A propos du centre ou de la direction fonctionnelle

At the frontier between integrative and computational neuroscience, we propose to model the brain as a system of active memories in synergy and in interaction with the internal and external world and to simulate it as a whole and in situation. Major cognitive and behavioral functions (eg. attention, recognition, planning, decision) emerge from adaptive sensorimotor loops involving the external world, the body and the brain. We study, model and implement such loops and their interactions toward a fully autonomous behavior. With such a “systemic” approach, we mean that such complex systems can only be truly apprehended as a whole and not as a sum of parts. The model will be designed under the supervision of Nicolas Rougier who has an expertise in modelization of very large neural structures (artificial neural networks, multi-agents and swarm systems, cellular automata...) and in formalisms of distributed computing allowing us to implement such models at different levels of description (as in computational neuroscience). We deploy our models at large scale (high performance computing), incarnate them in bodies interacting with the environment (autonomous robotics) and simulate them interactively with respect to events encountered by a virtual (real) robot.

Not only do we expect to share back such an integrative approach among these different fields of science, but beyond, we also aim at contributing to other related areas of both life sciences (neuroscience, medicine) and digital science (computer science, machine learning).

Contexte et atouts du poste

The ANR SOMA project gathers neuroscientists, computer science researchers, hardware architects and micro-electronics designers to explore the concepts of a Self-Organizing Machine Architecture: SOMA. This Self-Organization property already studied in various fields of computer science (artificial neural networks, multi-agents and swarm systems, cellular automata...), is studied for the very first time in a new context with a transverse look from the computational neuroscience discipline to the design of reconfigurable microelectronic circuits. The project focuses on the blocks that will pave the way in the long term for smart computing substrates, exceeding the limits of current technology.

Neurobiological systems have been a source of inspiration for computer science and engineering. The rapid technological improvements of computing devices have recently strengthened this trend through two complementary though with apparently contradictory consequences: by offering a huge computational power, it has made the simulation of very large neural structures possible, and by reaching its end, contradictory consequences: by offering a huge computational power, it has made the simulation of very large neural structures possible, and by reaching its end, it has motivated the emergence of alternative computing devices based on bio-inspired concepts. Thus, by evolving from programming and intellectual limitations, it has promoted « the excellence of the brain ». Inria, the excellence of the brain, is a source of inspiration for computer science and engineering. Inria’s mission is to contribute to the protection of potential scientific and technical development of the nation (PPST). Inria’s mission is to contribute to the protection of potential scientific and technical development of the nation (PPST). Inria’s mission is to contribute to the protection of potential scientific and technical development of the nation (PPST).

A propos d'Inria

Inria, institut de recherche dédié au numérique, promeut « l’excellence scientifique au service du transfert technologique et de la société ». Inria emploie 2700 collaborateurs issus des meilleures universités mondiales, qui relèvent les défis des sciences informatiques et mathématiques. Inria répond ainsi efficacement aux enjeux pluridisciplinaires et applicatifs de la transition numérique. Inria est à l’origine de nombreuses innovations créatrices de valeur et d’emplois.

Conditions pour postuler

Send CV, motivation letter, recommendation letters, Master degree’s grade transcripts and any publication/achievement list.

Sécurité défense :

Ce poste est susceptible d’être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L’autorisation d’accès à une zone est délivrée par le chef d’établissement, après avis ministériel favorable, tel que défini dans l’arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l’annulation du recrutement.

Politique de recrutement :

Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.

Attention: Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d’autres canaux n’est pas garanti.
Principales activités
The proposed research lies at the interface of neurophysiology, cognitive science, applied mathematics, and theoretical physics. The concepts and methods that will be used will draw on single neuron physiology, electrophysiological studies in behaving animals, statistical mechanics, dynamical system theory, and stochastic differential equations. The aim is to reveal the microscopic (cellular, neuronal) factors which underlie the reorganization of neural circuits during the adaptation of behaviour. More specifically, the ultimate goal is to propose a framework in which the control of vocal output is transferred from the BG networks to cortical premotor networks during song learning. To this end, we will combine a theoretical approach (development of a mathematical model of the song system) and an experimental one (chronic neural recording in awake birds, behavioural manipulations). Therefore, a collaboration with a team of physiologists at the IMN, and in particular with Arthur Leblois who has a long-established expertise in the neural mechanisms underlying vocal learning in songbirds.

Compétences
The candidate must:

- have a solid formation in neurosciences at both the theoretical and experimental levels
- have a prior experience in research (master level)
- be fluent in English

Avantages sociaux
- Subsidised catering service
- Partially-reimbursed public transport

Rémunération
1982€ / month (before taxes) during the first 2 years, 2085€ / month (before taxes) during the third year.