

University of Camerino
Int. School of Advanced Studies



Doctoral Programme in Computer Science and Mathematics

Open Day for Applicants
XXXVII cycle

Coordinator: Prof. Emanuela Merelli

May 21, 2021

CS&MAT Doctoral Program

A cross disciplinary PhD

Computer Science



Mathematics



CS&MAT Doctoral Program

CS&MAT doctoral program aims to stimulate the **personal and professional** development of doctoral candidates to become highly qualified, autonomous, leading **researchers**, and skilled **professionals**.

CS&MAT Research Topics for XXXVII

with co-funded fellowships

Artificial Intelligence and Intelligent Systems (michele.loreti@unicam.it)

- *Collective and adaptive systems*

Computing and Mathematics (sonia.linnocente@unicam.it)

- *Algebraic and logical aspects of quantum computing*

Intelligent Civil Engineering (andrea.dallasta@unicam.it)

- *Historical construction: monitoring and reliability model updating*

Intelligent Healthcare Protection (francesco.amenta@unicam.it)

- *Telemedicine and Teleservices (3 fellowships)*

Machine Learning and econometrics (carlo.lucheroni@unicam.it)

- *Machine learning for energy (2 fellowships)*
- *Machine learning for business analytics*

Software and Information System Engineering (andrea.polini@unicam.it)

- *Open Data and co-creation of public services by governments and companies*
- *Open Data, Enhancing supporting Ecosystem with Algorithm and Artificial Intelligence*

Research topics without UNICAM fellowship, but under agreement

Business Information Systems (knut.hinkelmann@fhnw.ch)

- *Querying and Navigating in Enterprise Model Repositories (FHNW agreement)*
- *A Tool-Based Methodology to assess and develop Digital Leadership (FHNW agreement)*

CS&MAT Other Research Topics for XXXVII

Artificial Intelligence Methods (francesco.santini@unipg.it)

- Explainable AI methodologies based on Knowledge Representation and Reasoning

Bioinformatics (luca.tesei@unicam.it)

- Structural analysis of RNA and proteins

Cybersecurity (francesco.tiezzi@unicam.it)

- Design of resilient systems, Intrusion detection systems, Honey pots analysis

Data Science and Machine Learning (emanuela.merelli@unicam.it)

- Topology driven modelling with applications to biological systems

Formal and Applied Ontology (francesco.orilia@unime.it)

- Representation of relational and temporal information

Investment Valuation in Software and Data (andrea.polini@unicam.it, grid.thoma@unicam.it)

Methodological Aspects of Science Education (carlo.toffalori@unicam.it, francesco.orilia@unime.it)

- Interdisciplinary use of logic in science education

Optimization and Machine Learning (renato.deleone@unicam.it)

- Support Vector Machines and optimization Methods in Machine Learning

Process Management (barbara.re@unicam.it)

- Collaborative and Distributed Business Process Enactment including Blockchain

Software Systems Design and Formal languages (flavio.corradini@unicam.it)

CS&MAT Research LABs

CS&MAT Doctoral Program is developed within and across several research groups and labs, among which:

1. PROS Lab: PROcesses and Services
2. Bioshape and Data Science Lab
3. Smart Mobility Lab
4. Software for Systems and Industries Lab
5. Quantitative Analysis of Systems Lab
6. Algebraic and Logic LAB
7. Econometrics and Machine Learning Group
8. Optimisation and Machine Learning Group
9. Methodological Aspects of Science Education Group
10. Formal and Applied Ontology Group
11. Molecular Ecology in Complex Systems Modeling Lab
12. CS for Health Protection and Telemedicine
13. CA for Seismic and Civil Engineering
14. Computational Molecula Biology

CS&MAT: PROS Lab: PROcesses and Services

Research carried out within the PROS Lab deals with the development of languages and techniques for the modelling, analysis and development of process aware information systems and services oriented applications.

The goal is to push the use of formal methods as methodological and automatic tools for the development of high-quality software development.

The main areas of expertise are formal method and software engineering, with a wide range of applications domain such as smart manufacturing, smart government, smart health and smart city.

