

[LOGO ED]

**ACCREDITATION REPORT OF THE DOCTORATE
PROGRAM (IAPD)**

**INFORME D'ACREDITACIÓ DEL PROGRAMA DE
DOCTORAT (IAPD)**

COMPUTING

Traçabilitat de les versions del document		
Versió	Data	Modificacions
1	21/02/2017	Self Accreditation Report
2	06/07/2018	Self Accreditation Report including modifications suggested in the Evidences Revision Report issued by AQU

**Escola de Doctorat
Universitat Politècnica de Catalunya**

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1. Context

Identifying Data / Dades identificadores

University/ Universitat	Universitat Politècnica de Catalunya
Name of the Doctorate Program / Nom del programa de doctorat	Computació (Computing)
Code / Codi RUCT	5600085
Web link / Enllaç web	https://postgrau.upc.edu/computing/en
Program coordination/ Coordinació del programa	María José Serna Iglesias, Catedràtica d'Universitat
Contact data / Dades de contacte	+34934137850 mjserna@cs.upc.edu

Responsible for the elaboration of the IAPD / Responsables de l'elaboració de l'IAPD	Academic Committee of the PhD in Computing (AC)
Body responsible for approval / Òrgan responsable de l'aprovació	Junta de l'Escola de doctorat de la UPC
Date of approval of the report / Data d'aprovació de l'informe	23/02/2018

Presentation of the Doctorate Program / Presentació del Programa de Doctorat

The doctoral program in Computing was designed as the adaptation to the EEES of the doctorate program in Software that was created in year 1985. The new framework originated by the guidelines of Bologna made the adaptation of the studies of postgraduate courses indispensable. For this reason a design that integrates a program of Master and another of Doctorate was selected in 2005 in order to provide a solid and competitive training to the students who wished to carry out their research in one of the research topics of the areas of Computing that form part of the research within the program. The actual program resulted from the adaptation to the regulations of the Royal decree 99/2011, the new Master degrees configuration in the area of Information Technologies (IT) at UPC and the new structure of the CS Department. The program has been verified in accordance with the regulations on official University courses defined by Royal Decree 99/2011 by the AQU in October 2012.

The Computing doctoral program covers subjects of research in a set of disciplines related with the programming of the computers: algorithms, programming, big data, bioinformatics, computer visualization, virtual reality, etc. These subjects are a continuation of the studies carried out in the

Bachelor's degree in Informatics Engineering major in Computing, the Bachelor's degree in Mathematics, major in Discrete Mathematics and the new Bachelor's degree in Data Science, as well as other closed in interest degrees. At Master level, those topics are covered in related Master's degrees and the Master in Innovation and Research in Informatics (MIRI) and the Master in Advanced Mathematics and Mathematical Engineering (MAMME) in which the Department has teaching responsibilities, as well as other closed in interest Master degrees. Moreover, these areas of interest are tied to the activity of the companies in the IT sector and to research topics recognized at international level.

The high participation of the research groups involved in the program in competitive research projects, most of them funded at European or at National level, together with the number of doctors who are incorporated to the industry, the universities or to other institutions of research also justifies the opportunity of this doctorate program.

The aim of the program is to train doctors capable of participating in business initiatives as well as of joining international research groups on topics related to computing. Several of the doctors of the program work in research institutes, as for example the Alan Turing Institute, in universities abroad, have created a company, like Nelio Software, or are working in reference companies such as Google or Amazon. Which shows a good level of employability.

In order to focus scientific and methodological skills on specific topics, the programme is structured around the core research areas bound to the research groups involved in the program. This approach ties the research to research groups of recognized international prestige. Thus allowing to keep the research lines of the program within the main stream research along the years. Each research group offers, beside technical support, a set of courses at Master level and research seminars within the corresponding research groups. The formative offer is complemented with the complementary skills activities offered by the UPC Doctoral School.

The related official degrees that grant access to the PhD in Computing are: the Master in Innovation and Research in Informatics with a major in Advanced Computing or in Computer Graphics and Virtual Reality or in Data Science and the Master in Advanced Mathematics and Mathematical Engineering with a major in Discrete Mathematics and Algorithmics.

The doctoral program in Computing/Software has been a fundamental support for a big part of the research performed in the department of Computer Science (CS) at UPC. The program has accommodated national students as well as students from the rest of the world. The acceptance that the program has had among the students, its internationalization and the quality of their doctoral theses have been determining factors when receiving and keeping the mention of quality of the Spanish Ministry of Education and Science since year 2003 (MCD 2003-00130) and obtaining the Mention towards excellence, replacing the quality mention, until 2013 (MEE2011-0425).

The program faculty has international accredited research. The five research groups involved in the program have been recognized as consolidated research groups by the *Generalitat de Catalunya* and two of them got in addition financial support in the 2014 call. Several professors in the program have received the award **Premi García Santesmases a la trajectoria professional**, one of the National Prizes given by the *Sociedad Científica Informática de España (SCIE)*. Prof. Josep Díaz in 2011 and Prof. Fernando Orejas in 2015. Prof. Albert Atserias is the holder of a Starting Grant of the ERC. Prof. Josep Díaz was nominated EATCS Fellow in 2017 and Prof. Jordi Cortadella IEEE Fellow in 2015 they also form part of Academia Europaea since 2011 and 2013 respectively.

Agents who have participated in the preparation of the report (Internal Evaluation Committee) / Agents que han participat en l'elaboració de l'informe d'acreditació (Comitè d'Avaluació Interna)

Nom i Cognoms	Càrrec	Col·lectiu
José Luis Balcázar Navarro	Full Professor, member of the Academic Commission (AC).	PDI Faculty
Marc Comino Trinidad	PhD candidate	PDI en formació (Predoctoral Contract)
Joaquin Gabarró Vallés	Associated Professor, member of the AC.	PDI Faculty
Merce Juan Badia	Administrative responsible of the PhD program.	PAS
Isabel Navazo Alvaro	Full Professor, member of the AC. Chair of the Postgraduate Committee of the Computer Science Department.	PDI Faculty
María José Serna Iglesias	Full Professor, chair of the AC and coordinator of the PhD program	PDI Faculty

Process of elaboration of the accreditation report / Procés d'elaboració de l'informe d'acreditació

The process followed to write this report started after the extraordinary meeting of the *Junta de l'Escola de Doctorat* on 11/10/2017. On the 16/10/2017 the Coordinator informed the Academic Commission of the PhD program in Computing (AC) of the calendar and guidelines to produce the report. After a discussion the AC decided to appoint additionally Marc Comino (PhD candidate) and Merce Juan (Administrative Staff) to constitute, together with the members of the AC, the internal evaluation committee (CAI). The CAI started to work on the 25th of October 2017.

- Oct 25th – 30th reading of the different reports (“verificació/seguiment”) and the corresponding AQU evaluation reports.
- Nov 2nd a list of missing data was produced and Merce Juan and Maria Serna were appointed to collect the data from internal sources.
- Nov 13th the collected data was forwarded to the CAI. The coordinator also informed of the discussions taken in the meeting organized by the Doctoral School on Nov 8th.
- Nov 14th- 20th the CAI prepared a first draft of the report. The draft was sent to the UPC *Gabinet de Planificació, Avaluació i Qualitat* (GPAQ) on Nov 20th. Still some data was missing as well as the improvement plan.
- Nov 21st- 24th the CAI prepared a second complete draft of the report that was sent also to the GPAQ
- Nov 27th- Dec 10th the CAI prepared a third draft and discussed the diffusion of the accreditation report for public comments. On the 7th it was decided to send the draft to the program’s lists of doctoral candidates and to the one of tutors and directors. The draft will also be sent to the members of the Postgraduate Commission of the CS Department and to the responsible of the Administrative Office (UGDSI) and the responsible of the *Laboratori de Recerca i Desenvolupament del Departament de CS* (RDLab).
- On Dec 12th the third draft was sent for comments to the selected mailing lists and people.
- Dec 18th-19th The CAI discussed how to incorporate the received comments: As a result a fourth draft with several improvements was prepared.
- On Dec 20th the fourth draft is forwarded to the UPC Doctoral School for approval.
- On Feb 23rd the approval data is added and the final approved draft is forwarded to the Doctoral School.
- On June 2018 the CAI discussed how to incorporate the comments issued in the *Informe de Revisió de les evidències aportades* issued by AQU
- On July 6th the modified draft is forwarded to the Doctoral School.

2. Evaluation of the achievement of the standards / Valoració de l'assoliment dels estàndards

STANDARD 1: QUALITY OF THE TRAINING PROGRAM / ESTÀNDARD 1: QUALITAT DEL PROGRAMA FORMATIU

The design of the program (research lines, skills profile and training activities) is updated according to the requirements of the discipline and responds to the training level required in the MECES /E l disseny del programa (línies de recerca, perfil de competències i activitats formatives) està actualitzat segons els requisits de la disciplina i respon al nivell formatiu requerit en el MECES.

