CS PhD student in the Netherlands: to be or not to be?

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You are completing a MSc-level study and feel qualified to apply for a PhD. You are toying with the idea to apply for a PhD position in computer science in the Netherlands. Not sure whether to do it or not. Then perhaps this document will help. (disclaimer: perhaps it won't.)

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Note

The latest version of this document can be found online at https://dr-knz.net/so-you-want-to-apply-for-a-cs-phd.html. Alternate formats: Source, PDF.

Prologue

After I wrote the first version of this document, without this prologue, I received some heat, in the form of comments stating that the text read too "dry" or "cynical" and that I "probably had a bad time with my PhD". The opposite is true, but the feedback does warrant a little additional explanation.

Usually advice about whether to start a PhD focuses on motivations, with statements of the form "if you like this, then do that" or "if you want to achieve this, then do that" (eg. "if you like doing research and want to do it more later, then you should do a PhD"). This is typically written by people who have gone through the process already, and who reflect back on the motivations they have found on the way.

However this approach is pedagogically flawed: as any PhD can confirm, PhD candidates only discover their motivations *after* they start. My experience is that most MSc students – or rather, most people in the typical age group – have no clear idea of what they really like and what they want for their future.

And that's all right!

However, it does mean that it is not too helpful nor constructive to describe PhD trajects in term of how it serves what you like or want for your future. So I won't do that. Also, it would be patronizing for me to tell you that "you should like this or that" in order to apply to and complete a PhD successfully. So I won't do that either.

Yet I feel it is my responsibility to write about what is usually not written on the topic, because either it is controversial, because it reveals the messy side of the business, or because it could potentially lower your interest for the job. You see, there is a lot of competion between research groups about who can hire the most and brightest PhD students. So a lot of potential advisors have to depict a rosier state of affairs than reality to compete and score the best candidates. Thankfully, I am not recruiting (yet) and can thus write on the topic without too much bias.

So yes the text below reads like plenty of negative things: reasons for you not to apply if you don't like what I have to say. But that's a feature, not a bug. Think about it like potential parents when they think of having their first child. It would be irresponsible for them to not think about things that can go wrong, and you as well should act responsibily by not going through if you know in advance there would be a serious problem. However, as parents usually find out, once the child is there (or you accept a position where you have applied), although you have no choice but to make it work *and it will be insanely hard*, it is usually possible to eventually draw some satisfaction from the ordeal.

Overview: good and bad reasons

Really there are plenty of bad reasons to start.

- **don't go in for teaching, money or social status**. These are really orthogonal issues. More on this below.

- **don't go in just because your friends did, or because you know someone in the research group already**. Your acquaintances will not (and cannot) support your success and help you complete your PhD. Chances are they will move away while you're still on it. Chances are they will become your competion. If all you have is social inertia, it simply won't work.

- **don't go in to win a Turing award or become world famous**. The chances of this happening are slim to none: too much competition, too little opportunity. Anyway, if you had a significant chance at either, you would not be reading this document in the first place.

- **don't go in to "improve the condition of mankind"** – be it via producing new scientific knowledge, delivering good teaching or whatever strategy you want to excercise. You will be far too busy each day dealing with the next you won't be able to deliver on your own expectations about this. Even if you try, you are human, humans make mistakes, and chances are either you will do more harm than good, or whatever you do will have no significant bearing on the rest of mankind. Also the PhD reward system (see below) will not notice you helping mankind, and it will have no bearing on how your peers evaluate your work (and thus how your success will be measured).

- **don't go in to "solve problems"**. If you like to solve problems, do a PhD in maths, or work as an engineer. I recommend the latter, it is very satisfying and the pay is stellar. A PhD in CS is about *creating* (or recognizing) new problems, not solving them. See the discussion on the pyramid scheme below: your job will be to convince other suckers that your (new) problems are the most important in the world and that they must help you by solving your problems. Conversely, if you have the feeling that your scientific job is solving problems, it implies you are someone else's sucker.

  A corollary is that you will spend most of your work time thinking about new problems without solutions. This is very frustrating / depressing psychologically.

- **don't go in to "learn interesting stuff"**. Of course you will learn interesting stuff in CS, but that is only a tiny part of what you will be doing. Actually it is worse than that: you must learn an insane lot of new, interesting, exciting stuff before you can even begin doing the important work. You must learn *so much* that you will nauseate at the amount of new knowledge you need to process during your PhD traject. Soon enough the word "interesting" will equate in your mind with "so much, too much work to learn" and you will become extremely picky about what you invest learning. And even then, *it will not be enough*: the real work for which you will be rewarded begins only when you start delivering new stuff, and nobody will start caring about you having learned something interesting before then.

