

Note

Design and Implementation of the Bachelor with Honors Program at TU Wien

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Abstract:

This note outlines the Bachelor with Honors (BHons) program of the Faculty of Informatics at TU Wien, the very first honors program shaped according to American standards at an Austrian university. Besides the usual excellence goals of such programs, a main driver for its creation was exposing gifted students to scientific research very early in their academic careers to hopefully prevent them from accepting industry jobs before doing a Ph.D. Main design challenges were broad accessibility for all top students, demanding and fully transparent admission and completion rules, and dealing with severe resource constraints for running the program. Main implementation challenges were the need to convince other Faculties at TU Wien that the BHons would not jeopardize the existing Bologna-type study programs and to overcome certain reservations against such “elite programs” in general. Substantial efforts eventually convinced the senate of TU Wien to approve the program, which was started in January 2018. Albeit still in the bootstrapping phase, we are happy to say that the program has developed very well so far.

Keywords: Bachelor with Honors programs, Bologna system, design challenges, implementation challenges

1. Introduction and Overview

Driven by the need to adequately support and challenge excellent students within the tight constraints of a “mass university” like TU Wien, where more than 600 freshmen enroll to one of the Bachelor programs of the Faculty of Informatics every year, we started to consider ways of accomplishing this in 2016. Besides supporting excellence, a main goal was also to possibly counterbalance the increasing trend among our top Master graduates to accept industry jobs before doing a Ph.D.

Our considerations quickly converged towards creating a Bachelor with Honors (BHons) program in the American style. Main design challenges for establishing such a program in our Faculty were broad accessibility for all our top students, irrespective of the particular Bachelor program they are enrolled in, defining demanding and fully transparent admission and completion rules that make passing the program a real accomplishment, and, last but not least, implementing it without allocating a substantial amount of dedicated resources. Whereas meeting all our design challenges finally turned out to be surprisingly easy, we faced unforeseen problems to actually implement the BHons officially at TU Wien. Main obstacles were the need to convince other Faculties within TU Wien that the BHons would not jeopardize the existing Bologna-type study programs, to maintain compatibility with the law, and to overcome certain deeply-rooted reservations against such “elite programs” in general. Nevertheless, substantial promotion efforts and discussions eventually convinced our senate to approve the program, which could hence be launched in January 2018. Albeit still in the bootstrapping phase, we are happy to say that the program has developed very well so far.

Note outline: In Section 2, we provide a glimpse of the context and the particular goals of our BHons program. Section 3 briefly describes the design challenges that shaped its development, and Section 4 summarizes its mission, cornerstones, and structure. Section 5 sketches some of the problems we faced during its implementation, and Section 6 provides a short summary of its current status and our future plans. The paper is rounded off by some conclusions and lessons learned in Section 7.

2. Motivation and Goals

Unlike in the American academic system, where the importance of honors programs is out of question (Willingham, 2018), to the extreme that Ivy League places like MIT rightfully consider their whole study programs as such, and that “BSc (Hons)” graduates of other universities have a clear competitive advantage over regular ones, the situation is quite different in Europe. Whereas there is a remarkably wide range of excellence programs available, at various levels, in essentially every European country (Wolfensberger, 2015), dedicated Bachelor with Honors programs according to American standards are not generally perceived as a “must have” and are hence quite rare – with the Netherlands forming a remarkable exception, however.

One of the reasons, besides wide-spread reservations against “elite programs” in general, can arguably be traced back to the Bologna system (European Ministers of Education, 1999) with its 3 year Bachelor + 2 year Master + Ph.D., which somewhat disfavors Bachelor-level honors initiatives. Unlike the US system, which allows graduates of 4 years Bachelor programs to immediately enter a Ph.D. school, a European 3 years Bachelor graduate cannot do much besides enrolling in a Master program. As only the latter is usually considered a “real” graduation of a study program, hence a prerequisite for entering a Ph.D. program, for example, there is not much incentive to excel at the Bachelor level.

Nevertheless, we do have excellent students also at TU Wien that deserve to be taken care of adequately from the very beginning, and we do have the responsibility to provide industry and academia not just with a large number of good graduates but also with top ones – the

“classic” duty of honors programs in general. Supporting true excellence was hence the obvious first goal for the design of our envisioned BHons program.

In addition, for quite some time already, several areas in computer science face the problem that the excessive demand of industry for graduates starts to drain scientific research. Given the salaries offered by industry for top Master students nowadays, it is increasingly difficult to “seduce” them to do a Ph.D., even if full funding is available. Apart from the immediate negative consequences for the academic research community, this is also a dangerous development for industry in the longer term; declining scientific research will eventually also slow down their future development.