- 1.1 The program has mechanisms to ensure that the admission profile of PhD students is adequate and their number is consistent with the characteristics and distribution of the lines of research of the program and the number of places offered./ El programa disposa de mecanismes per garantir que el perfil d'ingrés dels doctorands és adequat i el seu nombre és coherent amb les característiques i la distribució de les línies de recerca del programa i el nombre de places ofertes.

The admission profile establishes the basic requirement of having the background necessary to perform research in one of the areas included in the program., i.e., one the research lines actively developed by the research groups supporting the program. The academic profile of the admitted PhD candidates has followed closely the established criteria. Nevertheless, in some cases, we have been unable to assess correctly the academic background and the research skills of some foreigner candidates. This fact has lead, in most of the cases to an increment on the expected time to finish the dissertation and in few cases to abandonment.

Along the years we have received a high number of admission applications of candidates having an IT profile but far away from the expected admission profile. In most of those cases we got non European applicants having a degree on Electrical Engineering or in Computer Science with majors in Computer Architecture or Networking. In those cases, we have rejected the application after assessing that the complementary formation required to match the entrance profile will require more than 60 ECTS of courses of the MIRI or the MAMME. Otherwise, we have fixed the necessary complementary formation. When an admission is rejected, if possible, we have suggested the candidates a most adequate PhD program at UPC.

Upon the follow-up report, we performed an improvement action (919.M.2.2016). As a result the AC is now asking for a detailed description of the research interests approved by a program researcher, as a formal requisite. This has the objective of fostering the initial contact with the faculty involved in the program and to avoiding misplaced applications. The end goal is that the candidates will reach a supervision agreement as a requisite for acceptance as fixed in the actual UPC regulations as well as to guarantee a better access to the research topics included in the program.

As it can be seen from the data, the number of admissions applications have grown-up slightly from 2013 to 2015 with a drop on 2016. Nevertheless, the numbers on the first period for 2017 with 30 applications by November 2017 are quite similar to those before 2016. From those 30 applications 10 could not be validated because some formal requirement was not fulfilled. From the 20 validated applications we have accepted 10. Besides improving the design of the of the web page documentation (919.M5.2017) no additional improvement action seem to be required to increase the number of applications.

The number of offered openings 25 is coherent with the formative capacity of the program faculty. Nevertheless we do not expect to cover all those positions in the short term. In this prospective we take into account two facts. The first one is the low expectative for funds for predoctoral scholarships or contracts. Those have decreased a lot in the past years and we believe that they

will be still low in the near future. The second one is the high rate of employability of the IT sector making that many of our potential candidates decide to opt for an industrial partnership after graduation.

It can be seen that there is a difference between the number of admissions and the number of enrolments. However, we have to take into account that the majority of our candidates require the admission before applying to a funding scheme, scholarship or contract. As we have mentioned those are quite competitive and scarce. We believe that the figures are correct according to the actual economic situation. We believe that getting funds is a crucial point for the program and might require some improvement action from the AC. In consequence we have issued improvement action (919.M.10.2017) to foster initiatives leading to the participation in different funding schema.

- 1.2** The program has adequate supervision mechanisms for doctoral students and, if applicable, training activities / El programa disposa de mecanismes adequats de supervisió dels doctorands i, si escau, de les activitats formatives.

The program has the following established mechanism for supervising the progress of the PhD candidates. The AC performs an annual supervision in July-September of the development of the thesis work formalized by a **research plan** as well as of the **formative activities**. The annual evaluation is performed on the basis of three components. The first one is the **candidate's activity report** presenting the formative activities and the research contributions of the period. The second one is the **advisors' progress report** assessing the correct advance of the research. The third component is related to the definition and development of the **research plan**. In the first year, the AC receives a first short draft of the research plan. During their second academic year the candidates have to write an accurate description of the research plan and make a public presentation in front of an examination panel. The AC uses the draft and the examiners' evaluation in addition to the other documents in the evaluation of the second year. In successive years the candidate submits a report describing the achievements and changes with respect to the latest research plan draft. During the defence year a preliminary draft of the dissertation is submitted to external reviewers. The AC grants the defence of the thesis after a positive appraisal of the external reviewers. Complementary courses are taken from official Master degrees at UPC and they are evaluated according to their corresponding curricula.

The above mechanism is complemented with further actions, when needed, taken together by the AC and the supervisors. For example, the design of additional tutorial or supervising activities, establishing the conditions to improve the research plan after a fail, or the follow up of the academic progress of those candidates that have to take complementary courses in one of the Master degrees related to the program.

All those documents constitute a part of the **doctoral activity document (DAD)** of the PhD candidate. We believe that the overall mechanism is adequate. Nevertheless its implementation could be greatly improved by an online system implementing an electronic DAD. This later fact has led to a proposal for improvement (919.M.8.2017)

- 1.3** The program includes the modifications that have been introduced in the title. / El programa recull les modificacions que s'han introduït en el títol.

There have been only minor modifications. Those have addressed the adaptation of the internal mechanism and processes to the successive modifications of the doctorate Royal Decrees and the corresponding UPC regulations and the natural evolution of the faculty involved in the program.

1. We opted for PhD examination panels of 3 members instead of the 5 members considered in the initial proposal.
2. As stated in the updated verification report, the complementary formation, when required, corresponds to courses in the MIRI, MAMME or other official master degrees at UPC.
3. Prof. José Luis Balcázar replaced Prof. Ricard Gavaldà in the AC.
4. The AC decided to include the program's coordinator in the Admission Committee, in addition to the three academic members of the AC. The discussions are held electronically and directed by the coordinator. The decisions are taken by consensus.
5. Determined the criteria and evaluation procedures for the presentation of thesis as a compendium of publications ([link](#)).
6. Modifications to the program's faculty
 - a. Professors that leave the program
 - i. Christian Blum (leaves UPC)
 - ii. Guillem Godoy (leaves UPC)
 - iii. Maria Lluisa Bonet (absence of activity related to the program)
 - iv. Josep Vilaplana (absence of activity related to the program)
 - b. Professors that enter the program after achieving a permanent position at UPC
 - i. Antoni Chica

EVIDENCES / EVIDÈNCIES

- Updated report for the verification of the degree
- Monitoring report / Informe de seguiment.
- Evaluation of the monitoring report / Valoració de l'informe de seguiment
- Application for admission to doctoral studies / Aplicació d'admissió als estudis de doctorat
- UPC command board / Quadre de comanament UPC

INDICATORS / INDICADORS

Table 1.1 Indicators for the quality of the training program

	2013-2014	2014-2015	2015-2016	2016-2017
Positions offered	25	25	25	25
New enrolled students	8	10	12	3
Total number of students enrolled	45	40	41	35
Percentage of foreign students enrolled	36%	28%	36%	37%
Percentage of students from masters degrees from other universities	38%	40%	46%	46%
Percentage of students with scholarship	29%	25%	24%	40%
Percentage of students enrolled part-time	4%	7%	7%	11%
Number of applications for admission	41	49	56	24
Number of admitted applications	10	18	20	4
Percentage of students admitted with training complements.	10%	11%	0%	25%

STANDARD 2: RELEVANCE OF PUBLIC INFORMATION / ESTÀNDARD 2: PERTINÈNCIA DE LA INFORMACIÓ PÚBLICA

All interest groups are informed in a timely manner about the characteristics of the doctoral program and the management processes that guarantee quality. / S'informa de manera adequada tots els grups d'interès sobre les característiques del programa de doctorat i sobre els processos de gestió que en garanteixen la qualitat.

2.1 Valid, complete and updated information is published on the characteristics of the doctoral program, its operational development and the results achieved. / Es publica informació veraç, completa i actualitzada sobre les característiques del programa de doctorat, el seu desenvolupament operatiu i els resultats assolits.

With the expected technical difficulties we try to keep all the relevant information accessible and up to date. This involves a continuous process of maintenance and actualization of the pertinent information. Nevertheless the information is kept in two different sets of web pages, the ones maintained by the UPC doctoral school (<https://doctorat.upc.edu/ca/programes/computacio>) and the program's own one (<https://computing.phd.upc.edu>). We have to coordinate with the Doctoral School so that from time to time the necessary changes are done in order to eliminate duplicity or inconsistency. The process is not always satisfactory and requires improvement. Improvement action (919.M.6.2017) has been issued to solve this problem. We also want to mention that, in some cases, there might be differences in the reported program results as the sources of information used by the Doctoral School and those used by the program are different. It is worth to mention that the page that has the up-to-date information is the program's one: (<https://computing.phd.upc.edu>).

2.2 Easy access to relevant information on the doctoral program is guaranteed to all interest groups, which includes the results of the follow-up and, where applicable, their accreditation./ Es garanteix un fàcil accés a la informació rellevant del programa de doctorat a tots els grups d'interès, que inclou els resultats del seguiment i, si escau, de la seva acreditació.

