

# Guidelines for the preparation of the PhD Thesis Plan

PhD Program in Computer Science  
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## What is the PhD Thesis Plan?

After completion of the PhD courses, all students of the FCT NOVA PhD Program in Computer Science are required to write and publicly present a PhD Thesis Plan. The PhD Thesis Plan is a short monograph (15–25 pages) motivating and describing the planned research work and the contributions expected to lead to a PhD Thesis. The candidate will make an oral presentation and discuss his thesis plan with the Thesis Advisory Committee in a public session (video conferencing is allowed, and even encouraged, particularly if international CAT members are involved). Since the PhD Thesis Plan must be delivered in the early phases of the PhD program, it is neither intended to define a fully scheduled work plan nor a concrete set of expected results. A precise description of results and contributions are only expected in the PhD Thesis Proposal, to be submitted by the end of the research phase and right before the dissertation writing phase of the PhD Program.

The objective of the PhD Thesis Plan is to demonstrate that the candidate is well prepared and has an adequate profile to progress to the research phase of the PhD Program. This means that the student should already have identified some research directions and relevant research problems, has acquired a good knowledge of the relevant scientific area, and is involved in a supporting research environment, arguably leading to a successful PhD thesis by the end of the program. The PhD Thesis Plan will be assessed by an evaluation committee, after a public presentation in a specially organized seminar. A PhD Thesis Plan resembles a project proposal, except that it doesn't need to give so many details on the concrete results and deliverables. It should describe the motivation, novelty, and relevance of the problems to be addressed in the context of the broad research area and state of the art, while highlighting the candidate's ability to successfully conduct the proposed research. Hence, it should not be just a study plan, an activity plan, or a dry abstract of a forthcoming thesis. The student must demonstrate

that he is familiar with the research area in which he is going to work. Although a PhD Thesis Plan will be mostly read and evaluated by experts in the particular subject area, they might not know about all the technical details of the targeted area or problem. So, they will also be waiting to assess the student's ability to situate her goals and research themes for the broader audience in Computer Science / Informatics / Science and Technology.

The Thesis Plan should identify the problem (or problems, kind of problem, or problematic area) the student is aiming to address. The student must invest his best effort to explain why the problem is important, what is new about it (or, if there are already solutions proposed in the literature, why it is believed that he can do better), what are the general ideas to solve it, and what is the plan to tackle it. More concretely, a PhD Thesis Plan should address most of the following aspects:

- *Present the basic idea(s) of the thesis research work*, explain the problem to be solved, why it is challenging, and the approach(es) and tools planned to be built. Explain how (what steps are needed) to go from the promising idea(s) to the solution of the problem. The promising idea is necessarily somewhat far from the solution (as a PhD work is an "in depth" development, and requires some years to complete), so the candidate should really spend some time to elaborate her vision.
- *Explain why the chosen research problem is interesting and relevant.* A PhD thesis is expected to expand the existing body of knowledge. It cannot be something that is built solely on the basis of existing knowledge. It is also not enough to describe a different way of doing something: besides being a different way, it must be an arguably better way (at least in some aspects). Moreover, it must be recognized by the scientific community, measured by publications in relevant scientific venues. So, the Thesis Plan must explain why the research is timely and currently relevant. To give clear support for the arguments along these lines, it is needed to situate the discussion in the context of related research. The state of the art and survey must relate the candidate's ideas with selected references from the literature, emphasizing differences and commonalities, and contextualizing the thesis work in the existing body of knowledge. It is also useful to list the journals, conferences and workshops where the student plans submit his work, providing additional information about the research context.
- *State what kind of results are expected and identify what would be the expected contributions to the field* after carrying out the proposed research. The plan is not expected to be very precise, but characterize the scope of the results (algorithms, models, systems, balance of applied versus theory), and the form in which they will be presented (e.g, methodologies, prototypes, theorems, models).

- *Propose a preliminary work plan*, and argue how the proposed results may be obtainable within the available time frame. It is certainly difficult to be completely sure about a work plan in the beginning of the research phase. But the candidate should be able to put forward some ideas about how to progress, telling “the story” on what steps he will need to go from the stage where he currently is, towards the final goals. In the end, tentative dates should be assigned to each of the steps, taking into account the prescribed time limits (3–4 years). Too schematic, or abstract, plans should be avoided (e.g., “in the first year we will improve our understanding of the state of the art, in the second year we will explore the idea and develop some preliminary results, in the third year we extend, apply and validate the results, and conclude writing the dissertation”). It should be taken into account that the role of the work plan is to allow the evaluators to check that the project is realizable during the PhD, so examples should be given of what kind of preliminary results are being promised, and avoid abusing of vague verbs such as “study”, “explore”, and “attempt”, without further qualification.
- *Include a list of bibliographic references* to support the survey and state of the art as well as the student’s personal qualifications.

## Typical Structure of the Thesis Plan

There are certainly many ways of structuring a PhD Thesis Plan. As with any creative process, writing a Thesis Plan is a very hard job, and substantially influenced by personal factors. In any case, we find it useful to suggest a general template that roughly follows the best practices in PhD programs worldwide. The Thesis Plan text should not exceed 25 pages, and will typically consist of 15–20 pages (excluding bibliography). The student is advised to write his Thesis Plan using LaTeX and either the article style, in *a4paper* format, 11 point font (or equivalent), or the NOVAthesis LaTeX template (<https://github.com/joaomlourengo/novathesis>). Notice that the section titles suggested below are mere place holders, as the most appropriate ones should be chosen for each case.

### 1 Introduction

The Introduction should include a short summary of the major issues behind the proposed research, and provide the context of those issues within a broader background (not only in academic, but also in industrial and social terms, if possible). It may already provide a glimpse of the problems and challenges you intend to solve and the kind of results you expect to obtain, in

general terms. After reading the Introduction, anyone should get an intuitive grasp of what the research issues are and why they are relevant.

## **2 Research Context**

The Research Context should present a survey review of the field and topics in which the work will take place, covering the most relevant technical background and state of the art needed. The main goal is to present the context of your research, describe the research topics, and motivate the issues that will be investigated and solved in the thesis, leading the reader to the Research Statement, as described in the next section.

## **3 Research Statement**

The Research Statement should explain the intended research work, including a description of the kind of issues and problem(s) to address, their motivation, the vision and ideas on how they may be tackled, their novelty, and the expected results. This presentation should be cohesively cross-referenced to the survey included in the previous chapter.

## **4 Work Plan**

The Work Plan should contain a description of how the research work will be organized and scheduled, leading to the written dissertation.

## **5 References**

The list of bibliographic references.

## **Final Remarks**

The evaluation of the Thesis Plan document, its oral presentation, and public discussion is an important event, the first major milestone of the PhD student progress towards the PhD degree. As such, the student should carefully prepare her Thesis Plan, working in close collaboration with the supervisor(s), her first source of advice and guidance. It is likely that it will be necessary to iterate a few times the precise form of the document, so the student should reserve some time to review and polish it before submission. Writing the Thesis Plan should also be a pleasurable and exciting activity, and it gives yet another opportunity for presenting the PhD research plan and receiving feedback about it.