- **don't go in to obtain stable employment by a university in the Netherlands**. The chances of this happening are currently slim to none, because of the pyramid scheme described below. However a PhD may increase your chances of stable employment by other teaching organizations, either a Hogeschool in the Netherlands or a university in other countries.

- **don't go in if you can't read and write in English**. By "reading" I mean the ability to deeply, intellectually process more than 4 pages of dense technical writing per hour. For example you should be able to fully summarize this article by Peter Naur and explain it to a peer within two hours. By "writing" I mean the ability to produce more than 4 pages of dense technical writing per day. For example you should be able to produce the equivalent of this article in your field of expertise by tomorrow.

Nobody will do this reading and writing for you. A weak ability at reading or writing may be just enough to complete your mandatory responsibilities and avoid getting you fired, however you *will* need the intensive ability to be rewarded (see reward system below).

Although I promised I won't tell you "do this if you like that" I can acknowledge there are some notable positive correlations between PhD success and personal interests:

- **scientific knowledge**: if you like producing new hard knowledge (the one grounded in fact and observation, not belief or promises), or refining existing knowledge, then a research career is the only way you can achieve this. Consider a PhD as the professional training you will need to continue doing it on the longer term.

  Note that this includes phrasing testable hypotheses and designing sound experimental protocols. Yes, even in CS. Beware that most undergraduate (BSc, MSc) CS studies in the Netherlands do not prepare you appropriately to the scientific method. So it will be particularly hard if you come from there.

- **philosophy of information**: if you like thinking about the metaphysics of truth and what it means for people to think and communicate their thoughts through a machine, then the 4 years in your CS PhD will be the only opportunity in your life to get paid to study this.

  (Note: even if you go on with CS later on, never anyone will pay you again to do philosophy. So use these 4 years well.)

Orthogonal issues, not relevant in your decision

- **There is plenty to read on the web about CS PhDs in the USA and the UK, however you should not let this influence you significantly**.

  The USA and the UK have extremely different PhD systems from the legal, educational and administrative perspective, and culturally a quite different incentive system too.

  If what you read about USA and UK PhDs makes you want to go further, then you should apply for a PhD in the USA or the UK, not the Netherlands. If what you read about them tends to drive you away, then don't do it in the USA or the UK. However this should have little bearing on your reasons to apply or not in the Netherlands.

- **The money issue is (mostly) orthogonal**.

  You can be extremely rich / upper class after you complete a CS PhD, or you can be middle class. *This is true also if you have a CS MSc and do not complete a PhD.* Only the means to achieve your monetary goal (whatever it is) will differ; the effort needed to achieve the goal will not change significantly.

  As you are paid a decent salary during your PhD in the Netherlands, you need not experience the PhD study as a financial drag/setback. I have met people who have successfully supported a child and a mortgage on their PhD salary and also defended successfully.

- **The social status issue is (mostly) orthogonal**.

  In CS/informatics you can gain a lot of social status working a job outside of the university, even if you do not become a company executive. You can gain a lot of social status working at a university or research institute, too.

Social status is about projecting your self-worth onto others. Thanks to the special role of CS and computing technology in the early 21st century, as soon as you are decent at programming and working with computers and can defend your ego in public, your social status will become/stay high no matter what.

- **The opportunities for teaching are (increasingly) orthogonal**.

  In most places in the world including the Netherlands, permanent teaching positions in universities are reserved to PhD graduates. However, you can also become a teacher for high school maths / informatics and in the vocational schools like the Dutch Hogeschool. For these positions, a PhD is not required: only a MSc in relevant disciplines and a complementary education diploma, which you can obtain using part-time studies next to a regular job.

  Morever, Dutch universities are currently experiencing a critical shortage of teachers in some CS areas like software engineering, they are already hiring non-PhDs to deliver some courses, and I predict this will happen increasingly often in the foreseeable future until/unless the CS economy changes significantly (more on this below).

  Also you should consider that as a teacher you will not make too much difference in the life of university students. If you are a good teacher, your students in high school or hogeschool will reward you more with their progress than university students.

Check compatibility with your other responsibilities

Do your personal math properly beforehand. Does a PhD traject fit your lifestyle?

- salary according to the standard salary scale (see job advertisements or look it up) for 4 years;
- between 40 and 50 office hours per week, 60 and 120 hours per week thinking about work in your head;
- several multi-day travels per year away from home.

Do you have pets and/or children and/or other dependents under your responsibility? If so you *must* ensure beforehand you can count on family or other social structures to help you, otherwise something will break in your life (either your PhD or your dependents).

Love & relationships

See the previous section. Given how much time you must dedicate to your research to succeed, your life partner if any will not receive much in comparison. Unless they are sitting in the same boat, they will find it difficult to accept that they will be only a small part of you for 4 years (approx). This in particular will make it very hard to begin and/or sustain a starting love relationship.