Coinciding with the extinction of the program regulated by RD 1393 the program's web page have been updated too following the improvement action (919.M.3.2016). We started another improvement action (919.M.5.2017) whose object is redesigning the web pages. We expect that they will be finalized by February-March 2018. We expect that the new design facilitates the access to the information to all the sectors involved in the program. Besides, we hope that it will be easy to maintain in the future.

2.3 The Quality internal guarantee system (SGIQ) in which the doctoral program is framed is published. / Es publica el SGIQ en què s'emmarca el programa de doctorat.

The PhD program in Computing implements the SGIQ at two levels. At Department level the SGIQ provides the mechanism for the external revision of the PhD thesis before defence while at UPC level the Doctoral School provides the mechanisms for the remaining quality control.

The conditions and nature of the pass through external reviewers is explained with clarity on the web pages of the program. We want to mention that the review process of the thesis defended in the last 4 academic years have involved a total of 94 external reviewers 70 of them from abroad. The indicators of the implementation and results of the review process are given as indicators in the Standard 5 and behave according to the expectations.

For the implementation and definition of the SGIQ at University level we refer to the *Informe d'Universitat* issued by the Doctoral School and the web page <https://doctorat.upc.edu/ca/escola-doctorat/sistema-de-qualitat/sistema-de-qualitat>

EVIDENCES / EVIDÈNCIES

- ❖ PhD in Computing thesis external review process
- ❖ Documentation related to the SGIQ processes on public information, collection of information and accountability / Documentació lligada als processos del SGIQ sobre informació pública, recollida d'informació i rendició de comptes

Taula 2.1. Contingut de la informació pública sobre el desenvolupament operatiu dels programes de doctorat

DIMENSÍO	CONTINGUTS
ACCÉS AL PROGRAMA DE DOCTORAT	<ul style="list-style-type: none"> - Objectius del programa - Perfil d'ingrés - Perfil de sortida - Nombre de places ofertes - Període i procediment de matriculació - Requisits i criteris d'admissió - Procediment i assignació de tutor i director de tesi - Complements de formació - Beques
ORGANITZACIÓ	<ul style="list-style-type: none"> - Grups de recerca - Activitats formatives - Procediment per a l'elaboració i avaluació del pla de recerca
PLANIFICACIÓ OPERATIVA	<ul style="list-style-type: none"> - Normativa acadèmica - Durada dels estudis i permanència - Calendari acadèmic - Recursos d'aprenentatge: <ul style="list-style-type: none"> • Espais virtuals de comunicació • Laboratoris • Biblioteca • Altres - Sistema de garantia interna de la qualitat
PROFESSORAT	<ul style="list-style-type: none"> - Professorat del programa - Perfil acadèmic i investigador - Informació de contacte
PROGRAMES DE MOBILITAT	<ul style="list-style-type: none"> - Objectius - Normativa general - Beques
TESI DOCTORAL	<ul style="list-style-type: none"> - Normativa i marc general (avaluació, dipòsit, defensa, menció internacional al títol, estructura, etc.) - Tesis defensades els darrers cursos acadèmics
INSERCIÓ LABORAL	<ul style="list-style-type: none"> - Principals sortides laborals (empreses, universitats i altres institucions) dels doctorands del programa

Taula 2.2. Indicadors mínims que haurien de ser públics

DIMENSÍO	INDICADORS
QUALITAT DEL PROGRAMA FORMATIU	<ul style="list-style-type: none"> - Oferta de places - Demanda - Estudiants matriculats de nou ingrés - Nombre total d'estudiants matriculats - Percentatge d'estudiants estrangers matriculats - Percentatge d'estudiants provinents d'estudis de màster d'altres universitats - Percentatge d'estudiants matriculats a temps parcial
ADEQUACIÓ DEL PROFESSORAT	<ul style="list-style-type: none"> - Nombre de directors de tesis defensades - Percentatge de sexennis vius dels directors de tesis defensades

EFICÀCIA DELS SISTEMES DE SUPPORT A L'APRENTATGE	<ul style="list-style-type: none"> - Satisfacció dels doctorands amb els estudis - Satisfacció dels directors de tesi amb els estudis
DIMENSÍO	INDICADORS
QUALITAT DELS RESULTATS	<ul style="list-style-type: none"> - Nombre de tesis defensades a temps complet - Nombre de tesis defensades a temps parcial - Durada mitjana del programa de doctorat a temps complet - Durada mitjana del programa de doctorat a temps parcial - Percentatge d'abandonament del programa - Percentatge de tesis amb la qualificació de cum laude - Percentatge de doctors amb menció internacional - Nombre de resultats científics de les tesis doctorals - Percentatge d'estudiants del programa de doctorat que han realitzat estades de recerca - Taxa d'ocupació - Taxa d'adequació de la feina als estudis

STANDARD 3: EFFECTIVENESS OF THE INTERNAL QUALITY ASSURANCE SYSTEM / ESTÀNDARD 3: EFICÀCIA DEL SISTEMA DE GARANTIA INTERNA DE LA QUALITAT

There is a formally established and implemented quality internal guarantee system that efficiently ensures the quality and continuous improvement of the doctoral program. / Es disposa d'un sistema de garantia interna de la qualitat formalment establert i implementat que assegura, de manera eficient, la qualitat i la millora contínua del programa de doctorat.

3.1 The implemented SGIQ facilitates the processes of design and approval of the doctoral program, its follow-up and its accreditation. / El SGIQ implementat facilita els processos de disseny i aprovació del programa de doctorat, el seu seguiment i la seva acreditació.

See the *Informe d'Universitat* issued by the UPC Doctoral School.

3.2 The implemented SGIQ guarantees the collection of information and the relevant results for the efficient management of the doctoral program, especially the satisfaction with the interest groups. / El SGIQ implementat garanteix la recollida d'informació i dels resultats rellevants per a la gestió eficient dels programa de doctorat, en especial la satisfacció amb els grups d'interès.

See the *Informe d'Universitat* issued by the UPC Doctoral School.

3.3 The implemented SGIQ is reviewed periodically to analyze its adequacy and, if necessary, an improvement plan is proposed to optimize it. / El SGIQ implementat es revisa periòdicament per analitzar-ne l'adequació i, si escau, es proposa un pla de millora per optimitzar-lo.

See the *Informe d'Universitat* issued by the UPC Doctoral School.

EVIDENCES / EVIDÈNCIES

See the *Informe d'Universitat* issued by the UPC Doctoral School.

STANDARD 4: TEACHING STAFF SUITABILITY / ESTÀNDARD 4: ADEQUACIÓ DEL PROFESSORAT

The teaching staff is sufficient and appropriate, in accordance with the characteristics of the doctoral program, the scientific field and the number of students. / El professorat és suficient i adequat, d'acord amb les característiques del programa de doctorat, l'àmbit científic i el nombre d'estudiants.

4.1 The teaching staff has an accredited research activity. / El professorat té una activitat de recerca acreditada.

The accredited experience of the academic staff attains a high level. Due to the lack of reliable collected data we have measured the accredited experience and quality of research by the following indicators.

- The number of “sexenis” obtained by faculty who are members of the CS department in November 2017 (direct questioning to the head of the Department). We also indicate how many of those professors attained the last one within a period of 6 years.
- The number of publications (in journals/conferences) listed in the DBLP (or Scopus when the research topic is out of the scope of DBLP).
- The h-index and the number of citations have taken from Scopus.
- The number of active public funded research projects in which the academic staff is involved from the institutional web future.upc.edu.

As for the collective of program's researchers we have considered the following sectors.

- The PhD faculty, formed by those Doctors that where in the list provided in the verification document with the changes mentioned in 1.3. Those are:
 - ALVAREZ FAURA, M. DEL CARME
 - ANDUJAR GRAN, CARLOS
 - ARIAS VICENTE, MARTA
 - ARRATIA QUESADA, ARGIMIRO ALEJANDRO
 - ATSERIAS PERI, ALBERT
 - AYALA VALLESPI, M. DOLORS
 - BALCAZAR NAVARRO, JOSE LUIS
 - BLES AAGUILERA, MARIA JOSEP
 - CARMONA VARGAS, JOSEP
 - CHICA CALAF, ANTONIO
 - CORTADELLA FORTUNY, JORDI
 - DIAZ CORT, JOSEP
 - DUCH BROWN, AMALIA
 - FAIREN GONZALEZ, MARTA
 - GABARRO VALLES, JOAQUIN
 - GAVALDA MESTRE, RICARD
 - JOAN ARINYO, ROBERT
 - MARTINEZ PARRA, CONRADO
 - MESSEGUER PEYPOCH, XAVIER
 - NAVAZO ALVARO, ISABEL
 - NIEUWENHUIS, ROBERT LUKAS MARIO
 - OLIVERAS LLUNELL, ALBERT
 - OREJAS VALDES, FERNANDO
 - PELECHANO GOMEZ, NURIA
 - PETIT SILVESTRE, JORDI
 - RODRIGUEZ CARBONELL, ENRIC
 - RUBIO GIMENO, ALBERT
 - SERNA IGLESIAS, MARIA JOSE
 - SUSIN SANCHEZ, ANTONIO
 - TOST PARDELL, DANI
 - VALIENTE FERUGLIO, GABRIEL
 - VAZQUEZ ALCOCER, PERE PAU
 - VINACUA PLA, ALVARO
 -

- The directors of the PhD thesis defended during the academic years 13-14 to 16-17.