The second main driver for developing our BHons program was hence the vision that it could provide a handle to also approach this problem, as it provides the opportunity to expose talented students to scientific research early on. In our regular study programs, this happens, at best, late at the Master level. As a consequence, the typical exposure time to scientific research is not long enough to “infect” students with the “research virus,” i.e., the fascination with and the satisfaction originating in successful scientific research, something that is very different from what they know from regular courses. If this happened already at the Bachelor level, according to our idea, this might prevent some students from leaving academia without a Ph.D.

Driven and coordinated by the author of this paper (but see the long list of contributors given in the acknowledgments at the end), we started to approach the above mentioned problems by designing a suitable Bachelor with Honors program at the Faculty of Informatics at TU Wien in 2016. The particular goals of the BHons, in line with TU Wien’s general goal of supporting excellence, were to:

- (i) effectively and early challenge and support outstanding students,
- (ii) early develop research interests,
- (iii) adequately educate our top students within a “mass university”,
- (iv) provide better career perspectives for them, and
- (v) attract excellent students to computer science.

3. Design Challenges

The special situation in our Faculty of Informatics, which runs 5 different Bachelor programs with overall more than 600 freshmen every year, posed several challenges that could not be addressed by the typical setup of honors programs like the one of the University of Oslo (Myklebust, 2019), for example.

Indeed, we were faced with the question of how to set up a Bachelor with Honors program that:

- is accessible for all talented Bachelor students in our Faculty, irrespective of their particular study program,
- allows admission based on the actual performance of the applicants in their regular Bachelor program at TU Wien, i.e., is not based on accomplishments obtained outside our sphere of control,

- has completion criteria that provably select for the < top-5% of our students, in a way that is strictly performance-based, transparent, easy to monitor internally, and easily verifiable from the outside,
- is attractive enough for gifted students to take both the additional effort and the risk of failing the program,
- provides tangible benefits for students who successfully complete the program,
- is easy to implement and does not consume significant resources for running the program,
- is compatible with the Austrian law, and hence with the Bologna system, and
- can be “exported” to other Faculties at TU Wien with minor effort and adaptations.

Whereas it was not at all clear at the beginning whether we would be able to meet all these challenges, it was finally surprisingly easy to do so. The process of developing our BHons program was essentially based on assembling a draft program, which was successively refined by collecting, integrating, and refining suggestions for improvement issued by an expert group. In the following section, we describe the final result of this process, which indeed meets all the challenges above.

4. Cornerstones of our BHons Program

Mission statement:

“The Bachelor with Honors Program of the Faculty of Informatics at TU Wien targets excellent students from all Bachelor Programs in Informatics and Business Informatics, who are seeking individual challenges in addition to their regular studies. It aims to nurture outstanding students in line with their talents, and to engage them in scientific research at an early point in their studies.”

Key features:

- Bachelor with Honors program (45-60 ECTS), individually composed by the student, consisting of:
 - Bachelor and Master courses of any reasonable study program, at any good university. Note that Master courses may be shared with a concurrent regular Master program!
 - Few BHons-specific courses (orientation, internship project, summer school).
 - Some restrictions for the 45 ECTS standard program (like not too many projects, to prohibit supervisors from abusing BHons students as workhorses); no restrictions (but the need for a convincing justification) for the extended 60 ECTS program. Note that the latter takes a full year, for compatibility with international 4 years Bachelor programs.

The individual BHons program must make sense topic-wise, and must respect all dependencies of the selected courses. It needs to be justified upon application.

- Individual mentoring by a full or associate professor of the Faculty, who can be chosen by the student.
- Admission twice a year, subject to performance-based criteria:
 - Passing of at least 72 ECTS of mandatory courses in the regular Bachelor program, with weighted grade point average ≤ 2.0 (the Austrian grades range is 1 – 5, with 1 being the best grade),