Responsible: Prof. Flavio Corradini

CS&MAT: Bioshape and Data Science LAB

Bioshape and Data Science Lab is a laboratory for exploring the power of [algebraic and computational topology within formal methods in computer science for data-driven modelling of complex systems](#). The focus is on RNA folding, Protein interaction, Immune System learning process, and structural and functional brain pattern recognition.

Responsible: Prof. Emanuela Merelli

CS&MAT: Software for Systems and Industries (SSI) LAB

The Software for Systems and Industries Lab (SSI Lab) performs basic research in various aspects of the [design, implementation, analysis, and evaluation of distributed systems](#).

Research is conducted with [systems at all scales](#), from sensors devices to cloud computing data centers.

An [experimental system approach](#) is taken in building real systems to investigate new research ideas. Particular areas of interest include wireless sensor networks, networking, middleware and smart environment programming.

Responsible: Prof. Leonardo Mostarda

CS&MAT: Smart Mobility LAB

Our mission is to implement computational models that make use of Machine Learning (ML) techniques in order to represent critical aspects of the Smart City, with more focus on urban mobility. This allows us to provide public and private stakeholders with scientifically-grounded software capable of supporting their work when it comes to make delicate decisions.

Responsible: Prof. Andrea Polini

CS&MAT: Quantitative Analysis of Systems LAB

Research activities of QuasyLab are focussed on **development of methodologies, tools and techniques for the quantitative analysis of systems.**

Responsible: Prof. Michele Loreti

CS&MAT: Summing up ... go to web site

Research in Computer Science

<http://cs-research.unicam.it>

Research in Mathematics

<https://mat.unicam.it/it/content/attività-di-ricerca>

CS&MAT Phd Candidates

Evaluation days: January 18, 20 and 21

		Evaluation	Exam	
CS	XXXII	0	2	
CS	XXXIII	5		
CS	XXXIV	10		
CS&MAT	XXXV	14		
	XXXVI	14		
		43		

CS&MAT Phd Candidates - XXXIII

COMPUTER SCIENCE -- XXXIII -- 2017		Phd thesis title	Supervisor
1	Brasili Simone	Looking beyond numbers. The symmetry and the search of invariants. An interdisciplinary learning path from primary school to secondary school.	Piergallini Riccardo
2	Marcelli Elisa	Kernel methods in supervised learning algorithms	De Leone Renato
3	Moriggi Pascal	Enable Digital Supply Supply Chain Integration using Blockchain	Holger Wace, Petra Aspiron
4	Pagnotta Fabio	Modelling and simulation of IoT systems	Leonardo Mostarda
5	Peter Marco	A Combined Company Capability and Case-Based Capability Approach for Digital Business Model Innovation	Knut Hinkelman, Stella Gatzju

CS&MAT Phd Candidates - XXXIV

	COMPUTER SCIENCE – XXXIV – 2018	Project	Supervisor
1	Abbas Zaigham	Driving Feature Engineering towards Ontologies	Andrea Polini
2	Altobelli Matteo	Blockchain for the Internet of Things	Leonardo Mastarda
3	Imtiyaz Sahil	Computational aspects of topological field theory of data	Emanuela Merelli
4	Kemal Kilic	Distributed Cloud programming	Leonardo Mastarda
5	Mazzante Gianmarco	Formal Analysis of Smart Contract ASC	Leonardo Mastarda
6	Montecchiari David	Representation and Exploitation of Enterprise Architecture Patterns	Knut Hinkelmann
7	Nalli Giacomo	Machine learning application to e-learning courses	Mostarda-Perali
8	Pinto Carmima Laura Giovanna	The evaluation system	Sonia L'Innocente
9	Veneri Claudio	Scienza Arte Tecnologia del Pianoforte, nella Storia	Renato De Leone (Alessandro Palmieri)
10	Wang Jianjun	Control and applications of logical dynamic systems via the semi-tensor product method	Renato De Leone