UPC:

- ATSERIAS PERI, ALBERT
- AYALA MARTINEZ, CLAUDIA PATRICIA
- AYALA VALLESPI, M. DOLORS
- BRUNET CROSA, PERE
- CARMONA VARGAS, JOSEP
- CASTRO RABAL, JORGE
- CORTADELLA FORTUNY, JORDI
- FAIREN GONZALEZ, MARTA
- FRANCH GUTIERREZ, JAVIER
- GABARRO VALLES, JOAQUIN
- GAVALDÀ MESTRE, RICARD
- GODOY BALIL, GUILLEM
- GÓMEZ SEOANE, CRISTINA
- JOAN ARINYO, ROBERT
- MARCO GOMEZ, JORDI
- MARTINEZ PARRA, CONRADO
- MESSEGUER PEYPOCH, XAVIER
- MOLINERO ALBAREDA, XAVIER
- NAVAZO ALVARO, ISABEL
- NIEUWENHUIS, ROBERT LUKAS MARIO
- OLIVÉ RAMON, ANTONI
- OLIVERAS LLUNELL, ALBERT
- PELECHANO GOMEZ, NURIA
- QUER BOSOR, MARIA CARMÉ
- RODRIGUEZ CARBONELL, ENRIC
- RUBIO GIMENO, ALBERT
- SERNA IGLESIAS, MARIA JOSE
- SUSIN SANCHEZ, ANTONIO
- TENIENTE LOPEZ, ERNEST
- VAZQUEZ ALCOCER, PERE PAU
- VILA MARTA, SEBASTIAN
- VINACUA PLA, ALVARO

No UPC

- CABOT, JORDI, ICREA Research Professor, UOC
- GUIGO SERRA, RODERIC, coordinator of the Bioinformatics and Genomics program of the Centre de Regulació Genòmica in Barcelona. UPF
- HAUSENBLAS, MICHAEL, Developer Advocate at Red Hat, OpenShift team, Ireland
- MUNTÉS MULERO, VICTOR, Vice President of Strategic Research leading the CA Strategic Research Labs in Barcelona
- RIBECA, PAOLO, The Pirbright Institute, UK
- SAPATNEKAR, SACHIN S., University of Minnesota.

- The directors of PhD candidates in the academic year 16-17.

- ALVAREZ FAURA, CARMÉ
- ANDÚJAR GRAN, CARLES
- ARIAS VICENTE, MARTA
- ARRATIA QUESADA, ARGIMIRO
- ATSERIAS PERI, ALBERT
- AYALA MARTINEZ, CLAUDIA PATRICIA
- BALCAZAR NAVARRO, JOSE LUIS
- BAIXERIES JUVILLA, JAUME
- BLESÀ AGUILERA, MARIA JOSE
- CARMONA VARGAS, JOSEP
- CORTADELLA FORTUNY, JORDI
- COSTAL COSTA, DOLORS
- DADVAND, POOYAN
- DUCH BROWN, AMALIA
- FERRER CANCHO, RAMON
- FRANCH GUTIERREZ, JAVIER
- GAVALDÀ MESTRE, RICARD
- JOAN ARINYO, ROBERT
- MARCO GOMEZ, JORDI

- MARTÍN, CARME
- MARTÍNEZ PARRA, CONRADO
- MORRILL, GLYN
- NAVAZO ALVARO, ISABEL
- PADRÓ, LLUIS
- PELECHANO GOMEZ, NURIA
- PETIT SILVESTRE, JORDI
- VÁZQUEZ ALCOCER, PERE PAU

From the indicators it can be seen that the percentage of alive “sexenis” among the PhD faculty is quite high 91%. This percentage is maintained along the other considered sectors. However we have to take into account that there are other thesis directors that do not form part of the CS Department and we did not have easy access to the information about “sexenis”.

The quantity and quality of the scientific contributions of the program's researchers is very high. This is kept in all the considered researcher sectors. It is worth mentioning that even if many of the publications made by members of this program in the last five years are well positioned in the firsts quartiles of the JCR (Journal of Citations Reports), we do not have the tools to quantify this fact. We have issued an improvement action (919.M.9.2017) to establish a procedure that will allow us to get and keep additional quality indicators in the future. We have included, two simpler to obtain indicators taken from Scopus. The first one is the h-index. The average h-index lies in the range 11 to 14 which is high with respect to the Computer Science areas included in the program. The second one is the number of citations. The average number of citations for the last five years is around 300. The data shows a higher number on the sector of directors of defended thesis. This is due to the fact that in that period we had two exceptional researchers in the Bioinformatics area, Profs. Paolo Ribeca and Roderic Guigó supervising a thesis. Finally, 94% of the PhD faculty is participating in competitive research projects. Overall our assessment is that the quality of the researchers involved in the program is very good.

4.2 The teaching staff is sufficient and has the right dedication to carry out its functions. / El professorat és suficient i té la dedicació adequada per desenvolupar les seves funcions.

As we have mentioned before the number of academic staff involved in the program and willing to supervise thesis is bigger than the demand. The AC has not received any complaint about the supervising tasks. Furthermore, the AC has been always able to find suitable directors to the admitted applicants.

Unfortunately the number of answers to the last satisfaction pool for doctoral candidates was too low. However, we have the impression that the level of satisfaction of the doctoral candidates in the program is quite good. After the monitoring report was issued we started an improvement action (919.M.4.2016) to foster the implication in the satisfaction pools. The action has not been closed yet as the UPC has not launched any new pool.

4.3 The doctoral program has the appropriate actions to promote the direction of thesis./ El programa de doctorat compta amb les accions adients per fomentar la direcció de tesis.

We have not needed to implement any particular action. The structure of the program, grounded on the involved research groups facilitates to keep the possible topics for doctoral thesis match the interests of the researchers involved in the program. In fact we have ever been able to assign a thesis director to each candidate having the required entrance profile. This last fact indicates that the potential thesis directors are well motivated and willing to act as directors.

4.4 The degree of participation of foreign teaching staff and international doctors in the monitoring committees and thesis courts is appropriate to the scientific field of the program./ El grau de participació de professorat estranger i doctors internacionals en les comissions de seguiment i tribunals de tesi és adequat a l'àmbit científic del programa.

The formative activities of the PhD program are grounded on the seminars organized by the

different research groups and, when possible, seminars or short courses organized by the program. Those activities involve a big number of foreigner researchers. We do not have numbers for all those activities. As an example, the ALBCOM seminar organized 27 talks in the past academic year involving 19 international speakers and the ViRVIG group organizes a weekly seminar involving two to four investigators outside of the program.

As we have mention before, another source of internationalization of the program is the pass through external reviewers which involves a good number of experts at international level. Almost each thesis in the considered period have passed through 3 external reviewers. Over 55% and, more usually over 70%, of the reviewers are experts from abroad.

On another direction the number of international doctors involved in the thesis committees is quite good. Observe that close to over 30% of the members of the thesis panels are from abroad.

