Training Opportunity for Luxembourgish Trainees

Reference	Title	Duty Station
LU-2019-TEC-EDD(4)	Reliable Artificial Neural Network support Systems for Space Applications	TEC-EDD

Overview of the unit's mission:

The Section's domain of responsibility covers control and data handling computers, low-level software, data transfer interfaces, command & control protocols and buses, OBC solid state mass memories, authentication/encryption modules, and general underlying microelectronics devices such as microcontrollers and interface components.

Overview of the field of activity proposed:

Non-linear adaptive systems expand the capabilities of an engineer in order to increase the probability of success in complex and highly demanding space missions. Non-linear systems emerge attributes that are highly desirable from a design point of view such as generalization, learning capabilities, increased accuracy, increased performance with less power, and robustness during failures or unexpected events, to name few. But the behavior of these systems requires extra attention during the implementation in order to enhance the attributes that support the mission requirements and depreciate the ones that loss of control might occur.

One concept that can be implemented as a non-linear adaptive system is the Artificial Neural Network System (ANNS). In this activity the candidate shall learn to design and train ANN in software and test it on either artificial data or real data. The final outcome shall be a software tool that will be used for space applications.

In more detail, the candidate shall learn to design multilayer perceptrons, support vector machines, Hebbian networks, Competitive and Kohonen networks, Time-delay Neural Network, and Reccurent Network. Although the target is to implement in software all the ANNS above, time constraints might limit the implementation to a few only.

In addition, training methods shall be part of the activity. Specifically, the backpropagation learning method (static and dynamic), Hebbian Learning, and Principal Component Analysis are some from the ones that will be used.

Investigation and selection of space applications using ANNS will be also part of the activity. Comparison of the software tool with other commercial products will also be performed.

Finally, possible hardware implementation of the ANNS shall also be considered.

Required education:

Applicants should have just completed, or be in their final year of a University course at Masters Level (or equivalent) in a technical or scientific discipline with specialisation on Electronics and with background on Software domain.