If you already have been together for many years, then perhaps it will work, if you negotiate with your partner in advance that the few years of your PhD time will only be a brief obstacle in the long course of your relationship.

If you are looking to start a new relationship and you are a strictly heterosexual male (the majority of candidates), realize that the cards are clearly stacked against you:

- PhD, so very little time available to date as explained above,
- computer science, with all the justified prejudices associated,
- less than 10% female colleagues, usually with unhealthy sexism at work which can taint the way you relate to women out of work without you noticing,
- most colleagues are socially rough and often isolated themselves so you won't learn too much from them nor get many indirect access to new opportunities.

In practice it is just extremely unusual to see successful and healthy relationships starting during PhD time and lasting. So if that is important for you, you should probably consider an alternate path.

Health hazards

You will spend between 40 and 80 hours per week sitting in front of a computer.

Just because of this you will run a much higher health risk than the general population for the following issues:

- degraded eyesight;
- serious back, neck and shoulder pain;
- unbearable wrist pain up to carpal tunnel syndrome;
- irritable bowel syndrome (IBS);
- cardiovascular diseases;
- sleep disorders, due to stress (highest contributing factor) and excessive bright light exposure (2nd highest factor);
- alcoholism and/or smoking addiction;
- clinical depression (the serious stuff, not just feeling sad or disappointed like when you are denied a piece of cake or an article publication).

If you are already sensitive to any of these before applying, consider this a serious argument to not start a PhD at all. Otherwise your PhD traject will rob you of what remains of your youth physical health and you may not recover easily (if at all).

If you recognize this risk **you will also need to make extra effort next to your work to stay healthy**. This includes:

- sports, which is really a big necessary step, and stereotypically hard to appreciate/invest into for students with a CS inclination;
- self-discipline about diet and sleeping hours;
- building a network of trusted people whom you can talk to about psychological issues;
- self-awareness about your health, and recognize the moment your body tells you to stop and take a break away from the screen for a few days.

If any of this sounds too complicated, then just don't start a PhD.

Moral hazards

Following a PhD traject will require you to step into a moral system that deviates from the norm:

- **The economics of PhD trajects worldwide is a pyramid scheme, where PhD students and post-docs are the suckers and top faculty the beneficiaries**. The pyramid scheme exacts work and wealth from the suckers for the benefit of the top with the dishonest promise they can reach the top if they themselves hire as much PhDs underneath.

  Of course like all pyramid schemes this does not scale and *most* suckers stay at the bottom, with the unrational, never satisfied hope that things will change. The proper "fix" to this situation would be to hire less PhDs, pay top faculty less money and and pay PhDs and post-docs more. Of course top faculty cannot rationally accept this change so the pyramid scheme is maintained.

  By choosing to apply for a PhD, you consent to participate in and support this pyramid scheme.

  The only way to balance things out morally would be either to require more money in your salary (usually very hard / nearly impossible), or simultaneously work actively on a solution to this problem and work with others to implement it. However in practice solving the problem is not tractable, as there are only so many hours per week where you can be productive and most of it will be taken by your PhD work.

- **The success in your scientific work in CS will likely causally imply job losses in other sectors**.

  Watch the video Humans need not apply on YT. Your job in CS will be to make people obsolete in various sectors.

  If your moral system requires that wealth be correlated with human labour and you associate virtue with human equality (in other words you buy into marxist values or similar), you will suffer from severe cognitive dissonance and it will bite you back, and you may not be able to defend your PhD successfully in the end because of it.

Be sure you understand the implication here. A PhD traject is not the only position where you are exposed to this moral hazard. If you particularly like this moral situation, you can also achieve the same by working as a freelance software developer.

The responsibility and reward system

In a regular job, you have a mission statement: if you complete the mission you get a reward, if you don't you get a punishment. Think about donkey, carrot and stick.

In contrast the responsibility/reward system of PhD trajects is crooked:

- **not delivering on your responsibilities will get you into trouble, but there are no rewards associated with them even if you do them properly**. Examples:
  - grading student assignments and exams,
  - reviewing research articles,
  - writing your own articles and get them published,
  - writing project reports,

  - implementing someone else's research idea in code,
  - writing your PhD thesis;

- **rewards** (e.g. scientific fame, career opportunities, extra training, money, life experiences) **will be only delivered for things out of your responsibility**, and which your supervisor may discourage you from doing because it will divert your energy away from your own research. Examples:

  - writing grant proposals,
  - supervising other students,
  - challenging your peers and colleagues about their motivations and assumptions,
  - autonomously deciding to design and deliver new lectures or new teaching assignments,
  - constructively criticizing the organization of your department or its teaching curricula,
  - reproducing experiments and constructively commenting on the work of other scientists,
  - organizing social events and otherwise stimulating the free flow of ideas and knowledge between your peers,
  - helping other scientists advance their career without claiming responsibility for doing so,
  - demonstrate to a business how they can apply your research to their problem;

In other words, there is a bunch of things with a stick associated that you will know about, but no carrot to be found there; then another bunch of things with carrots associated which you will have to figure out on your own. The perverse aspect is that in the end, your peers will implicitly measure your success based on the rewards you have obtained, without telling you how to get there.