EVIDENCES / EVIDÈNCIES

- ❖ PhD Web page
- ❖ DBLP: scientific contributions
- ❖ FUTUR UPC: Active projectes actius
- ❖ Scopus: scientific contributions, h-index , citations
- ❖ ALBCOMseminar
- ❖ ViRVIGseminar

INDICATORS / INDICADORS

Table 4.1 Number of sexenis per faculty sector

Sexenis (only counted for membres CS Dept)	Number of faculty UPC/CS	Number of sexenis UPC/CS	Number of alive sexenis UPC/cs	Percentage of alive sexenis
PDI of the program (Verifica)	34/33	--/110	--/31	-- / 93%
Directors of thesis defended from 2013-14 to 2016-17	32/23	-- / 81	--/22	--/91%
Directors of thesis under development in academic year 2016-17	27/23	--/66	--/21	--/91%

Table 4.2 Publications per faculty sector

Publications	Number of papers in Journals 2013-2017	Number of papers in Journals until 2017	Number of papers in Conference Proceedings 2013-2017	Number of papers in Conference Proceedings 2013-2017	Average papers in Journals 2013-2017	Average papers in Journals until 2017	Average papers in Conference Proceedings 2013-2017	Average papers in Conference Proceedings until 2017
PDI of the program (Verifica)	169	840	218	1071	5.12	25.45	6.61	32.45
Directors of thesis defended from 2013-14 to 2016-17	335	1068	386	1617	8.82	28.11	10.16	42.63
Directors of thesis under development in the academic year 2016-17	165	546	270	1020	5.89	20.2	9.64	37.78

Table 4.3 Citations per faculty sector

Citations	Average h-index	STDev h-index	Number Citations 2013-2017	Number Citations until 2017	Average Citations 2013-2017	Average Citations until 2017	STDev Citations 2013-2017	STDdev Citations until 2017
PDI of the program (Verifica)	12.06	4.76	10832	26864	328.24	814.06	363.80	1023.35
Directors of thesis defended from 2013-14 to 2016-17	14.59	11.00	51676	94888	1359.89	2564.54	4612.21	8242.12
Directors of thesis under development in the academic year 2016-17	11.11	5.19	7408	16245	264.57	601.67	272.46	574.71

Table 4.4 Participation in public research projects per faculty sector

Public Research Projects	Total	International	European	National	Regional
Active in June 2017	13	1	2	6	4
Projects in which the Principal Investigator is program's PDI	12	1	1	6	4
Percentage of programa's PDI participating in projects	94%	2.9%	5.8%	91%	52%

Table 4.5 Defended thesis indicators

Defended thesis	2013-2014	2014-2015	2015-2016	2016-2017
Number	10	5	9	8
Percentage de tesis amb 2 directors	50%	40%	33%	75%
Thesis Committees				
Number of membres	50	20	27	24
Percentage of membres from Spain but not from UPC	40%	40%	37%	25%
Percentage of membres from outside Spain	28%	30%	29%	41%
External reviewers				
Number of experts	29	14	27	22
Percentage of experts from outside Spain	72%	92%	55%	86%
Average number of reviewers per thesis.	2.9	2.8	3	2.75

STANDARD 5: EFFECTIVENESS OF LEARNING SUPPORT SYSTEMS / ESTÀNDARD 5: EFICÀCIA DELS SISTEMES DE SUPORT A L'APRENTATGE

The material resources and services necessary for the development of the activities envisaged in the doctoral program and for the doctoral program are sufficient and appropriate to the number of doctorates and to the characteristics of the program. / Els recursos materials i serveis necessaris per al desenvolupament de les activitats previstes en el programa de doctorat i per a la formació del doctorand són suficients i adequats al nombre de doctorands i a les característiques del programa.

5.1 The material resources available are adequate to the number of doctorand students and to the characteristics of the doctorate program./ Els recursos materials disponibles són adequats al nombre de doctorands i a les característiques del programa de doctorat.

The specific material facilities offered by the program have not changed too much in relation to the verification memory. Besides those facilities offered by UPC we have the spaces and resources offered by the CS Department and those of the research groups that participate in the program. In particular

Working space: The CS Department offers to the doctoral students of the two programs 3 rooms for around 10 people each. These rooms contain desks, several desktop computers and access to the department's intranet (reprography, departmental software, ...). It might seem that 30 work places are insufficient for two doctoral programs (60 students approx.). However, in practice these rooms are used much below capacity because students, when they do not have meetings or courses, prefer to work from home or in the library. We want to mention that those spaces are available to doctoral student having or not scholarships. In addition the UPC offers additional rooms for PhD candidates (see the *Informe d'Universitat* issued by the UPC Doctoral School)

Access to bibliographical resources: The UPC libraries offer on-line access to all scientific journals related to the research lines of the doctoral program. Most of the relevant conferences in the area have published proceedings that are accessible through the library or on open-access repositories.

Computing facilities: The CS Department has a *Research and Development Lab* (Rdlab) formed by 4 people that supports the research of the department. In addition to advice and support, they offer access to all kinds of scientific software, and to a cluster with more than 1000 CPU cores and 3 Terabytes of RAM. PhD students can access all these resources if they have the approval of their director.

In particular cases PhD students can get access to the Mare Nostrum which is the machine of the Barcelona Supercomputing Center.

PhD Students doing research in Virtual Reality can get access to the Barcelona Centre of Virtual Reality under the approval of their director. The center, among other equipment, has an immersive stereoscopic room (Computer-Animated Virtual Environment, CAVE). The CAVE is a four walls multi-projector system that functions with 40 off the shelf projectors controlled by 12 PC's. This architecture operates in passive stereo and provides high luminosity and 2000x2000 pixel resolution on each of the walls (16 million pixels in total).

We do not have reliable indicators that assess the degree of satisfaction of doctoral students and directors regarding material resources. Although we can say that we have had no complaint in this regard. As we have mentioned before we are developing improvement action (919.M.4.2016) with the aim of improving the participation in the surveys.

5.2 The services available to doctoral students adequately support the learning process and facilitate the incorporation into the labor market. / Els serveis a l'abast dels doctorands suporten adequadament el procés d'aprenentatge i faciliten la incorporació al mercat laboral.

The support services for PhD students, mainly reception and other logistics services (housing, legal advice regarding residence, etc.), of academic guidance (scholarships, mobility, projects, etc.) and professional guidance and job placement have been implemented at University level.

We do not have reliable information on the satisfaction of doctoral students or thesis supervisors neither established mechanisms to assess their satisfaction at program level. However, no complaints have been received regarding those aspects. We believe that the offer is adequate and provides a reliable support. As we have mentioned before we are developing improvement action (919.M.4.2016) with the aim of improving the participation in the surveys however the UPC doctoral school should take further actions in order to guarantee that periodic surveys cover those aspects.

We refer to the *Informe d'Universitat* issued by the UPC Doctoral School for the implementation at UPC level.

EVIDENCES / EVIDÈNCIES

- ❖ [CS dept. Facilities](#)
- ❖ [RDLAB](#)
- ❖ [Barcelona Supercomputing Center](#)
- ❖ [Barcelona Centre of Virtual Reality](#)

INDICATORS / INDICADORS

- Satisfacció dels doctorands amb els estudis . No reliable data
- Satisfacció dels directors de tesis amb els estudis. No reliable data

STANDARD 6: QUALITY OF RESULTS / ESTÀNDARD 6: QUALITAT DELS RESULTATS

The values of labor insertion indicators are available for doctoral theses, training activities and evaluation are consistent with the training profile. The quantitative results of academic indicators and job placement are adequate. Equals for the characteristics of the doctorate program./ Les tesis doctorals, les activitats formatives i l'avaluació són coherents amb el perfil de formació. Els resultats quantitius dels indicadors acadèmics i d'inserció laboral són adequats.

6.1 Doctoral theses, training activities and evaluation are consistent with the training profile. The quantitative results of academic indicators and job placement are adequate./ Les tesis doctorals, les activitats de formació i la seva avaluació són coherents amb el perfil formatiu pretès.

The profile that is intended to certify upon completion of the doctoral thesis corresponds to the criteria established by the program: *be able to perform research of quality at international level in one of the research areas included in the program.*

We believe that the defended doctoral thesis, the established quality controls in the development of the research plan, and the formative activities of the program are correctly designed and adequate to achieve the planned profile. The formative activities with evaluation correspond to courses at Master level and have the adequate control and evaluative assessment procedure established in the corresponding degree.

For those organized by the Doctoral School we refer to the *Informe d'Universitat* issued by the UPC Doctoral School.

6.2 The values of the academic indicators are adequate for the characteristics of the doctoral program. / Els valors dels indicadors acadèmics són adequats per a les característiques del programa de doctorat.

We believe that the evolution of the data is adequate to the nature and intent of the program. In this appraisal we are taking into consideration several facts.

- The difficulty in finding funds for predoctoral contracts
- The level of occupancy of the IT sector
- The fact that some of the thesis started when the program was regulated under less restrictive time constraints.

Those facts have reduced somehow the number of candidates although we have been close to the provisions of 8 thesis per year established in the verification report. It can be observed that the number of abandonments is pretty low, at most 1 per year. On the other hand the productivity of the thesis, as it can be seen from the indicators, remains high.

During the last four academic years a total of 32 thesis have been defended, 7 in 13-14, 5 in 14-15, 8 in 15-16 and 9 in until November 2017. Most of the thesis have been done within a time window of 4 years. Except for 15-16, in which the figure dropped to 12%, over 50% of the thesis have got the International mention. In 16-17 we have the first thesis awarded with the industrial mention, this thesis was supported through the industrial doctorate funding schema of the Generalitat de Catalunya. From the point of view of publications, the average number of publications in international journals per thesis ranges between 1.4 and 2.6, while the average number of contributions to international conferences lie between 3.4 and 4.7. It is worth mentioning the 4 patent applications derived from the industrial doctorate thesis.

