scale modelling with the construction of an enabling Research Infrastructure.

Below this text is a horizontal bar with eight colored boxes, each representing a research area with an icon and text:

- EXPLORE THE BRAIN (red box)
- BRAIN SIMULATION (orange box)
- SILICON BRAINS (yellow box)
- UNDERSTANDING COGNITION (light yellow box)
- MEDICINE (teal box)
- ROBOTS (blue box)
- MASSIVE COMPUTING (dark blue box)
- OPEN, ETHICAL, ENGAGED (dark blue box)

Below the research areas bar, there are four news article thumbnails:

- 60 ROME D**: Key HBP leaders speak at EC Digital Day. The thumbnail shows the European Union flag and a large letter 'D'.
- THE LANCET Neurology**: New opinion article proposes an approach linking brain organisation stages from genes to consciousness. The thumbnail shows brain scans and a diagram of brain development stages.
- Gender Equality**: HBP begins work on gender equality. The thumbnail shows silhouettes of two people with a balance scale.

- <http://www.darpa.mil/our-research>



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Neural Engineering System Design (NESD)

Dr. Elizabeth Strychalski

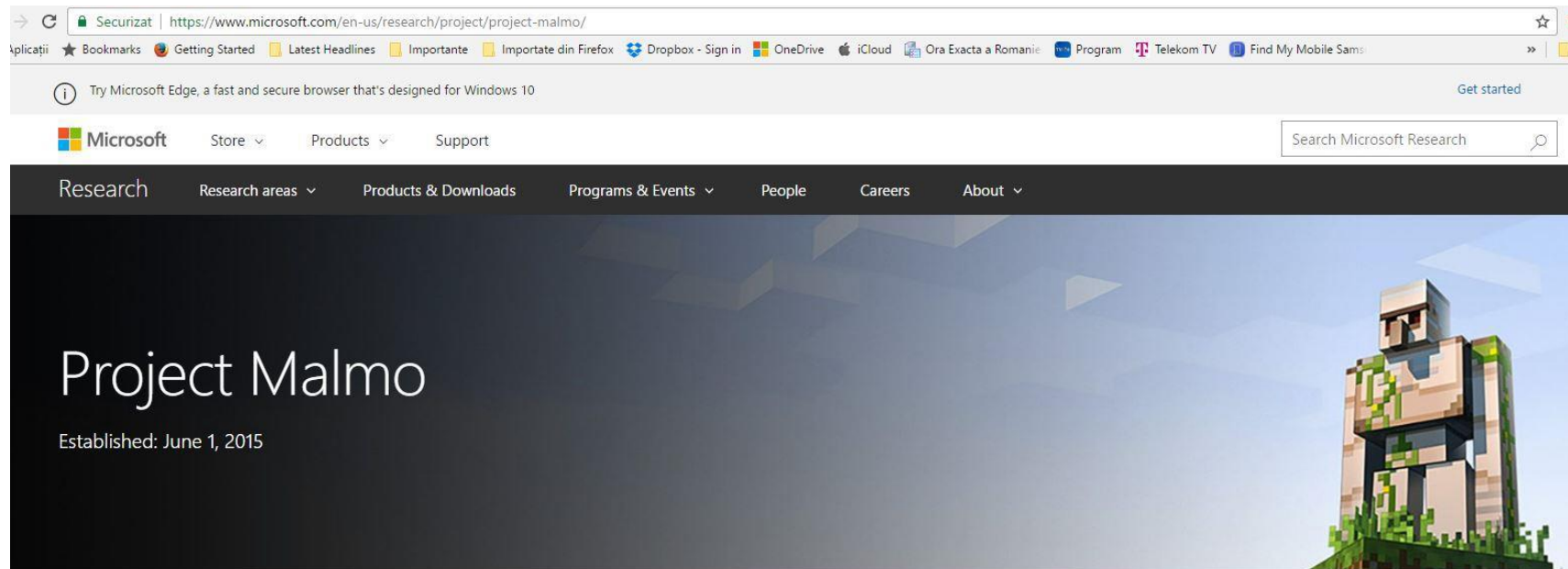


The Neural Engineering System Design (NESD) program aims to develop an implantable neural interface able to provide advanced signal resolution and data-transfer bandwidth between the brain and electronics.

