22.8.2025

Road to PhD: How to get started

Prof. Pasi Fränti, Univ. Eastern Finland (UEF)

Abstract: To complete a PhD, one needs to learn new skills, such as academic writing and handling the peer review process. However, determination is the most important. There are many challenges in this journey, and without strong motivation, one is likely to fail, regardless of how fascinating the research would be otherwise. To get started, this paper provides advice on how to select a supervisor and the role of teamwork.

1. Introduction

For a MSc graduate, there are many doors open to the world. Completing a PhD degree opens a few more doors, but is it worth investing four years of your life?

The Monty Hall game (Figure 1) involves three doors, of which the player chooses one. Two of them are hiding a goat, and one is a luxury car. The player is asked to choose a door. Before the player opens the door, the game master opens another, unselected door, having a goat behind, and asks if the player wants to change his mind [1]. In real life, PhD graduates will not win a luxury car but are more likely to end up petting a goat.

The biggest surprise is the size of the mountain you need to climb; see Figure 2. It requires more effort and comes with a smaller prize than expected. On the positive side, you will learn new skills and the trip will take you places you might not go otherwise. Consider it as a journey, not the destination. But most importantly, you will develop valuable skill: your mental strength.

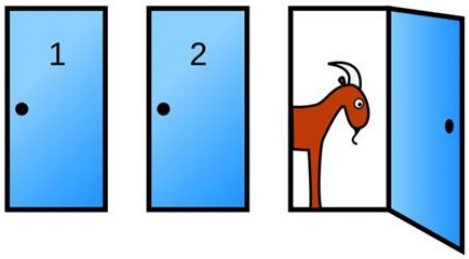

Figure 1: PhD opens a few more doors, but you may not find a luxury car as a reward.

In this paper, I will give you advice for the early part of your journey, focusing on the selection of a supervisor and the role of teamwork. My two related papers discuss more on scientific writing, focusing on the inspirational side [2] and how to deal with peer review [3].

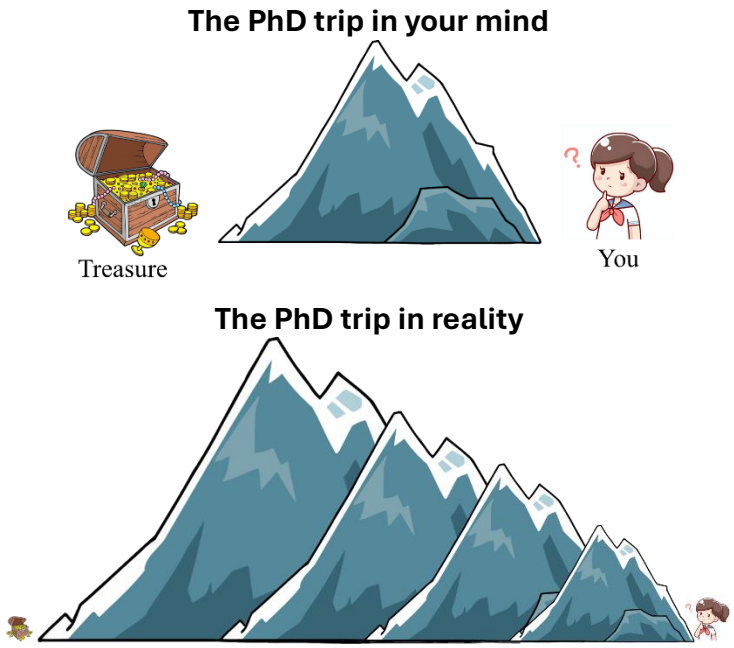

Figure 2: The road to PhD is not really a road. It is a challenging trip over mountains, much more challenging than you thought, with a much smaller reward at the end than you might have thought.

2. Selecting a supervisor

For my undergraduate studies, I needed to write an essay (later called BSc thesis). I got an extremely boring topic. I went back to the supervisor and asked if I could change the topic. Hesitatingly, he agreed, but the new topic was equally boring.

I completed the new topic, but the writing process was all but pleasant. I later realized the reason: wrong supervisor. The topics of this supervisor did not align at all with my interests. There was no choice as the same teacher gave all the BSc essays. But I learned my lesson: next time, get a topic from a supervisor whose topics inspire me.

