Preface

CRoNe, the Congress on Robotics and Neuroscience, is an encounter that acts not only as a bridge but also as a fruitful land for collaboration and discussion concerning recent advances in the frontiers of artificial intelligence, robotics and neuroscience, fostering the exchange of ideas among different, and often fairly separated, scientific fields. The congress, part of the Latin American Robotics Week[1], organized by Innovación y Robótica Estudiantil UTFSM [2], is a meeting point for people from engineering, human and biological sciences promoting the development and understanding of complex intelligent systems.

At its 4^{th} version, the Congress on Robotics and Neuroscience was focused on four different areas:

- Development of meaning: with approaches from Developmental Robotics, Machine Learning, and Brain-based theories.
- Predictive coding for cognitive development: introducing analyses from Neuroscience, Computational Neuroscience, and AI.
- Multimodal cognition: under neuroscientific and psychological scopes.
- Experimental analyses and methodologies: presenting novel methodologies for closed-loop brain training, brain functional connectivity analyses and Machine Learning applications.

On this opportunity, we had the pleasure to count with ten keynote speakers who presented state-of-the-art results encouraging discussions in relation to one or more of these areas. Three workshops introducing scientific tools and methodologies completed the program, spreading knowledge and access to processing and developmental environments on Interactive Reinforcement Learning and data analysis in Electroencephalogram signals.

The accepted works presented during the conference, collected in this volume, tackles a wide variaty of problems comming from areas as robotics, education or data analytics. Along the different proposed analyses, while some approaches are based on a single domain, discussions as the ones in Torres (2018) are crossed among areas. Torres (2018) evaluates different strategies for finding trending topics on a set of scientific articles, through a discussion arround the

[1] Further details in `http://www.roboticsweekla.com`.

[2] a multidisciplinary group of both, undergraduate and graduate students, focused on R&D with emphasis on robotics. More information in `http://innovacionyrobotica.usm.cl`.

recent approaches aiming to describe the brain processes of memory.

Following context characteristics, Ollino et al. (2018) propose a single-agent approach to tackle a multi-agent problem using batch reinforcement learning for developing defensive strategies in a RoboCup SSL (Small Size League) robotic team. The proposed implementation takes advantage of the framework of the team controller, which usually has a team-level decision-maker. The controller learns and executes different responses detailing the action for each agent, from a pre-defined set of actions, following a single team goal to minimize the score of an enemy team. In this same scenario, the already competing team shown in Aubel et al. (2018), presents an in-depth description about design and implementation tasks for different areas tackled in a real SSL team (with physical prototypes), with challenges ranging from structural issues to field strategy problems. In another real world scenario, Silva et al. (2018) describes CRABOT, a six-legged robotic platform for autonomous field recognition and object manipulation. CRABOT was developed under a leg-arm hybrid design: similar to a crab, it can stand on four of its legs leaving two completely free for object interaction, being able to deploy different tools attached to each limb.

Regarding to educational approaches, work in Vallejo-Jiménez et al. (2018) describes some experiences from environments defined as technological academies for STEM (Science-Technology-Engineering-Math) learning scenarios, for primary and secondary level school students in courses such as Mathematics, Physics or applied sciences such as Robotics or Virtual Technologies. In a more theoretical approach, work in Angel and Nettle (2018) presents a review over the last decades of educative methodologies, identifying keys for the development of competences and the acquisition of meaningful learning. The proposal from Angel and Nettle (2018) conclude with a procedural model for educational scenarios, which incorporates metacognitive practices for achieving student's awareness of what is learnt and how and when to apply it.

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