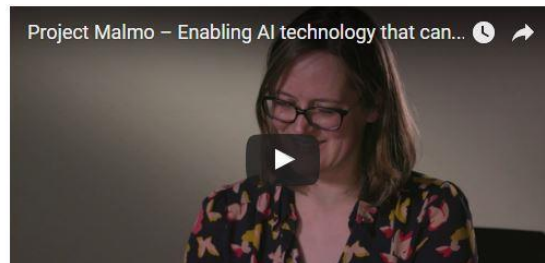
This interface would serve as a translator, converting between the electrochemical language used by neurons in the brain and the ones and zeros that constitute the language of information technology. The goal is to achieve this communications link in a biocompatible device no larger than one cubic centimeter in size, roughly the volume of two nickels stacked back to back.

Achieving the program's ambitious goals and ensuring that the envisioned devices will have the potential to be practical outside of a research setting will require integrated breakthroughs across numerous disciplines including neuroscience, synthetic biology, low-power electronics, photonics, medical device packaging and manufacturing, systems engineering, and clinical testing. In addition to the program's hardware challenges, NESD researchers will be required to develop advanced mathematical and neuro-computation techniques to first transcode high-definition sensory information between electronic and cortical neuron representations and then compress and represent those data with minimal loss of fidelity and functionality.

- <https://blogs.microsoft.com/next/2016/07/07/project-malmo-lets-researchers-use-minecraft-ai-research-makes-public-debut/#sm.0001re0afyfxpdy3qfc2862sk6qij>



How can we develop artificial intelligence that learns to make sense of complex environments? That learns from others, including humans, how to interact with the world? That learns transferable skills throughout its existence, and applies them to solve new, challenging problems?



People



Matthew Johnson
Principal RSDE Lead,
Agile Projects Team



Pushmeet Kohli
Principal Researcher



Robert Schapire
Principal Researcher



○ <https://deepmind.com/>

Securizat | <https://research.google.com/teams/brain/>

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Google Brain Team

Make machines intelligent. Improve people's lives.

Research Freedom

Google Brain team members set their own research agenda, with the team as a whole maintaining a portfolio of projects across different time horizons and levels of risk.

Google Scale

As part of Google and Alphabet, the team has resources and access to projects impossible to find elsewhere. Our broad and fundamental research goals allow us to actively collaborate with, and contribute uniquely to, many other teams across Alphabet who deploy our cutting edge technology into products.

Open Culture

We believe that openly disseminating research is critical to a healthy exchange of ideas, leading to rapid progress in the field. As such, we publish our research regularly at top academic conferences and release our tools, such as TensorFlow, as open source projects.

Papers accepted to ICLR, 2017

- [A Learned Representation For Artistic Style](#)
- [Adversarial examples in the physical world](#)
- [Adversarial Machine Learning at Scale](#)
- [Adversarial Training Methods for Semi-Supervised Text Classification](#)
- [Capacity and Trainability in Recurrent Neural Networks](#)
- [Categorical Reparameterization with Gumbel-Softmax](#)
- [Decomposing Motion and Content for Natural Video Sequence Prediction](#)
- [Deep Information Propagation](#)
- [Density estimation using Real NVP](#)
- [HyperNetworks](#)
- [Identity Matters in Deep Learning](#)
- [Improving policy gradient by exploring under-appreciated rewards](#)
- [Latent Sequence Decompositions](#)
- [Learning a Natural Language Interface with Neural Programmer](#)

○ <http://www.aria-romania.org>

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**ASOCIAȚIA ROMÂNĂ
PENTRU INTELIGENȚĂ
ARTIFICIALĂ**

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Welcome

About ARIA

Founded in April 2011, **ARIA (Asociația Română pentru Inteligență Artificială)** is a nonprofit scientific association dedicated to the support of research advancements in Artificial Intelligence and the development of Romanian research and education in the field.