CS&MAT Phd Candidates - XXXV

COMPUTER SCIENCE -- XXXV -- 2019		Research Topic	Supervisor
1	Bouarr Khalid	Modelling, verification and programming for robotics applications	Francesco Tiezzi
2	Chaintalapudi Nalini	Application of text mining in seafarers's telemedicine	Francesco Amenta
3	Ceccoini Nicola	Seismic isolation and FE Model Updating	Andrea Dall'Asta, Laura Ragni
4	Chen Jia	Learning and mining brain functional networks based on fMRI data	Renato de Leone
5	Cipriani Leonardo	Civil Seismic Engineering	Andrea Dall'Asta Fabrizio Gara
6	Faloci Francesco	Distributed Ledger Technologies and Supply Chain management	Stefano Bistarelli
7	Fontana Antonio	Mathematical Logic in High School Education	Carlo Toffalori
8	Jiang Xiao	Machine Learning, Survival Analysis	Renato De Leone
9	Luciani Caterina	Process Mining	Andrea Polini
10	Marcelletti Alessandro	Combining Business Processes and Blockchain	Barbara Re
11	Marcozzi Marco	Consensus Protocols for Classical and Quantum Systems	Leonardo Mostarda
12	Rehman Anika	Methods and Tools for Analysis of Smart Systems	Michele Loreti
13	Sestili David	Protocol for scalable o+chain computation	Leonardo Mostarda
14	Pashang Riccardo	econometrics and machine learning	Carlo Luccheroni

CS&MAT Phd Candidates - XXXVI

	COMPUTER SCIENCE – XXXVI – 2020	Research Topic	Supervisor
1	Caraudo Marco	Intelligence systems for Health protection	Francesco Amenta
2	Compagnucci Ivan	Process management (?)	Barara Re
3	Del Giudice Nicola	Collective and Adaptive Systems	Michele Loreti
4	Di Canio Marzio	Intelligence systems for Health protection	Francesco Amenta
5	Fedeli Arianna	Model-Driven application for Internet of Things	Andrea Polini
6	Marchei Daniele	Structural analysis of RNA folding	Emanuela Merelli
7	Matteucci Lorenzo	versatile tool for the analysis of LSS	Michele Loreti
8	Paccamiccio Mattia	Model-Driven application for Internet of Things	Leonardo Mostarda
9	Pettinari Sara	Integration of model-driven engineering with multi-robot systems	Francesco Tiezzi
10	Principi Lorenzo	Intelligent Civil Engineering	Andrea Dell'Asta
11	Riccobelli Paola	Physics laboratory with Arduino	Sonia L'innocente Andrea Di Cicco
12	Scala Emanuele	Security models for scalable blockchain in the IoT	Rosario, Culmone
13	Sprovieri Danillo	Business information systems (?)	Knut Hinkelmann
14	Wang Ping	Optimization and machine learning (?)	Renato De Leone

PhD Research Process

Three phases are identified: 1. the introductory phase, 2. the research phase, and 3. the preparation of the dissertation and defence phase.

- ▶ **GETTING OFF TO A GOOD START** 0 - 3 months
- ▶ **RESEARCH** 3 - 36 months
- ▶ **GRAND FINALE** 36 - 42 months

Doctoral Education Plan

Each doctoral candidate is metaphorically speaking a **student** of UNICAM School of Advanced Studies: the Doctoral Education Programme supports the candidates' development.

Attività formative – I anno

Titolo attività formativa*	CFU	Voto o idoneità
Attività didattiche VERTICALI	10	Idoneità
Attività didattiche TRASVERSALI	10	Idoneità
Attività di RICERCA (con relazione annuale per il passaggio d'anno)	40	Idoneità

Doctoral candidates **take courses** to develop Transferable, Discipline-related and Research skills (minimum of 10 CFU per category). Some credits can be earned through so-called Learning on-the-Job activities, such as presenting, publishing and teaching.

Attività formative – II anno

Titolo attività formativa	CFU	Voto o idoneità
Attività didattiche VERTICALI	10	Idoneità
Attività didattiche TRASVERSALI	10	Idoneità
Attività di RICERCA (con relazione annuale per il passaggio d'anno)	40	Idoneità

The **first-year** doctoral candidates should consider which skills to develop in consultation with their supervisors.

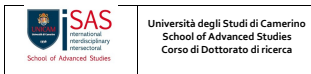
Attività formative – III anno

Titolo attività formativa	CFU	Voto o idoneità
Attività didattiche TRASVERSALI	10	Idoneità
Attività di RICERCA (elaborazione tesi di dottorato e discussione finale per il conseguimento titolo)	50	Idoneità
Totale CFU		180

The **first-year** doctoral candidates should investigate which **courses are available** and prepare a proposal to obtain at least 30 CFU, preferably spreading the Doctoral Education

activities over the first 3 years.

