ÉCOLE POLYTECHNIQUE

IP PARIS

Master of Science and Technology

Artificial Intelligence and advanced Visual Computing

WHY ARTIFICIAL INTELLIGENCE AND VISUAL COMPUTING?

Intelligent Systems operating on their own

- **To help humans or achieve challenging tasks by themselves**
  - Decision, creation, autonomous motion…

- Based on two complementary approaches
  - **Modeling knowledge** & **reasoning mechanisms**
  - **Learning from examples** (Machine learning, Deep learning, Reinforcement learning)

At the fence between **Computer Science** and **Applied Maths**:

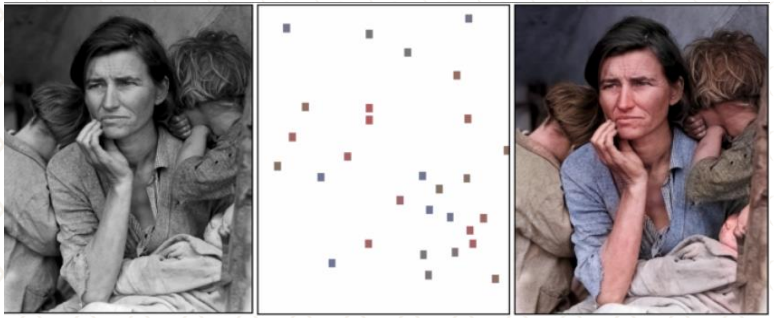
- Requiring both theoretical & strong programming backgrounds
- Students need a Bachelor's in either maths or computer science, with at least some background in the other topic and strong motivation

PROGRAM OVERVIEW

Artificial Intelligence refers to intelligent systems that can independently perform tasks that were originally restricted to humans.

AI is based on two complementary approaches:

- **Traditional AI**: modeling existing knowledge and reasoning mechanisms in an efficient way
- **Machine learning**: systems that gain knowledge on their own, either with training examples or instantly, with the use of reinforcement learning



Visual Computing involves processing multimedia content:

- **Analyzing & editing** masses of online contents (sound, video, 3D)
- Great domains to **illustrate AI methods**
- Brings **challenges** (editing tasks) & **solutions** (artificial examples)

PROGRAM OVERVIEW

KEY FEATURES

- **Two-year course**
- Entirely **taught in English**
- **Full-time** basis only
- **Industry-oriented** program
- Courses by **world-class professors**, associated research centers, academic partners and **top industry professionals**
- 2 compulsory **internships**

PROGRAM STRUCTURE

YEAR 1

PERIOD 1

Machine Learning I

Constraint-based Modeling and Algorithms for Decision Making Problems

Image Analysis and Computer Vision

Digital Representation and Analysis of Shapes

Signal Processing

Marketing and Strategy Introduction

PERIOD 2

Machine Learning 2

Computer Animation

Algorithmic Geometry: from theory to applications

Image Synthesis: theory and practice

Statistics in action

Advanced Topics in Artificial Intelligence

Technology-based entrepreneurship and new business creation

Languages

Humanities and French Culture

Sports

PROGRAM STRUCTURE

YEAR 2

PERIOD 1

Deep Learning

Data Analysis : geometry and topology in arbitrary dimensions

Natural Language and speech Processing : from knowledge modeling to machine learning

Advanced 3D Graphics: Exploring the links between Computer Graphics and AI

PERIOD 2

Reinforcement Learning

Robot motion planning, verification and control of hybrid systems

Socio-emotional embodied conversational agents

Soft robots: simulation, fabrication, and control

Advanced Computer Vision

Transverse Project

Seminar on ethical issues, law and novel applications of AI

Virtual/Augmented Reality & 3D Interactions

Languages

Humanities and French Culture

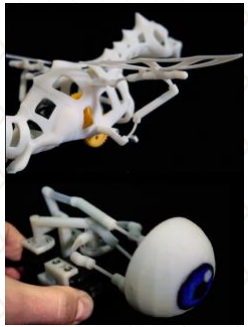
Sports

INTERNSHIPS

Students complete a **four- to six-month internship** at the end of each year of the Program, either in France or abroad

Example of internship projects include:

- COVID-19 **risk mitigation** – Inria
- **Neutral architecture search** and AutoML – Argonne National Laboratory
- Deep learning in **3D images** – Bentley Systems
- Finding good gripping positions for **soft robots** – Inria
- Managing a large number of **NPC**: visual, AI, transition – Ubisoft
- Fast partial-to-partial point **cloud registration** with unsupervised mask estimation – Valeo
- Prototype of smart tool to help the **creation of decor and 3D scenes** – Ubisoft
- **LiDAR-based semantic information** extraction with deep learning - Renault



WEEKLY SEMINARS

Students will be sensitized to **ethical issues and law**, and introduced to **novel applications** of artificial intelligence and visual computing through key-note talks from both institutional and industrial partners.

Examples of seminars include:

- **Facial recognition: from early methods to deep learning** | Stéphane Gentric, Research unit manager, IDEMIA
- **Augmenting bodies using AI: from human know-how to Computer Aided Design** | François Faure, CEO Anatoscope
- **From Phd to Startup creation: Real-estate Market Transparency using AI** | Adrien Bernhardt, CTO Homiwoo
- **Google AI principles** | Ludovic Peran, Public Policy and Government Affairs Manager-AI, Google
- **Fighting blindness with bionic eyes** | Vincent Bismuth, General Electric Healthcare
- **Ethics in artificial intelligence** | Issam Ibnouhsein, Quantmetry

INDUSTRY AND INSTITUTIONAL PARTNERS

CAREER PROSPECTS

The Master's combines **both research and professional experience**. After graduating, students can either pursue **PhD study** or **work for companies and start-ups** across a range of industries:

- **Digital applications** for smartphones, computers, or personal assistants: Google, Facebook, Shazam, Apple, Snap
- **Control of autonomous vehicles**, drones and robots: Valeo, Audi, Google, BMW, Peugeot-Citroen
- **Virtual reality**, image & video editing, 3D simulation, films, games & design: Ubisoft, Dassault systems, Microsoft, Adobe, Sony, Nintendo, Anatoscope
- **E-commerce** and **online advertisement**: Criteo, Google, Teads, Cdiscount, FNAC, eBay

And many start-ups not listed here!

CONTACT US

programmes.polytechnique.edu

For all enquiries
gdadmissions@polytechnique.fr

2nd round of applications from January 12th to March 12th (4pm CET)