When starting my MSc thesis, my primary topics were (1) human-computer interaction, (2) machine learning, and (3) any topic of my favorite professor.

The first topic is important but not taught during my study years; thus, no supervisor in sight. For the second topic, I went to the AI lecturer. He kindly pointed me out the door leading to the library and effectively asked me to find my own topic. I realized I might not receive much advice from this supervisor, so I rushed to my favorite professor. I got a topic in algorithms, which I later continued in my PhD.

The lesson is to find a supervisor whose topics you enjoy and a person you like to work with for the next four years or more. Lucky ones like me will get a supervisor who patiently teaches how to write scientific papers and guides you through the entire road to PhD.

Have you sent many applications but haven't received any offers yet? Are you sure you have the skills? What might be wrong with your CV? Show it to your most critical friends who do not hesitate to give honest feedback. Keep it concise but informative and let your personality shine through. Using a ready template for a CV and an AI-generated research plan is a guarantee that nobody will pay attention to your application.

If you plan to pursue a PhD because you have not found a better option, then reconsider. PhD studies require skills and motivation, and you seem to lack both. If you have skills, you should have enough options already. PhD as a secondary career choice indicates the motivation is not very strong either.

Skillful students do not even need to apply. Professors will pick them up straight from the school. Local students also have the advantage that their skills and suitability for the team are tested already during their studies before PhD. Professors do not like to gamble with unknown candidates from abroad, especially if no possibility for a face-to-face interview.

3. Supervisor types

There are as many types of supervisors as there are people. I mention three types you should be aware of before starting the PhD journey. A good supervisor is such a rare species that it does not make it into my list. The common types are:

- Rich professor
- Old-school professor
- Lazy professor

First, a rich professor has numerous projects with paid positions. This is good if you want to do research closely related to real-life applications. The research can be overlooked by other, more theoretically oriented researchers, but at least you will gain relevant experience for life after graduation. However, projects usually involve meetings, deadlines, and numerous duties not directly related to the research. An even bigger drawback is that the professor’s focus is likely on grant applications and project meetings rather than on actual research (and supervision).

The second type is an old-school supervisor who thinks that to earn a PhD degree, the student must do everything, from generating ideas and conducting literature studies to implementing, experimenting, and writing the paper. The supervisor gives very general advice, if any at all.

This might be good for talented introvert individuals, but it rarely leads to the most productive research. The students tend to go in circles, tuning the same topic forever without making real progress. The work may produce one excellent paper, but breaking out from the tiny circle of the topic can be difficult without a sparring supervisor or co-authors. Teamwork usually leads to better results.

Ultimately, the result matters, not how it was produced or who contributed most. Learning by example would require much more effort from the supervisor, but it would not only enhance the learning process but also produce higher-quality papers as a result.

The third type is the Lazy professor. By default, such should not even exist as lazy researchers rarely end up professors, but sometimes they do. The supervisor is usually a casual character, giving students a chance to pursue a Ph.D easily, but does not put effort into the supervision. They trust the students will solve all the practical problems themselves. It may not even matter if one student drops out; the strongest ones will complete anyway.

Essentially, the old school and the lazy supervisors lead to the same result. One PhD graduate with such a supervisor compared it to throwing the students into deep water, regardless of whether they can swim or not. You'd better learn fast if you want to survive.

The student will receive the diplomas at the end, but there is no universal standard for what counts as a PhD degree. Universities have different formalities, and external examiners are commonly used. But ultimately, it is the supervisor's decision when the thesis is ready to submit. With a good supervisor, this just happens much faster.

But how to find a good supervisor? I do not have an answer as they seem rare. I selected a supervisor already during my MSc studies, and he later recruited me to continue my PhD, so it happened naturally. Just like professors prefer local students over unknown candidates abroad, students may also prefer a professor they already know.

Best if the student is considered as a trainee in a research team (rather than a student). Learning by doing as an apprentice can be effective. The more advice you get, the better. I rarely see a student who receives **too much** help. On the contrary, I frequently see students obviously lacking supervision, even to the extent of seeking help outside the lab, because they have not received any guidance from their own supervisor.