We do not have information about the quality of the publications because the UPC, so far, does not keep track of the publications of the PhD students. We believe that this fact should be part of

a traversal improvement action in the *Informe d'Universitat* to be issued by the UPC Doctoral School. We hope that the future on-line system managing the DAD (see 919.M.8.2017) will allow an easy gathering of this relevant information.

To measure, up to some level, the quality of the publications derived from the program's thesis, we have taken the information of the applications to the last two editions of the "UPC Premi Extraordinari de Doctorat". We have counted the number of papers published in journals indexed in the JCR and conferences included in de Core ranking and classified in the A or B levels. In total there were 9 applications. Recall that in order to apply it is required that the thesis got a cum-laude. Those 9 thesis gave rise to 54 publications. From the 28 such journal publications, 17 of them were on journals in the first third of their area and 7 on the second third. From the 26 conference contributions 15 were in conferences classified as Core A. We believe that those are good indicators of the quality of the doctoral thesis awarded by the program.

Finally, we want to mention that several thesis for the program got the UPC "Premi Extraordinari de Doctorat", in 2017, Daniel Larraz and Jorge Muñoz, in 2016 Bernat Gel, in 2015 Borja de Balle, and in 2014 Hugo Hernández. Furthermore Jorge Muñoz thesis got the award IEEE Best Dissertation in Process Mining, 2015.

6.3 The values of labor insertion indicators are appropriate for the characteristics of the doctoral program. Els valors dels indicadors d'inserció laboral són adequats per a les característiques del programa doctorat.

We do not have statistical data about this aspect other than the survey on labour insertion of doctors in the TIC area run triannually by the Generalitat the Catalunya (see <http://estudis.aqu.cat/dades/Web/Menu/MenuDoctorsView>). From this survey it is clear that the level of coccupacy of doctors in the TIC area is high, around 98%. Furthermore, only around 5% is working in positions that do not require a PhD degree. The average salary is 3.032€. Showing a very good level of laboral insertion. To complement this positive trend, we have got information of the positions held by some of our doctors. Several of them are working at Universities all around the world (U. Iowa, U.Monterrey, U.Valparaiso, Pontificia Universidad Católica, UPC, etc.) , at International research centers (Alan Turing Institute, CIPF, IMPPF) , or at top IT enterprises like Google or Amazon. Some others are working on spin-off companies like Barcelogic or have created a company like Nelio Software. Those positions cover the sectors intended in the program's design including top companies like Google, Amazon or Hewlett Packard. A list gathered after a Web search in October 2017 of the doctors defending their thesis in the period 2013-2016 follows. The intermediate date corresponds to the month and year of the thesis defense. As it can be seen the positions held match the intended ones.

VILLEGAS NIÑO, ANTONIO	ene-13	Co-Founder and CTO at Nelio Software .
PLANAS HORTAL, ELENA	mar-13	UOC
DÍAZ IRIBERRI, JOSE	abr-13	Centre de la Imatge i la Tecnologia Multimèdia CITM (UPC)
NIKITIN, NIKITA	abr-13	Staff R&D Software Engineer at Mentor Graphics, Grenoble France
ABÍO ROIG, IGNASI	may-13	Barcelogic
LÓPEZ CUESTA, LIDIA	may-13	UPC
OJEDA CONTRERAS, JESÚS	may-13	Galgo Medical S.L
OLIVA VALLS, SERGI	may-13	Director, Analytics & Strategy at Philadelphia 76ers
DE BALLE PIGEM, BORJA	jul-13	Machine Learning Scientist @ Amazon Research
HIDALGO GARCIA, MARTA ROSA	dic-13	Centro de Investigación Príncipe Felipe (CIPF) · Systems Genomics

AMELLER, DAVID	ene-14	UPC
CRUZ MATÍAS, IRVING ALBERTO	ene-14	Associated Prof. Universidad de Monterrey Mexico
GASCÓN CARO, ADRIÁN	may-14	The Alan Turing Institute. Warwick UK
STEINER, THOMAS	may-14	Google Germany GmbH, Hamburg, Germany
AGUILERA MONCUSÍ, DAVID	jun-14	Co-Founder and CTO at Nelio Software.
CAMPOALEGRE VERA, LÁZARO	jul-14	R&D 3D Printing Engineer, Hewlett Packard
GEL MORENO, BERNAT	jul-14	Institut de Medicina Predictiva y Personalizada del Cancer (IMPPC)
MONCLUS LAHOYA, EVA	jul-14	UPC
RIQUELME CSORI, FABIÁN ROLANDO	jul-14	Universidad de Valparaiso. Chile
BEACCO PORRES, ALEJANDRO	dic-14	Dept Personalitat, Avaluació i Tractament Psicol. Universitat de Barcelona
MUÑOZ GAMA, JORGE	dic-14	Assistant Professor and Researcher, Pontificia Universidad Católica de Chile (UC)
TARRÉS PUERTAS, MARTA ISABEL	dic-14	Event Lab, UB
ORIOI HILARI, MARC	mar-15	<u>UPC</u>
LARRAZ HURTADO, DANIEL	jul-15	Post Doc U.Iowa
THEOKTISTO COSTA, VICTOR SIMON	nov-15	Univ. Simón Bolivar
CERVERÓ ABELLÓ, MARIA DELS ÀNGELS	ene-16	Institut Caparrella Project Manager, Engine Engineering, POWERATRAN at APPLUS+ IDIADA
CIVIT FLORES, OSCAR	feb-16	UPC
SURINYAC ALBAREDA, JORDI	feb-16	Universidad de Vic
OLIVA MARTINEZ, RAMON	Nov-16	Event Lab, UB

For further comments we refer to the *Informe d'Universitat* issued by the UPC Doctoral School.

EVIDENCES / EVIDÈNCIES

- ❖ List of theses: Web of the PhD program
- ❖ ADU forms: authorization of the thesis defence

INDICATORS / INDICADORS

Table 6.1 Indicators for results

Defended Theses	2013-2014	2014-2015	2015-2016	2016-2017
Total number	10	5	8	9
Percentage with Cum Laude	99%	100%	50%	100%
Percentage of part time theses	0%	0%	0%	0%
Percentage of doctors with mention (International or industrial)	50%	80%	12,5%	55%
Percentage of abandonment	11%	10%	5%	--
Percentage with two directors	50%	40%	37,5%	66%
Percentage with two a director from outside UPC	10%	0%	0%	33%

Taula 6.2 Scientific results

Scientific results	2013-2014	2014-2015	2015-2016	2016-2017
Publications in Internacional journals	26	13	11	17
Contributions to International Conferences	35	22	38	31
Contributions to National Conferences	5	6	1	4
Patents	0	0	0	4

3. Pla de Millora

Fruit de l'anàlisi i reflexió del desenvolupament del programa de doctorat, cal proposar un Pla de Millora.

Relació de propostes de millora

919.M.1.2016	Clarification of the regulations Clarificación de la normativa.
919.M.2.2016	Adequacy and improvement of the admission process Adecuación y mejora del proceso de admisión
919.M.3.2016	Improve the access and update the content of the online information about the program. Mejora del acceso y actualización el contenido de la información on-line sobre el programa.
919.M.4.2016	Improve the participation in the surveys
919.M.5.2017	Redefinition of contents and structure of the program's web pages Redefinición de contenidos y estructura de las páginas web del programa
919.M.6.2017	Update of the information of the program on the web pages of the Doctoral School
919.M.7.2017	Procedure for external reviewers indicators

919.M.8.2017	Online system implementing the DAD
919.M.9.2017	Mechanism for maintaining quality of research indicators for the researchers
919.M.10.2017	Mechanism for fostering and advising participation in funding schemas.
For other transversal improvement actions see the <i>Informe d'Universitat elaborat per l'Escola de Doctorat</i> .	

A complete description is included as Appendix I.

Valoració global del Pla de Millora

As it can be seen the improvement actions are (or have been) intended to solve the detected deficiencies:

1. The manual handling of the DAD
2. The process of gathering indicators for different types of quality indicators
3. The low participation on surveys
4. The design, update and maintenance of the web pages.
5. The adaptation to the UPC regulations.
6. The hardness of finding funding schemes for doctoral candidates

We expect that the first two could be solved satisfactorily in a near future, although they require decisions at UPC level which might delay its implementation. However, we expect that the internal protocols will be defined and ready for implementation by the end of this year, actions (919.M.7.2017) and (919.M.9.2017).

We initiate (919.M.4.2016) addressing the third item after the monitoring report was issued. However as UPC has not yet performed more surveys and it is planning to run a survey in 2018, we decide to keep it open to record the list of additional publicity measures that the AC decides to take.

For the next two, we see them on one side as periodical tasks that have to be coordinated to adapt to changes led by the Doctoral School in a short period. On the other hand the usability of the web page requires a redesign after some period of years. We have implemented (919.M.3.2016) so as to get updated information on the program's web page. As a follow up we are now starting action (919.M.5.2017) and we expect that upon its finalization the program's web page will become really useful and informative.