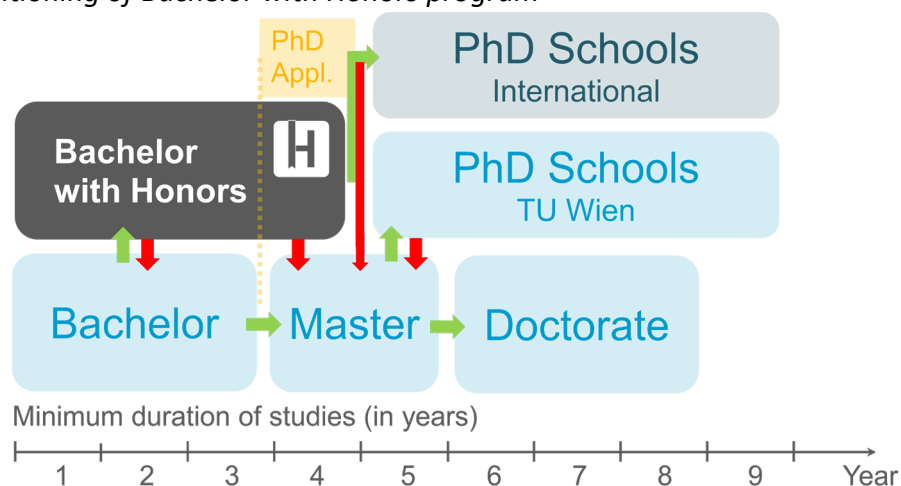
- a realistic chance to meet the completion criteria (which are considerably harder, see below),
- a suitable and convincing BHons program,
- a suitable mentor.
- Solely performance-based completion criteria, which provably select for the < top-5% of our students:
 - Completion of regular Bachelor program with distinction,
 - overall weighted grade point average of both regular Bachelor program and BHons program ≤ 1.5 ,
 - overall duration of regular Bachelor + BHons program ≤ 9 semesters overall.

Note carefully that the fulfillment of these requirements can be validated externally, by means of the certificates for the regular Bachelor program and the BHons. Fulfilling these criteria is hence a real accomplishment.
- No monitoring of the students while in the BHons program: students failing the completion criteria won't get a certificate and drop out automatically after 9 semesters.
- Successful completion earns:
 - Representative Bachelor with Honors certificate, signed by the TU Rector, the TU Vice-Rector for Academic Affairs, the Dean and the Dean of Academic Affairs of the Faculty of Informatics. The certificate also lists the complete BHons program and the obtained grades.
 - A personal letter of recommendation from the TU Rector, certifying being among the < top-5% of our students.

Embedding in our study programs:

Designed as a 1-year extension of their regular Bachelor's degree, students with outstanding academic achievements can acquire a 4-years Bachelor's degree with Honors comparable to the American model (Figure 1):

Figure 1. Positioning of Bachelor with Honors program



Students can enter the BHons program at any time during and even after their regular Bachelor program, subject to the above performance and time constraints. The additional 45-60 ECTS BHons program can overlap with a simultaneously enrolled Master program,

which allows BHons students who fail the BHons completion criteria not to lose the credits already obtained. Note that BHons students can apply for external Ph.D. schools already after having obtained their regular Bachelor degree (i.e., after 3 years), and can use the waiting period until decision for completing the BHons program.

5. Implementation Challenges

The process of designing the BHons program proceeded reasonably smoothly and converged quickly, despite the fact that people (professors, students) with very different perspective were involved. What we did not at all foresee initially, however, were massive objections against the BHons in other Faculties at TU Wien and in the senate that popped up only when we tried to officially implement it:

- The philosophy of other Faculties at TU Wien rests firmly on their Master programs, in the sense that the main academic education happens there. Since our BHons essentially allows students to simulate a 4 years Bachelor, which allows admission to international Ph.D. programs, it is considered a threat to their Master programs. Consequently, as of now, BHons graduates are not allowed to immediately enter a Ph.D. program at TU Wien.
- A substantial fraction of faculty members openly displayed their reservations against a honors program in general, culminating in statements like “favoring good students is a discrimination of bad ones” (made by a full professor!), for example. This is in line with Wolfensberger (2015), who observed that it is the case (albeit rarely admitted) that many people resent “elite programs” and competitiveness in Austria, like in many other European countries.
- Some members of the senate were concerned about potential incompatibilities with the law, in particular, the Bologna rules.
- Some members of the senate, in particular, the student representatives, were concerned about the danger of creating a “2 class society” among our students.

Overcoming those objections proved to be a challenge and ate up more than half a year of promoting the BHons and discussion with many members of the seven other Faculties and, last but not least, of the senate of TU Wien, who is responsible for approving all study programs.

Fortunately, the final vote in the senate was in favor of implementing our BHons program, which is hence part of the official curricula of all Bachelor programs of the Faculty of Informatics since October 2017, see e.g. (Faculty of Informatics TU Wien, 2019).

6. Current Status

The BHons program started in January 2018. As of October 2019, 24 students have been admitted to the program overall, 4 successfully graduated, and 1 failed the completion criteria.