The rank of the university may not guarantee a good supervisor. The rank is evidence of the quality of research, but not a guarantee of good supervision. The brand name of the university attracts skilled students who tend to graduate regardless of supervision. You do not need an excellent supervisor for this.

Good research and supervision can happen anywhere. It is not about the name (or rank) of the university but about the people in the research group and the characteristics of the supervising professor. You can learn the skills to become PhD by yourself, but it happens more efficiently within a team. You are likely to learn more in a team than working alone.

4. Teamwork

During my career, I have published over 300 research papers but have rarely been the sole author of a paper (<10). This happened not because I would be heavily dependent on the work of others, but because I value the power of teamwork.

Two heads working towards the same goal will lead to better results than working alone. Even if the advice is just putting red ink on the draft paper, it helps. One can be blind to one's own mistakes so that even a minor contribution from co-authors can significantly improve the

quality. It also helps when the authors have compensating skills and are able to look at the research problem from different angles.

The contribution of the supervisor can be important in the early stage. I wrote my first paper entirely in Finnish because of my poor English skills at the time. My supervisor then translated the entire paper into English. For the next paper, my pocket-sized dictionary became heavily used as I would have been so ashamed if my supervisor had to translate another paper.

But what is the optimal team size? There is no universal answer to this question.

Whenever we wrote with many authors [4], I felt the work less as my own, and the overall result seemed to be lacking something compared to those papers written by a smaller team. Also, when working alone, the paper seemed to lack something [5, 6].

My experience suggests the optimal number to be close to three. A typical combination includes a PhD student, a postdoc, and a professor. With this combination, we wrote several good papers during my PhD and postdoc periods [7, 8].

In the author list, there are two *pole positions*: the first and last. In my field, the first is usually the author writing (most of) the paper, and the last one is the supervisor. The second slot may still feel motivating enough, but when the list grows longer, the motivation of the authors drops drastically. Authors in the middle may assume their name is there for courtesy, or that only a very minor contribution was expected.

The cumulative contribution seems to reach a maximum at around three authors. The same number has also been reported in [9]. Exceptions are multidisciplinary studies where expertise is needed from several disciplines. How much weight would you put on a paper where you are the 13th among 20 authors? I do not even include such papers in my publication list.

Giving author slots as a favor without contribution seems common in cultures. It can be tempting to gift the authorship when the number of authors is already large, as adding one more does not make so much difference.

However, gifted authorships become problematic when the other authors do not contribute, or even worse, degrade the overall quality due to decreased motivation. As an editor, I find it annoying when reading papers of sub-standard quality, despite the many authors. The actual work of such papers is often performed by a single student. This is easy to detect when the student uses “I” rather than “we” in the communication. The other co-authors may not even have read the paper. This kind of behavior reminds me of the joke about Herbert with many bosses in Fig. 3.

A closely related problem is known as a *paper mill* [10], where dishonest parties write (often fake) papers to exploit the flaws in publication systems. They target large-volume journals of for-profit publishers who are tempted to accept papers with cursory review. The author slots are sold at the stage when the paper is already accepted but not yet published.

Figure 3: Horst (or Herbert) and his many managers.

In brief, teamwork does not mean having many authors but rather genuine collaborating leading to a real contribution.

A good team can share the joy of success but also save you from frustration. I had worked intensively for two weeks with my late teammate, Timo Kaukoranta, when we suddenly found a fundamental flaw in our idea. Two weeks of work were wasted. I was pulling my hair in frustration while Timo let out a small sigh and then calmly said: "*Oh well <sigh>, let us continue with the plan B then*." I loved to work with him.

5. Whose ideas

Select the topic that motivates both you and your supervisor, regardless of whose idea. Some students may lack their own ideas and rely on those given by their supervisors. Others can be obsessed with working solely on their own ideas. My simple advice is to work with the best ideas, regardless of whose.

Most ideas are worth publishing if studied deeply to gain new insight worth sharing. This is not the bottleneck. The writing is. Every paper needs to be written, and this is the part that takes the most effort, no matter how good or experienced you are.