We have detected new opportunities to address the lack of funding. On one hand the new Erasmus programs that provide funds for short research stays and other schemes like Marie Curie Actions, in particular Initial training networks and European Doctorates. Our impression is that some of our faculty are or could be interested in participating. We have included action (919.M.10.2017) in order to analyze those funding schemes and others and analyze the possibilities for providing further support to participation.

4. Evidences / Evidències

En aquest apartat cal introduir les evidències que suporten l'informe d'acreditació. Aquestes evidències han d'estar disponibles i accessibles per als membres del Comitè d'Avaluació Externa (CAE).

Evidence Name / Nom de l'evidència	Localització (URL)
Updated report for the verification of the degree / Memòria actualitzada per a la verificació de la titulació	https://computing.phd.upc.edu/en/RD99-11/AandA
Monitoring report / Informe de seguiment.	https://computing.phd.upc.edu/en/RD99-11/AandA
Evaluation of the monitoring report / Valoració de l'informe de seguiment	https://computing.phd.upc.edu/en/RD99-11/AandA
Application for admission to doctoral studies / Aplicació d'admissió als estudis de doctorat	https://preinscripcio.upc.edu/home_responsable.php
UPC command board / Quadre de comanament UPC	https://gpaq.upc.edu/lldades/indicador.asp?index=doctorat
PhD in Computing thesis external review process	https://computing.phd.upc.edu/en/RD99-11/AandA
Documentation related to the SGIQ processes on public information, collection of information and accountability / Documentació lligada als processos del SGIQ sobre informació pública, recollida d'informació i rendició de comptes	SGIQ de l'Escola de Doctorat
DBLP: scientific contributions	http://dblp.uni-trier.de/
Scopus: scientific contributions, h-index, citations	https://www.scopus.com
FUTUR UPC: Active projectes actius	http://futur.upc.edu/
ALBCOM Seminar	http://albcom.cs.upc.edu
ViRVIG Seminar	https://www.virvig.eu/
Computer Science Department	http://www.cs.upc.edu
RDLab	https://rdlab.cs.upc.edu
Barcelona Supercomputing Center	https://www.bsc.es/
Barcelona Centre of Virtual Reality	https://www.virvig.eu/equipment.php
List of theses: Web of the PhD program	https://computing.phd.upc.edu/en/RD99-11/AandA
ADU forms: authorization of the thesis defence	In paper – Filed in the personal academic record

APPENDIX I

Relació de Propostes de Millora

<p>919.M.1.2016</p>	<p>Clarification of the regulations./ Clarificación de la normativa.</p> <p>Càrrec: AC of the program/Comisión Académica del PD</p> <p>Origen: seguiment</p> <p>Estàndard: Estàndard 3: Eficàcia del sistema de garantia interna de la qualitat de la titulació</p> <p>Diagnòstic: After the modification of the doctoral studies regulations, some aspects such as the evaluation of the research plan and the requirements for defense by compendium of articles must be adjusted and regulated internally. Trás la modificación del texto regulatorio de la normativa de doctorado, cabe adecuar y regular internamente algunos aspectos como la regulación de la evaluación del plan de investigación y los requisitos para la defensa por compendio de artículos.</p> <p>Implica modificació de la memòria verificada?: No</p> <p>Objectius a assolir: The main objective focuses on the redefinition and adaptation of the different processes and internal regulations linked to the modification of the UPC doctoral studies regulations. The Academic Committee of the Program and its coordinator will work on the definition of the concepts that the regulation leaves to the decision of the doctoral program itself. Once decided by the Academic Committee, the information will be made public in the different pages on which the program is advertised. El principal objetivo se centra en la redefinición y adecuación de los distintos procesos y normativas internas ligadas a las modificación de la normativa de doctorado. La Comisión Académica del Programa y su coordinadora trabajarán en la definición de los conceptos que la normativa deja a decisión del propio programa de doctorado. Una vez decidida por la Comisión Académica la información se hará pública en las distintas páginas en las que se publicita el programa.</p> <p>Accions proposades: The Academic Committee of the Doctoral Program will take the appropriate decisions to establish the internal regulations associated with these processes. Once all the information has been decided, it will be made public in the corresponding web pages. La Comisión Académica del Programa de Doctorado tomará las decisiones oportunas para establecer la normativa interna asociadas a dichos procesos. Una vez decidido toda la información se hará pública en las páginas web correspondientes.</p> <p>Abast: Computació</p> <p>Prioritat: alta</p> <p>Termini: 18/10/2017</p> <p>Estat: Finalitzada</p> <p>Actuacions realitzades: The Academic Committee after a series of meetings set the normative aspects that remain as the power of this commission in the new regulations. The information on these decisions as well as the current regulations was transmitted to the doctoral students of the program in a meeting held on February 9, 2017. The corresponding information was published on the web in April 2017. La Comisión Académica tras una serie de reuniones fijó los aspectos normativos que quedan como potestad de esta comisión en la nueva normativa. La información sobre estas decisiones así como de las regulaciones actuales se transmitió a los doctorandos del programa en una reunión celebrada el día 9 de Febrero de 2017. La información correspondiente se publicó en la web en abril de 2017.</p> <p>Resultats obtinguts: An update of the internal regulations of the doctorate program Actualización de la normativa interna del programa de doctorado</p>
<p>919.M.2.2016</p>	<p>Adequacy and improvement of the admission process/Adecuación y mejora del proceso de admisión</p> <p>Càrrec: AC of the profram/Comisión Académica del PD</p> <p>Origen: seguiment</p>

	<p>Estàndard: Estàndard 1: Qualitat del programa formatiu</p> <p>Diagnòstic: With the experience of the last courses we have detected problems in the selection process of foreign students. Both in the evaluation of their real level of knowledge and in their real research interests. On the other hand, the recently approved regulations require the commitment of the supervisor(s) at the beginning of the studies. Con la experiencia de los últimos cursos hemos detectado problemas en el proceso de selección de estudiantes extranjeros. Tanto en la evaluación de su nivel real de conocimientos como en sus intereses reales de investigación. Por otra parte la normativa recién aprobada requiere un compromiso de dirección al inicio de los estudios.</p> <p>Implica modificació de la memòria verificada?: No</p> <p>Objectius a assolir: Admission of doctoral candidates who have the interest and ability to do the thesis work within the time constraints with granted supervision. Admisión de doctorandos que tengan el interés y la capacidad para realizar el trabajo de tesis en los plazos previstos con garantías de dirección.</p> <p>Accions proposades: The Academic Committee of the program will analyze the inclusion of additional requirements in the application for admission. These requirements may be additional information, such as documents that reliably reflect the areas of research of interest, and mechanisms to establish an initial direction commitment. La Comisión Académica del programa analizará la inclusión de requerimientos adicionales en la solicitud de admisión. Estos requerimientos pueden ser información adicional cómo documentos que reflejen de forma fiable las áreas de investigación de interés y mecanismos para establecer un compromiso de dirección inicial.</p> <p>Abast: Computació</p> <p>Prioritat: alta</p> <p>Termini: 18/10/2017</p> <p>Estat: Finalitzada</p> <p>Actuacions realitzades: In compliance with the current doctoral regulations at the UPC, the Academic Committee of the program agreed on the need to obtain an address commitment as a requisite for admission. This requirement is requested from the 2016-2017 academic year. After the establishment of the commitment the Academic Committee with the help of the future director determines whether or not complementary courses are necessary, the number of ECTS that must be taken. The final selection of subjects will be made by the supervisor. En cumplimiento de la actual normativa de doctorado en la UPC, la Comisión Académica del programa acordó la necesidad de obtener un compromiso de dirección como requisito para la admisión. Este requisito se solicita desde el curso 2016-2017. Tras el establecimiento del compromiso inicial de dirección, la Comisión Académica recaba internamente la ayuda del futuro director para determinar si es o no necesaria formación complementaria y el número de ECTS que se deben cursar en cursos de Master para obtenerla. La selección final de cursos la decide el director.</p> <p>Resultats obtinguts:</p>
919.M.3.2016	<p>Improve the access and update the content of the online information about the program/Mejora del acceso y actualización el contenido de la información on-line sobre el programa</p> <p>Càrrec: AC of the program/Personnel providing administrative support - Comisión Académica del PD/Personal de soporte administrativo</p> <p>Origen: seguiment</p> <p>Estàndard: Estàndard 2: Pertinència de la informació pública</p> <p>Diagnòstic: The information on the PhD program website is not always easy to find. There are multiplicity of access points. On the other hand, the coexistence of more than one regulated Ph.D. studies has often led to some confusion in the parts not common. On the other hand some information is different from the corresponding one on the page of the Escola de Doctorat. The contents are not adapted to the new regulations of the doctoral program. La información en la web del programa de doctorado no es siempre fácil de encontrar. Hay multiplicidad de puntos de accesos. Por otra parte la coexistencia de más de un plan de estudios de doctorado vigentes ha generado, a menudo, una cierta confusión en las partes no comunes. Por otra parte alguna información es diferente a la correspondiente de la página de la Escola de Doctorat. Los contenidos no están adaptados a la nueva normativa de doctorado.</p> <p>Implica modificació de la memòria verificada?: No</p>

