Sapienza PhD in ICT

Doctoral program in Information and Communications Technologies at Sapienza Università di Roma, Rome, Italy

First Year Doctoral Program Form

LAST NAME	Lonardo
NAME	Alessandro
CURRICULUM	Information and Communications Technologies
DOCTORAL CYCLE	XXXII

The Doctoral Program Form contains, year by year, the description of the PhD program of each Doctoral student. This form must be submitted to the PhD coordinator with roughly the following timing:

o by the end of February of the first year for first year students
o before the admission to the second year by perspective second year students
o before the admission to the third year by perspective third year students

The Doctoral Program Proposal is approved by the PhD board shortly after submission. The Doctoral Program requirements place formalized emphasis on methodology and mastery of fundamental and applied engineering systems concepts. A Doctoral Program Proposal should be constructed in agreement with the Faculty mentor, that is the supervisor or tutor, by complying to the requirements, described in the Tables below.

ADVANCED COURSES: 12 CREDIT FORMATION UNITS (CFU)[1]
Only courses/schools providing a final verification test with pass/fail outcome certified by instructor can be included here.

Title	Type	Duration / period	CFU[2]	Motivation for selection
Scrittura tecnico-scientifica	PhD Course	22 hours Jan./Feb. 2017	4	Improve writing skills in order to be able to produce clearer and more effective scientific and technical documents.
I fondamenti epistemologici del sapere scientifico e tecnologico	PhD Course	17.5 hours Feb./Mar. 2017	4	Acquire an epistemological perspective on the concepts and methods learned during the Master Degree courses, as a guideline for the research activities,
PRINCE2 Foundation	PhD Course	24 hours Jun. 2017	6	Get an introduction to the PRINCE2 project management method, its principles, themes and terminology.
Total CFU			14	

SEMINARS AND LABORATORY ACTIVITIES: 6 CFU[3]

Activity	Type	Duration / period	CFU[4]	Motivation for selection
Human Brain Project Summit 2016	Workshop	3 days 13-15 Oct. 2016	1	The programme featured a diverse mixture of plenary sessions, parallel working group meetings, a poster session with over 100 posters and networking opportunities. The candidate had the chance to interact directly with some of the European key scientists in the field of neuromorphic computing.
Development of a hardware/software network architecture prototyping and benchmarking platform.	Laboratory. This activity will be carried out in the context of the H2020 FET-HPC ExaNeSt project, at the INFN APE Lab, Department	100 hours Oct. 2016 – Oct. 2017	5	Prepare the tools for the validation and the performance evaluation of the network architectures that will be designed during the second and third year of the PhD.

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[1] Please insert lines as required/appropriate, and for each line complete each column of the Table.
[2] Indicate here the CFUs that can be accounted for as a result of the successful completion of the activity; for Master Degree courses, assume 1 CFU = 8 teaching hours + 12 homework/study hours, for a total of 20 hours. This rule can be slightly adjusted for other types of courses/activities (e.g., PhD courses may require slightly less hours per CFU)
[3] Please insert lines as required/appropriate, and for each line complete each column of the Table.
[4] Indicate here the CFUs that can be accounted for as a result of the successful completion of the activity; as a rule of thumb, assume 1 CFU = 20 working hours.

			6	
	of Physics at Sapienza Univ.			
Total CFU			6	

ADDITIONAL INDEPENDENT FORMATION AND RESEARCH ACTIVITIES: 6 CFU[5]
Indicate activities that extend and complement the mandatory activities listed above

Activity	Type	Duration / period	CFU[6]	Motivation for selection
Reti Neurali	Sapienza Univ. Master Degree course. code 1007603	March-June 2017	6	Increase knowledge the theoretical foundations of the computational problems to be accelerated.
Total CFU			6	

RESEARCH ACTIVITY: 36 CFU

Research area	Network Architectures
Research topic	Network Acceleration of Spiking Neural Networks Simulations and Bio-Inspired Recurrent Deep Learning Architectures
Framework of the proposed research topic	During the first year of the PhD the candidate will deepen his knowledge of the theoretical foundations of Spiking Neural Networks and Recurrent Deep Learning techniques. Meanwhile he will develop the tools that will be needed later (2nd and 3rd year of the PhD) to validate and benchmark the results of his work.
Research environment	The research activities will be carried out in the context of the H2020 FET-HPC *ExaNeSt* and of the Human Brain Project-SP3 *WaveScales* projects. The ExaNeSt project, started on December 2015 and funded in EU H2020 research framework (call H2020-FETHPC-2014, n. 671553), is a European initiative aiming to develop the system-level interconnect, a fully-distributed NVM (Non-Volatile Memory) storage and the cooling infrastructure for an ARM-based Exascale-class supercomputer. The ExaNeSt Consortium combines industrial and academic research expertise, in the areas of system cooling and packaging, storage, interconnects, and the HPC applications that drive all of the above: Istituto Nazionale di Fisica Nucleare (INFN), Istituto Nazionale di Astrofisica (INAF), EnginSoft S.p.A. and eXact lab srl for Italy, Foundation for Research and Technology - Hellas (FORTH) for Greece, Universitat Politècnica de València for Spain, Virtual Open Systems for France, Fraunhofer Institute for Mathematics (ITWM) for Germany, MonetDB Solutions for the Netherlands, University of Manchester, Iceotope Technologies Ltd and Allinea Software Ltd for the UK. The *WaveScalES* experiment, led by the INFN, is performed by a team of five research institutes. Three of the partners are specialised in experiments on the human brain and the brains of rodents, the other two will concentrate on developing theoretical models and computer simulations. The INFN's APE lab will combine its DPSNN simulation engine and the HBP platforms to develop the large scale neural WaveScalES simulator, which will mimic the behaviour generated by several tens of billions of nerve cell connections, or synapses. The partners in the experiment will measure the slow cerebral waves propagated in the cortex during deep sleep and the waking state, and observe the cortical response to localised spatio-temporal perturbations. The experimental techniques used will include non-invasive observations in humans, such as high resolution electroencephalographic response to transcranial magnetic stimulation, performed by the team led by Marcello Massimini at the University of Milan. And electrophysiological measurements on rodents in response to opto-pharmacological stimulations, conducted by teams led by María Victòria Sánchez-Vives, from the Institut D'Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS) in Barcelona, and by Pau Gorostiza, from the Institut de BioEnginyeria de Catalunya (IBEC), also in Barcelona. The theoretical models will be developed by the Italian Institute of Health (ISS - Istituto Superiore di Sanità), under the direction of Maurizio Mattia and Paolo Del Giudice.

FACULTY MENTOR (TUTOR OR SUPERVISOR)

Prof. Dr.	Maria-Gabriella Di Benedetto
Supervisor signature for approval	

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[5] Please insert lines as required/appropriate, and for each line complete each column of the Table.
[6] Indicate here the CFUs that can be accounted for as a result of the successful completion of the activity; as a rule of thumb, assume 1 CFU = 20 working hours.

27/02/2017