Given the very high teaching load of the members of our faculty, it is impossible to invest substantial resources into dedicated BHons courses in the foreseeable future. Consequently, the number of BHons-specific courses is currently very low:

- There is a mandatory 1 ECTS BHons Orientation course, which is primarily used for internal community building.
- Standard courses based on individual supervision, like scientific and engineering projects and Bachelor thesis, are tailored to the needs of BHons students: Typically, they include the involvement into some funded research projects. Actually, since 2018, the two major research funding agencies in Austria, the [Austrian Science Fund \(FWF\)](#) and the [Vienna Science and Technology Fund \(WWTF\)](#) allow their project leaders to also fund BHons students from their projects.
- There are dedicated BHons courses for short-term internship projects (long-term projects are incompatible with the demanding BHons requirements and hence discouraged) and summer/winter schools, which broaden the horizon and are hence very attractive for our BHons students. They usually require scholarships, however.

Resources permitting, our plan is of course to increase the number of specific BHons courses in the future, e.g., by means of dedicated seminars.

BHons internship program: 5-week internship projects (6 ECTS) at academia (better ranked than TU Wien) or industry (well-known and also research-oriented). Currently, our network consists of the following host institutions:

- *Academia:* Purdue University, ENS Cachan, MPI Saarbrücken, University of Illinois at Urbana-Champaign, IST Austria.
- *Industry:* Infineon, Intel, Robert Bosch AG.

Negotiations with other potential host institutions are on-going; individually arranged internship projects are also quite common.

BHons scholarship program: Application-based scholarships (typically € 3,000), given by our Faculty and also sponsors (research funding, academia, industry). Current sponsors, besides our own Faculty, are:

- *Austrian funding agencies:* WWTF, FWF.
- *Industry:* Infineon, Intel.

Negotiations with other potential sponsors are on-going (but tough).

Last but not least, we also took measures to better integrate BHons students into our Faculty: For example,

- all social events of our various Ph.D. Schools (like LogiCS and RES) are also open for BHons students,
- BHons graduations take place at the EPILOG of our Faculty of Informatics, where all Master theses of the last semester are on display and the “Distinguished Young Alumnus” is elected among those.

Success stories: Some of our BHons students did extremely well in international competitions, which shows that the program already comes up to our expectations. A few examples:

- Two of our BHons students applied successfully to the extremely competitive 2019 Research Fellowship Program at ETZ Zurich.
- One of our BHons students successfully published his first research paper at a conference, which also won an invitation to a journal special issue for the best papers.

- From the 2018 report of the International Advisory Boards (IAB) of the Faculty of Informatics at TU Wien [Hans Akkermans (Vrije Universiteit Amsterdam), Carlo Ghezzi (Politecnico di Milano), Edward A. Lee (UC Berkeley), Nadia Magnenat-Thalmann (University of Geneva / Nanyang Technological University), Moshe Vardi (Rice University): 'The Bachelor with Honors program is a great initiative.'

Future Plans: Despite the very positive signs listed above, our BHons program is still in a bootstrapping phase. We currently do not get even half of the students who are in the < top-5% range to apply for the BHons program, which reveals considerable room for improving the attractiveness and the awareness of our prospective students. We are also continuously working on possibly expanding our still very small network of internship host institutions and, in particular, on attracting a larger number of prestigious sponsors for BHons scholarships.

Ultimately, a convincing sign of having eventually succeeded with our program would be the adoption of our BHons program by some other faculty at TU Wien or elsewhere.

7. Conclusions: Lessons learned

In this note, we provided an overview of the goals, design challenges and implementation of the Bachelor with Honors program of the Faculty of Informatics at TU Wien. The most important lessons learned in the course of setting up and running our BHons program were the confirmation of the importance of:

- (i) having a clear vision of the goals of the program,
- (ii) our strong commitment to demanding, solely performance-based and fully transparent admission and completion criteria,
- (iii) our strive for creating a true win-win situation for students and faculty, including the implementation of an escape path in case of failures, and
- (iv) our decision to primarily offer opportunities to the students but giving them as much freedom as possible.

Our experience with designing and setting up the BHons during the last 3 years allow us to conjecture that succeeding with such an effort requires primarily (i) an experienced and well-connected person who is really devoted to this task and is willing to invest quite some time and effort to drive and coordinate the various activities that are needed for its design and implementation, and (ii) representatives at all levels, from the faculty to the senate to the rectorate, who wholeheartedly support the undertaking. Our BHons proves that it is doable if these prerequisites are met.

Acknowledgments

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Link

Details about the program can be found at <http://informatics.tuwien.ac.at/bachelor-with-honors>