To summarize, applying for a PhD really is applying to two jobs simultaneously, getting paid for only one of them and only discovering on the way about the other.

If you feel uncomfortable with this double workload and the lack of visibility onto the reward system, probably you should not pursue a PhD.

Conversely, be sure you understand the implication. A PhD traject is not the only position where you can find this double job under the hood. Technical IT consultants are exposed to the same. So if you particularly like this double workload, also consider a career in consulting; it will pay better and you will gain more respect and visibility over time.

Shit you may have to put up with

- The pyramid scheme (see above).
- Your supervisor can use you and your work to advance their career, in a way where you don't significantly benefit from their advancement.
- You will be evaluated based on your number of publications, but there is little correlation between the scientific quality of your work and whether your articles will get published.
- Computer scientists in particular have generally poor self-discipline and procrastinate a lot; chances are your co-authors will force you to spend entire nights or week-ends at/on work to finish an assignment (eg. article, grant proposal, student grading) on time.

- You may be blackmailed by your supervisor or department to accept work assignments that help them but for which you will not be rewarded.
- As you spend more time with your supervisor, you may develop an infatuation or other form of limerence for them, which will hurt your productivity greatly until you learn how to deal with it.

If any of this makes you uncomfortable, consider this as an argument not to apply for a PhD position.

Also be sure you understand the implication. A PhD traject is not the only way to face these challenges. If you particulaly like these circumstances, you can also obtain the same by working as a journalist, data analyst, high school teacher and possibly other positions.

The secret prerequisites

When you read a PhD job opening, you will find application criteria like "must have studied in a relevant field," "must be self-driven," "interested in research," etc.

The dirty secret of PhD job openings is that your future supervisor does not really care about any of this. There are plenty of reasons why your supervisor needs you (more on this above), which you can use to your advantage. But there are secret pass-or-fail criteria, which you cannot (and may not) discuss openly during interviews:

- **you are choosing your supervisor, not a research topic**.

  Research is not like a regular engineering task: the topic on which you start will *likely* lead nowhere, and you will probably need to change topics entirely one or more times. Chances are even that you will develop your own ideas and decide to do that instead of what your supervisor has in mind. From the science perspective this is OK.

  What remains is the unspoken agreement between you and your supervisor: you will work *together* and *support each other* for 4 years (approx). Your supervisor must become your friend over the years and you must be able to trust each other fully, otherwise you won't be awarded your PhD diploma at the end.

  If you don't see friendship happening with a potential supervisor, it will show through during the interviews (best) or during the 1-year trial period (bad) and you will have to stop anyway. Your supervisor is going through the same evaluation about this in their mind when they interact with you, even if they don't (and can't) say so explicitly.

- **you must be at least as smart as your supervisor**.

  If you're not, your supervisor will either use you against your will or be disappointed about you continuously and it will kill your motivation. Note that being smart includes realizing that even if your supervisor may not be as clever as you are, they have life experience that you can learn from. (Also due to the Dunning-Kruger effect, if you are too much confident that you are smarter than your supervisor, chances are you really are not and you will be made fun of behind your back by your supervisor and your colleagues. To qualify on this requirement, there must be honest uncertainty about how clever you and your supervisor are relative to each other.)

- **you must not be too much smarter than your supervisor, or at least willing to keep appearances to the contrary**.

Supervisors want you to be smarter than they are because they want to learn as much from you as you will learn from their past experience. But if you are too smart and let it show, it will make them look stupid and hurt their ego. They won't allow this.

- **you must either be extremely (abnormally) emotionally self-sufficient, or already belong to the culture of the research group where you apply, or be extremely willing to blend in.**

  If you don't blend in culturally, your supervisor and colleagues will assume you belong somewhere else and that you will leave as soon as you finish your PhD. They will not make significant effort into building lasting social bonds with you. You will feel isolated, and this will kill your motivation slowly and make you hate the work. If you are Dutch you should already know this; if you are not, you need to figure out this Dutch culture thing ASAP.

There two main corollaries to these points:

1. if you want to base your work relationship with your employer on the merits of your work and its visible outcomes, regardless of social and cultural differences, then don't apply for a PhD; it would be a terrible idea.
2. if you really want to go for a PhD, you must do your homework first and find a research group where you feel comfortable culturally, and where you properly balance intellectually and emotionally with your future supervisor.

Acknowledgements

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Bibliography

I recommend the following books:

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