Course available for CS&MAT – Vertical Courses



Computer Sciences and Mathematics a.a. 2020/2021

Docente	SSD	Titolo attività formativa	Codice	CFU	CFU modulo	Mutuato da	Valutazione	Ore Didattica	Semestre
Attività Didattiche VERTICALI									
Piergallini Riccardo	MAT/03	Applied Topology	DOCSM017	3		-	Idoneità	21	II
Loreti Michele	INF/01	Advanced Techniques for System Verification	DOCSM009	4	2	-	Idoneità	28	II
Tesei Luca	INF/01				2				
Corradini Flavio	INF/01	Automata Theory and Formal Languages		2			Idoneità	14	II
Merelli Emanuela	INF/01	Computability Theory	DOCSM019	2		-	Idoneità	21	II
Lucheroni Carlo	SECS-S/06	Electricity from Renewable Energy: Finance, Physics, Mathematics Energy Meteorology and Climatology for Finance and Economics	DOCSM012	3		-	Idoneità	21	II
Orilia Francesco	M-Fil/05	Formal and Applied Ontology		3			Idoneità	21	II
Pucciarelli Sandra	BIO/07	Molecular Ecology in Complex Systems Modeling	DOCSM020	3		-	Idoneità	21	II
Piangerelli Marco	INF/01	Machine Learning and its applications	DOCSM013	4	2	-	Idoneità	28	II
Pilati Sebastiano	FIS/03				2				
L'Innocente Sonia	MAT/01	Model Theory	DOCSM011	3		-	Idoneità	21	II

Teaching Activities

Mandatory 30 hours at most 40 hours of teaching or tutoring

Note: paid teaching activities can not be counted!

Doctoral Candidates Role

The doctoral candidate is the most important actor in the PhD process.

He or she is expected to:

- ▶ **TAKE** the lead and show ownership of the design, organisation and execution of the research work;
- ▶ **DELIVER** agreed work packages on time;
- ▶ **CONDUCT** the research with care and at or above the professional academic standard of the field. Reporting must be complete, clear and results must be well documented. Research data must be well managed and shared according to the requirements set by UNICAM and the funding parties of the research.
- ▶ **STUDY** the relevant work of others and
- ▶ **PROPERLY** acknowledge this work and **NEVER** present work done by others as one's own work;
- ▶ **MAINTAIN** the customary academic contacts with their fellow scientists;
- ▶ **CONDUCT** research and disseminate results in accordance with all applicable codes and regulations, including those regarding agreements made with the funding parties of the research;
- ▶ **WRITE** a dissertation that shows the candidate's ability to; conduct independent scientific research (not biased towards an outcome in the interest of the funding party), to master the topic, to reflect on own methodology and results, and to discuss further research and/or applications;
- ▶ **CONTACT** the mentor or Faculty Graduate School if difficulties occur in the relationship with supervisors and seek professional assistance in case personal problems appear.

Supervisor(s) Role

The supervisors are expected:

- ▶ **TO MAKE** sure that there is a commitment for 3 years (with possible termination);
- ▶ **TO STIMULATE** and support the doctoral candidates in conducting their research and to guide them towards becoming an independent junior scientist;
- ▶ **TO HELP** the candidate to develop a critical attitude, to be able to handle critical comments, and to initiate effective communication;
- ▶ **TO PROVIDE** prompt feedback and assist the candidate at regular meetings to define short- and medium-term goals, to reflect on the progress with the candidate, and to help plan his or her doctoral training and research;
- ▶ **TO INTRODUCE** and guide the candidate into the relevant academic communities;
- ▶ **TO STAY** up to date with UNICAM's policy with regard to doctoral supervision, regulations and quality assessment;
- ▶ **TO HELP** monitor the progress (using the Doctoral Monitoring Application), to provide administrative input and to adhere to work flow schemes;
- ▶ **TO AIM** for completion of the (draft) dissertations within 3 years;
- ▶ **TO CONTACT** the mentor or Faculty Graduate School about non-conformances and concerns.