ARIA has a strong national representation. It brings together distinguished university professors and senior researchers from top Romanian universities and institutes, members of the Romanian Academy, young researchers, students at PhD, Master and Bachelor level, and top ranked IT companies, all having a keen interest in Artificial Intelligence. The founding members of ARIA include, among others, University Politehnica of Bucharest and the Research Institute for Artificial Intelligence of the Romanian Academy.

The mission of ARIA is to promote Romanian research and education in the domain of Artificial Intelligence, and to contribute to the creation, production and dissemination of knowledge and technology in the domain. Main activities of ARIA include the organization and scientific patronage of conferences, symposium, and workshops, publishing ARIA Bulletin, awarding grants and scholarships, and facilitating the development of joint academia-industry research projects.

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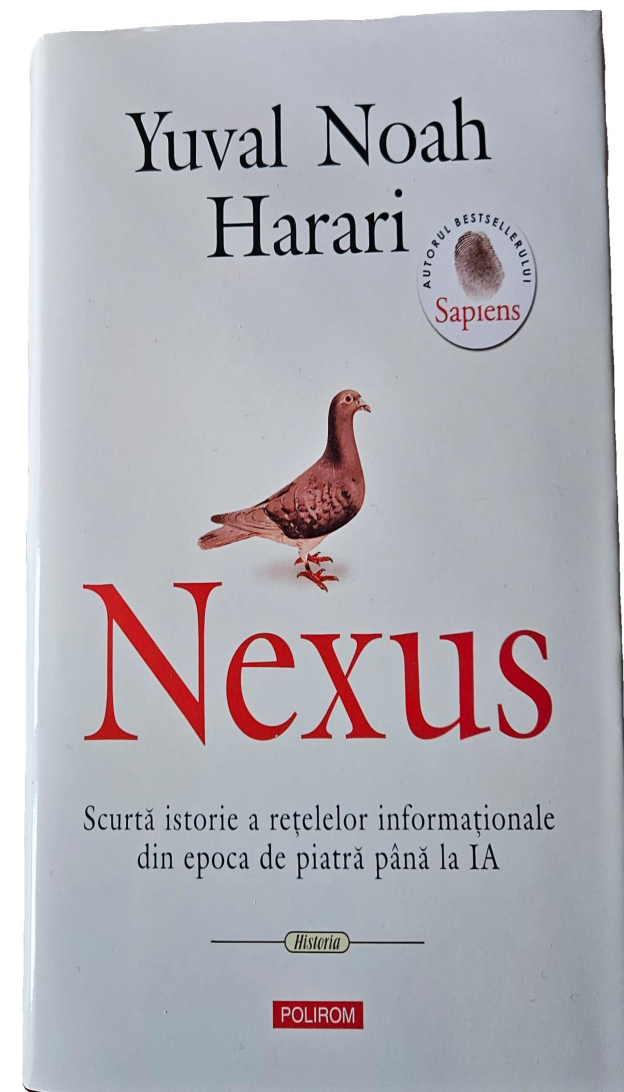
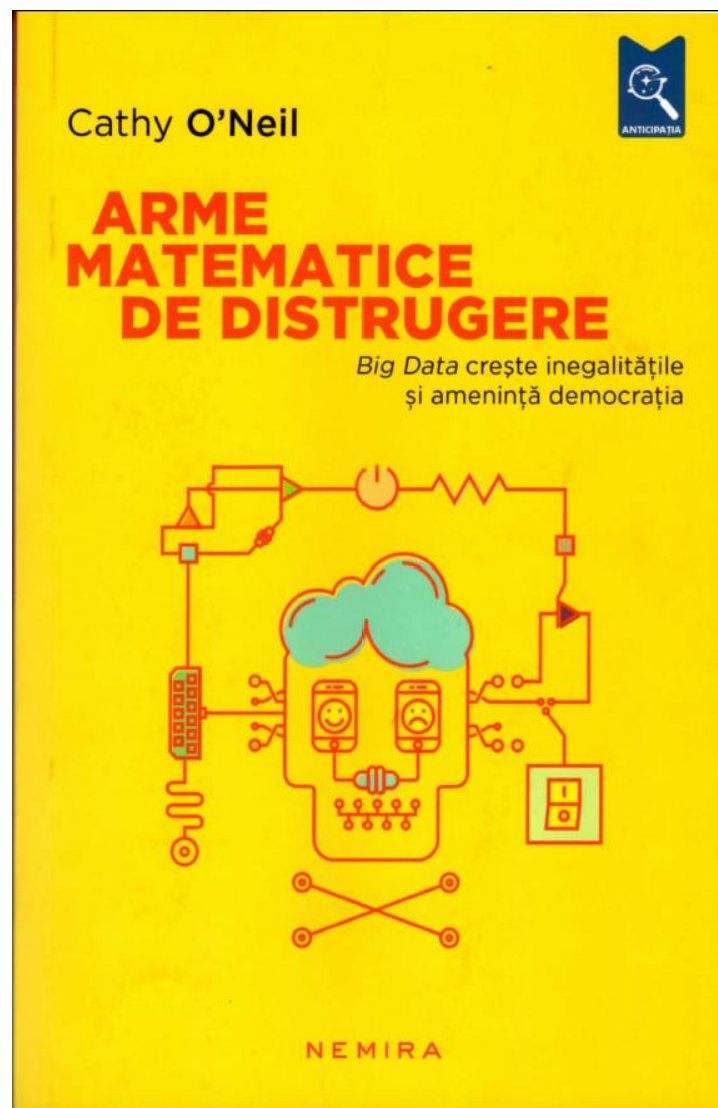
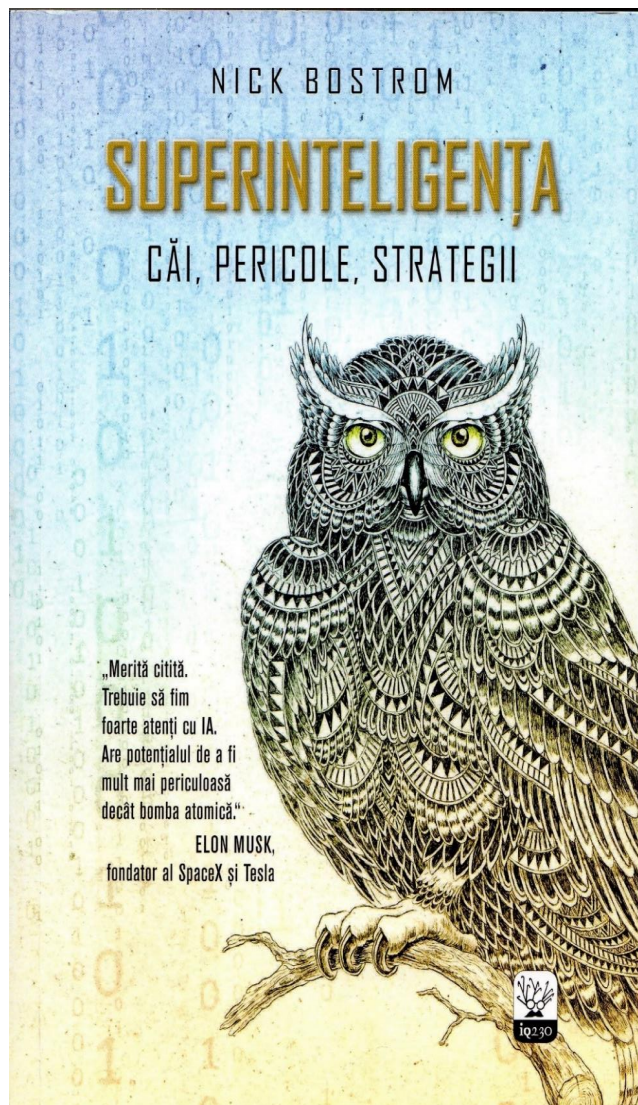
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- BITDEFENDER (machine learning),
- Avira (machine learning),
- TeamNet (machine learning, multi-agents systems, robotics, etc),
- Oracle (natural language processing).
- Eau de Web (semantic web and linked open data).
- AQUAsoft (ambient intelligence).
- - Recognos (semantic web), Cluj.



Petals Around the Rose

<http://www.borrett.id.au/computing/petals.htm>