The second bottleneck is the peer review process. It can be tough and nerve-wracking even when fair and timely review reports are provided. However, nowadays, the process has become a headache characterized by slowness, low-quality review reports, superficial (even fake) reviews, and incompetent editorial decisions that focus on secondary factors, such as elitism [11, 12]. Even if the writing part was still inspiring, the peer review process can become time-

consuming and uninspiring. For these reasons, the efforts would be better spent on the best ideas.

I sometimes offer a simpler, less complex idea for a starting PhD student to get a smooth start. This gives the student time to familiarize themselves with the topic and learn the necessary skills before getting involved with a more challenging idea. The danger is that if the student faces all the negative aspects of peer review at an early stage, it may even destroy the motivation before reaching the better, more important ideas.

I have a 90/10 rule: an idea from a starting PhD student has a chance of success with 10% probability, while the idea from an experienced supervisor is 90%. These are just imaginary numbers but reflect the imbalance. The success also depends on the supervisor's experience and how closely the topic aligns with their previous research.

It is tempting to spend time on our own, more inspiring idea. But this initial motivation comes with a higher risk of it being a dead end, which is ultimately more demotivating in the long-term. Working on a less inspiring but more solid idea from the supervisor might be preferable for growth. Having early successes under your belt will give you the confidence and experience to pursue your own ideas down the line. A bonus is to guarantee to have a motivated co-author.

6. Summary

To start a PhD:

1. Make sure you have the motivation.
2. Find a supervisor who will provide real guidance.
3. Work on the best ideas regardless of whose.
4. Value teamwork.

I wish you *good luck* with your journey to PhD.

References

1. R. Gill. Monty Hall problem. *International Encyclopaedia of Statistical Science*, 858-863, 2010.
2. P. Fränti. Six rules for writing. *Applied Computing and Intelligence*, 5 (1), 77-81, 2025.
3. P. Fränti, Road to PhD: how to handle the review reports, *Journal* (submitted).
4. P. Fränti, T. Kaukoranta and O. Nevalainen: On the Splitting Method for VQ Codebook Generation, *Optical Engineering*, 36 (11), 3043-3051, November 1997.
5. T. Kaukoranta, P. Fränti and O. Nevalainen, A fast exact GLA based on code vector activity detection, *IEEE Trans. on Image Processing*, 9 (8), 1337-1342, August 2000.
6. P. Fränti, H.G. Gyllenberg, M. Gyllenberg, J. Kivijärvi, T. Koski, T. Lund and O. Nevalainen, Minimizing stochastic complexity using local search and GLA with applications to classification of bacteria, *Biosystems*, 57 (1), 37-48, June 2000.
7. P. Fränti: Blockwise Distortion Measure for Statistical and Structural Errors in Digital Images, *Signal Processing: Image Communication*, 13 (2), 89-98, August 1998.

8. P. Fränti, Genetic algorithm with deterministic crossover for vector quantization, *Pattern Recognition Letters*, 21 (1), 61-68, 2000.
9. Y. Bramoulle, L. Ductor, Title length. *Journal of Economic Behavior and Organization*, 2018, 150: 311-324.
10. L. Parker, S. Boughton, L. Bero, J.A. Byrne. Paper mill challenges: past, present, and future. *Journal of Clinical Epidemiology*, 176, 111549, 2024.
11. P. Fränti, What is wrong with peer review?, Think Open, *Helsinki University blog*, published 2024-11-14.
12. P. Fränti, "What is wrong with MDPI: Is it a predator or a serious competitor?", *arXiv:2411.08051*, 2024.

Bio: Prof. Fränti received his MSc and PhD in 1991 and 1994 from the University of Turku, Finland. He has been a full professor at the University of Eastern Finland since 2000 in computer science. During his 30 years of experience in research, he has published over 120 peer-reviewed journal articles and 180 conference publications. He has supervised 34 PhD students and is currently guiding 10 more. Prof. Fränti has reviewed for over 140 journals, served as associate editor for Pattern Recognition Letters, Journal of Electronic Imaging, Machine Learning with Applications, Systems and Computing, AI+, and Applied Sciences. He is one of the founding editors of the AIMS Journal of Applied Computing & Intelligence.