	<p>Objectius a assolir: Build a clear web, with an intuitive, sustainable structure and with more agile access to information. Construir una web clara, con una estructura intuitiva, sostenible y con un acceso a la información más ágil.</p> <p>Accions proposades: Review the contents of the web, adapt them to the new regulations. Simplify its structure and, as far as possible, improve the synchronization with the website of the Doctorate School. Revisar los contenidos de la web, adaptarlos a la nueva normativa. Simplificar su estructura y, en la medida de lo posible, mejorar la sincronización con la web de la Escola de Doctorat.</p> <p>Abast: Computació</p> <p>Prioritat: alta</p> <p>Termini: 18/10/2017</p> <p>Estat: Finalitzada</p> <p>Actuacions realitzades: An update of the program's website was made in April 2017, incorporating the adjustments to the new doctorate regulations and simplifying the structure. Se realizó una actualización de la web del programa en abril de 2017 incorporando los ajustes a la nueva normativa de doctorado y simplificando la estructura.</p> <p>Resultats obtinguts: Web pages with updated information to the new regulations. Páginas web con información actualizada a la nueva normativa.</p>
919.M.4.2016	<p>Improve the participation in the surveys</p> <p>Càrrec: PhD Coordinator/Comisión Académica del PD</p> <p>Origen: seguiment</p> <p>Estàndard: Estàndard 3: Eficàcia del sistema de garantia interna de la qualitat de la titulació</p> <p>Diagnòstic: Participation in the doctoral students' surveys is very low. La participación en las encuestas de los doctorandos es muy baja.</p> <p>Implica modificació de la memòria verificada?: No</p> <p>Objectius a assolir: Improve the participation of doctoral students in the surveys. Mejorar la participación de los doctorandos en las encuestas.</p> <p>Accions proposades: Increase publicity. Raise awareness among doctoral students of the importance of the process. Analyze the best way and form to foster participate in the process. Incrementar la publicidad. Concienciar a los doctorandos de la importancia del proceso. Analizar la mejor forma y manera de participación en el proceso.</p> <p>Abast: Computació</p> <p>Prioritat: mitja</p> <p>Termini: 18/10/2018</p> <p>Estat: En curs</p> <p>Actuacions realitzades: During the meeting with the doctoral students held on February 9, 2017, this issue was addressed. Explaining the importance of obtaining objective evaluations of the operation of the program. Durante la reunión con los doctorandos realizada el 9 de Febrero de 2017 se incidió en este tema. Explicando la importancia de obtener valoraciones objetivas del funcionamiento del programa.</p>
919.M.5.2017	<p>Redefinition of contents and structure of the program's web pages/Redefinición de contenidos y estructura de las páginas web del programa</p> <p>Càrrec: PhD program coordinator/ Coordinador del programa</p> <p>Origen: acreditacio</p> <p>Estàndard: Estàndard 2: Pertinència de la informació pública</p>

	<p>Diagnòstic: The information on the PhD program website is not always easy to find. Neither information on program evaluation nor indicators are publicized.</p> <p>Implica modificació de la memòria verificada?: No</p> <p>Objectius a assolir: Web pages more operative and with better accessibility. Including information about the process of verification and accreditation and the essential indicators.</p> <p>Accions proposades: A new design of web pages. A review and update, if needed, of the contents. Incorporation of the new content.</p> <p>Abast: Computació</p> <p>Prioritat: alta</p> <p>Termini: 21/11/2018</p> <p>Estat: En curs</p> <p>Actuacions realitzades: An initial design of the web page.</p>
<p>919.M.6.2017</p>	<p>Update of the information of the program on the web pages of the doctoral school</p> <p>Càrrec: PhD Coordinator</p> <p>Origen: acreditacio</p> <p>Estàndard: Estàndard 2: Pertinència de la informació pública</p> <p>Diagnòstic: The information published about the program on the website maintained by the Doctoral School does not correspond to the verified degree. Some of the characteristics of the program are not reflected in these pages. Some data do not correspond to the one gathered by us.</p> <p>Implica modificació de la memòria verificada?: No</p> <p>Objectius a assolir: Establish a protocol to allows the exchange of information necessary to keep the contents of these pages correctly updated. In case that the information differs an agreement on how to clarify their differences.</p> <p>Accions proposades: Establish a communication channel with the Doctoral School. The AC will prepare a list of differences and discuss how to deal with them.</p> <p>Abast: Computació</p> <p>Prioritat: alta</p> <p>Termini: 21/11/2018</p> <p>Estat: No iniciada</p>
<p>919.M.7.2017</p>	<p>Procedure for external reviewers indicators</p> <p>Càrrec: PhD Coordinator</p> <p>Origen: acreditacio</p> <p>Estàndard: Estàndard 2: Pertinència de la informació pública</p> <p>Diagnòstic: The statistic data concerning the pass per reviewers that is usually presented annually at the Consell de Departament. However it does not does not cover the indicators that we have incorporated in this report.</p>

	<p>Implica modificació de la memòria verificada?: No</p> <p>Objectius a assolir: Arrive to an agreement with the Postgraduate Commission of the CS Dept. and the department responsible for this task on the procedure to extract keep maintain and publicize the relevant indicators.</p> <p>Accions proposades: - The AC of the program will prepare a proposal. - This proposal will be discussed with the responsible of the thesis revisions and the chair of the CS Postgraduate Commission. - The proposal will be sent to the CS Postgraduate Commission. - The AC will take the part agreed in the approved procedure.</p> <p>Abast: Computació</p> <p>Prioritat: alta</p> <p>Termini: 27/11/2018</p> <p>Estat: No iniciada</p>
919.M.8.2017	<p>Online system implementing the DAD</p> <p>Càrrec: PhD coordinator/Chair of the Doctoral School</p> <p>Origen: acreditacio</p> <p>Estàndard: Estàndard 1: Qualitat del programa formatiu</p> <p>Diagnòstic: The actual tools to keep the DAD are mostly manual. Its implementation should be improved by an online system allowing to keep an electronic DAD.</p> <p>Implica modificació de la memòria verificada?: No</p> <p>Objectius a assolir: An o-line system supporting the DAD.</p> <p>Accions proposades: This is a global task that cannot be performed by the program as this needs decisions at the UPC level. The AC of the program will participate actively in any discussion or training activity related to de design implementation and launching of such a tool.</p> <p>Abast: Computació</p> <p>Prioritat: mitja</p> <p>Termini: 11/12/2019</p> <p>Estat: No iniciada</p>
919.M.9.2017	<p>Mechanism for maintaining quality of research indicators for the researchers</p> <p>Càrrec: PhD Coordinator</p> <p>Origen: acreditacio</p> <p>Estàndard: Estàndard 4: Adequació del professorat al programa formatiu</p> <p>Diagnòstic: There are no tools to obtain indicators of quality for the publications of the researchers involved in the program.</p> <p>Implica modificació de la memòria verificada?: No</p> <p>Objectius a To establish a protocol and a mechanism for gathering each academic year indicators on scientific</p>

	<p>assolir: contributions and their quality.</p> <p>Accions proposades: Discuss with the Doctoral School the possibilities to get access to institutional information on quality of publications for the different researchers collectives involved in the PhD program. Based on those possibilities implement plan to guarantee that the objectives can be achieved.</p> <p>Abast: Computació</p> <p>Prioritat: mitja</p> <p>Termini: 11/12/2019</p> <p>Estat: No iniciada</p>
919.M.10.2017	<p>Mechanism for fostering and advising participation in funding schemas</p> <p>Càrrec: PhD Coordinator</p> <p>Origen: acreditacio</p> <p>Estàndard: Estàndard 1: Qualitat del programa formatiu</p> <p>Diagnòstic: We have detected new opportunities to address the lack of funding for PhD candidates. On one hand the new Erasmus programs provide funds for short research stays. On the other Marie Curie Actions, in particular Initial training networks and European Doctorates provide new opportunities for financing doctoral students. Our impression is that some of our faculty are or could be interested in participating.</p> <p>Implica modificació de la memòria verificada?: No</p> <p>Objectius a assolir: Provide adequate support and advice on those funding schemes (and possibly others) to foster the participation of the academic staff</p> <p>Accions proposades: The AC will study the calls and the application process and discuss the best way to provide publicity and support for potential applicants.</p> <p>Abast: Computació</p> <p>Prioritat: mitja</p> <p>Termini: 21/12/2019</p> <p>Estat: No iniciada</p>