The supervisor is a member of the Faculty Doctoral Program, he/her is responsible for the Doctoral Process

PhD Agreement

The PhD agreement is a comprehensive project plan and framework for supervision. The agreements are made between the doctoral candidate and the supervisors. The form includes **clear expectations**, a **Doctoral Education plan** and work packages, such as:

- ▶ Working title of the research
- ▶ Name of supervisor(s) and external members
- ▶ Research description and planning
- ▶ The supervisors and the first-year doctoral candidates agree on a reasonable and acceptable project plan and framework for supervision.
- ▶ Publication plan (number and timing of anticipated publications)
- ▶ Doctoral Education planning: skills and competences to be gained and developed and courses to be followed for Transferable, Research and Discipline-related skills.
- ▶ The supervisors agree to the division of specific responsibilities. They ensure that the project's aims, content and planning for the next 3 years are in realistic balance. They establish the right organisational and logistical working conditions for their doctoral candidates.
- ▶ Agreements concerning educational, financial support to attend conference meetings, participation in various research communities and other non-research activities.
- ▶ It is to be expected that the candidate receives **financial support** from the School of Advanced Studies, to travel and present his or her work at international scientific conferences.
- ▶ Teaching activities are part of the doctoral candidates' work and/or education up to 30 CFU.
- ▶ Doctoral candidates can expect to be asked to spend about 10 to 15% of their time on educational or other activities not directly related to their own project. The planning in time of these activities should be done in such a manner that the resulting delay in the research progress of the PhD candidate is minimised.
- ▶ If applicable: arrangements due to the personal situation of the candidate (e.g. candidates **without fellowship**).

More on Doctoral Research Process

Three phases are identified: the introductory phase, the research phase, and the preparation of the dissertation and defence phase.

- ▶ **GETTING OFF TO A GOOD START** 0 - 3 months
- ▶ **RESEARCH** 3 - 36 months
- ▶ **GRAND FINALE** 36 - 42 months

The Research Phase (month 3 – 36)

Good supervision is a critical success factor. At least once a year, each doctoral candidate will have a formal progress and performance meeting with their supervisors for yearly evaluation and assessment. In addition, first-year doctoral candidates and their supervisors should have regularly meetings discussing the progress of the research, the Doctoral Education programme and the overall planning towards finishing the doctoral dissertation in time. It goes without saying that supervisors and doctoral candidates come to these meetings well-prepared and that supervisors reserve ample time for guidance and supervision.

Yearly Progress Meeting – at 12th, 24th and 36th month

Typically 11 and 23 and 33 months after the start of the Doctoral Programme, Yearly progress meetings are held with the doctoral candidate, the supervisory team and the Faculty CS&MAT Doctoral programme to discuss the progress of the research, the production of articles, the planning of the draft dissertation, and the status of the Doctoral Education.

The meeting held after 36 months focusses on the schedule for completing the dissertation and the DE programme. The doctoral candidate's next career step is also discussed.

Preparing for the Gran Finale

– 33 – 42 month

The doctoral dissertation is a professional thesis - arranged according to the prevailing UNICAM guiding principles - which describes the scientific research done by the candidate.

The dissertation may consist of submitted and/or published articles produced by the candidate and written for the appropriate scientific community or may contain a monograph. In both cases a clear introduction and research or design challenge is provided together with ample discussion, reflection and prospects of the results

Next to the dissertation the candidate presents his or her propositions. At least six statements do not directly deal with the research work of the candidate but show the individual's quality to reflect on other e.g. scientific, philosophical and/ or societal matters.

The public defence of the dissertation and propositions is the last exercise. During the defence the candidate is challenged by the defence committee, with regard to the assumptions that are made, the available literature, the methodology that has been used, the conclusions that are drawn and the forecast given.

Mentoring activity for Supporting the PhD Candidate

The mentor supports and advises the doctoral candidate on issues related to the organisation and planning of the research and doctoral education.

- ▶ Mentor function can anticipate possible bottlenecks refer the doctoral candidate.
- ▶ In the unfortunate case that the doctoral candidate experiences doubts or problems regarding the progress of his or her Doctoral Programme the mentor will inquire into the interpersonal relation with the supervisor, and will encourage and help the doctoral candidate to take ownership of the problem.
- ▶ The mentor should never be involved with the doctoral candidate's research work.

Thanks