

ARTIFICIAL INTELLIGENCE

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Artificial intelligence

Description

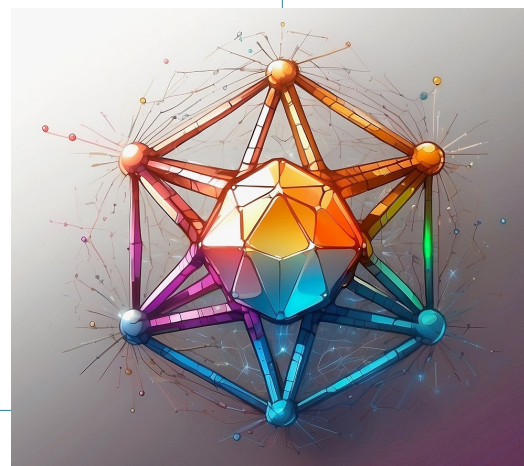
The Artificial Intelligence area of the CRISAL laboratory studies the theoretical foundations and applications of learning algorithms, sequential decision-making under uncertainty, neuromorphic architectures and multi-agent systems for the simulation of complex systems. This research explores a variety of contexts: privacy, equity, decentralisation, multimedia security, using optimisation methods (game theory, HPC) and uncertainty quantification. It is applied to signal, natural language and music processing, the calculation of integro-differential equations and market equilibria, video protection, agro-ecology, and simulation in a multi-disciplinary context (economists, sociologists, financial, ethologists, etc.).

'Emblematic' projects

- ERC Blackjack (R. Bardenet)
- Europe: FLUTE (HORIZON-HLTH-2022-IND-13-02), TRUMPET (HORIZON-CL3-2021-CS-01-04), Interreg PATHACOV, COBRA InterReg
- AI Chair: Apprenf, Sherlock, Baccarat
- ANR: JCJC, PMR, BIP-UP, REPUBLIC, FATE, NeuRL, RICOCHET, CI2, OIILH, ULP Cochlea, LOCSP, SOS, INCA, Deadpool, HUMAN 4D, CQFD, Distiller
- CPER: Cornelia, RITMEA, TecSanté
- PEPR: IA REDEEM, IA Emergences, Cybersécurité IPop, Numpex Exama, Agroécologie et Numérique NINSAR, eSEMBLE, Cloud Taranis, Cloud CareCloud
- Industrial Chair: E-LODI, Luxant-ANVI

Teams concerned

- ♣ **GT DatInG (Data Intelligence Group):** MAGNET, SCOOL, SIGMA
- ♣ **GT OPTIMA (OPTimisation : Modèles et Applications):** BONUS, INOCS, ORKAD, OSL
- ♣ **GT I2C (Interaction et Intelligence Collective):** BCI, Loki, MINT, NOCE, SMAC
- ♣ **GT CO2 (Commande et Calcul Scientifique):** CFHP, DEFROST, SHOC, VALSE
- ♣ **GT SISE (Systèmes Informatiques Sûrs et Efficaces):** LINKS, 2XS
SyCoMoRES
- ♣ **GT ToPSyS (Tolérance Pronostic Système de Systèmes):**
ToSyMA, SoftE, PERSI
- ♣ **GT Image:** FOX, 3D SAM, Imagerie couleur
- ♣ **GT MSV (Modélisation pour les Sciences du Vivant):**
BioComputing, Bonsai
- ♣ **GT GL (Génie Logiciel):** CARBON, EVREF, Spirals



Examples of themes depending on the team:

MAGNET 1. Theoretical foundations and applications of learning algorithms in the context of privacy, equity and decentralisation

2. Representation learning, multi-task learning and transfer learning in the context of automatic natural language processing and computational linguistics.

SCOOOL Sequential decision making under uncertainty. In particular, we are studying bandit problems and reinforcement learning problems. Research ranging from theory to application.

SIGMA Bayesian approaches to statistical signal processing. Generative models for inference and inverse problem solving. Distributed inference methods for high-dimensional problems and quantification of uncertainties. Applications in astronomy and astrophysics. Statistical learning and deep learning for multimedia content security (steganalysis and steganography, watermarking, etc.).

CFHP Generative AI for calculating integro-differential equations, applied to parameter estimation.

BONUS We are interested in the study of optimisation methods for ML and by ML with a contribution from HPC: hyper-parameter optimisation (HPO), AutoML, automated algorithm design / selection, surrogate assisted optimisation, deep network optimisation, Neural Architecture Search (NAS).

INOCS Distributed calculation and learning of equilibria, dynamic games with information, various applications (auctions, calculation of market equilibria, planning under competition).

SMAC Development of multi-agent systems for solving problems or simulating complex systems. The work carried out by the team is fundamentally multi-disciplinary, as it is aimed at thematic specialists (transport engineers, economists, sociologists, financiers, ethologists).

2XS Neuromorphic architectures / impulse neural networks (SNNS): design, simulation, emulation on FPGA, AutoML, debug, impulse image, sound and video processing, various applications (video protection, environmental surveillance, motion detection, etc.), resistance to adverse attacks.

FOX

1. Spatio-temporal modelling for video analysis.
2. Impulse neural networks for vision (recognition, detection, tracking).
3. Computer vision from impulse sensors.
4. Weakly supervised learning for computer vision.