What background is needed for future professionals in computer science?

The Competency Framework of the UCL Master's Program in Computer Science
You plan to study computer science at UCL and you are asking yourself **whether the skills you will acquire** during your studies (bachelor and master) will be useful later in your professional life ...

You already got a bachelor degree in the field of computer science, you are wondering **what additional skills the master in computer science at UCL can bring you** ...

You recruit computer scientists and you want to identify **the strengths of their training at UCL** ...

... this booklet is for you.

What expertise is needed to **quickly adapt to a first job**? What competencies should a young graduate possess to be able to **evolve throughout his career**?

In response to such questions, a competency framework has been established for the Master’s in Computer Science at UCL, resulting from an extensive collaboration between UCL, particularly the professors of the Ecole Polytechnique de Louvain (EPL) managing the study programs in computer science, student representatives, alumni and business representatives.
The competency framework of the Master’s program in Computer Science at UCL

The program tries to maintain a balance between:

• soft skills and scientific/technical skills,
• striving for excellence and pragmatism.

Beacons to ensure the quality of training

The skills described in this framework are beacons to help guide all those involved in the Computer Science program at UCL.

A competency framework

☐ for students to be involved in their training and to perceive the important concepts as well as their consistency;
☐ for teachers to unite around a collective project and to clarify the position of their courses in the curriculum;
☐ for employers to identify skills that they are entitled to expect of graduates they hire.

A framework for managing the quality of the program

☐ to provide a basis for dialogue between students, teachers, employers and to assess their respective satisfaction;
☐ to guide program changes;
☐ to support its implementation.
At the end of this master’s program, the graduate will be able to organize and carry out every step of the software development process, meeting the complex needs of a customer:

1. To analyze the problem or functional requirements, to meet and formulate the corresponding specification.
2. To model the problem and design one or more original technical solutions that meet these specifications.
3. To assess and classify solutions in terms of the criteria expressed in the specifications: effectiveness, feasibility, quality, ergonomics and safety to the environment.
4. To implement and test the solution.
5. To make recommendations to improve the operational features of the solution.

The bachelor’s program is open to other disciplines. A sound basic training is offered in the following areas:

- Mathematics to model a situation and prove the correctness of an assertion;
- Statistics to perform quantitative analysis of data;
- Economics, management and social sciences to understand the socio-economic world surrounding IT.

The bachelor’s program also aims to acquire basic knowledge in computer science:

- Discrete structures;
- Fundamentals of programming;
- Algorithms and complexity;
- Architecture and organization of computers;
- Operating systems;
- Information management.

The master’s program develops advanced skills in the computer science field. Various areas are addressed in the core curriculum and the student then specializes through an option:

- Networks and distributed systems;
- Programming languages;
- Software engineering;
- Artificial Intelligence.

At the end of this master’s program, the graduate will be able to document and summarize the state of the art in this field.

1. To document and summarize the state of the art in this field.
2. To propose a modeling and/or an experimental device to simulate and test assumptions about the problem.
3. To deliver a summary report to explain the theoretical and/or technical potential innovation resulting from this research.
At the end of this master's program, the graduate will demonstrate both rigor, openness, critical thinking and ethics in his work. While taking advantage of technological and scientific innovations at his disposal, he will take the necessary perspective and be a responsible actor to validate the sociotechnical relevance of a hypothesis or solution:

1. To apply the standards in their discipline (terminology, units of measurement, standards of quality and safety ...).
2. To find solutions that go beyond purely technical issues, integrating sustainable development issues and the ethical dimension of a project.
3. To demonstrate critical thinking regarding a technical solution to verify its robustness and minimize its risks in relation to the context of its implementation.
4. To self-assess and individually develop knowledge to remain competent in his field.
4 strengths of the program

→ Training based on research

UCL is a place for teaching and research. The research conducted in the field of Computer Science within the ICTEAM Institute is internationally recognized. Through the options of the Master’s program, students benefit from this cutting-edge knowledge in the fields of Artificial Intelligence, Networking and Security or Software Engineering and Programming Systems.

Beyond the mere acquisition of knowledge, training is based on a deep understanding of concepts, reflection and abstraction. These skills enable graduates to adapt quickly to the demands of employers. Furthermore, these studies can be extended to research activities and lead to a PhD.

→ From concepts to application

The adaptability of graduates is further enhanced by the importance attributed to the application of concepts in the curriculum. It is inconceivable to master concepts at a theoretical level and not to be able to apply them while facing a practical problem. Therefore, the program contains many projects, assignments, a master’s thesis and the possibility to perform an internship.

→ Openness to other disciplines

Every computer scientist must be able to interact with colleagues from other disciplines who do not share the same technical language, who are not concerned by the same constraints. Graduates are aware of other aspects of the socio-economic world through training in economics and management.

→ International perspective

English is the language most widely used in business and in particular in the technical field. The Master’s program is taught in English to enable non English native students to acquire good skills both oral and written in this language.

Offering a master’s program in English is definitely a position with an international outlook. Teaching in English enables to welcome and host foreign students in good conditions, while allowing them to be immersed in a French environment. It also expands the possibilities for exchange programs and dual degrees with well-known universities.