

# PhD in the United States

BY OKKE SCHRIJVERS

At some point, everyone has to deal with the reality of life after education. In 2011, about a year after I started my Masters in computer science, I had to deal with this issue for the second time. The first time did not work out so well: after my Bachelor degree from the Hanze University of Applied Sciences, I worked as a programmer in the video game industry for two years. During that time, the frustration of investing time in the company instead of my own development became too much and I rushed back to academic life.

**G**iven my bad experiences in industry and my newfound enthusiasm in the academic world, I figured I would try to stick around in academia a bit longer and decided to apply for PhD positions. With more than a year to go I had plenty of time to consider my options, and after everything

was said and done, I started my PhD in September of 2012. In this article, I would like to talk about two different aspects of this: first, I will discuss the structure of the PhD program at Stanford (which is representative of American programs) and my research in Algorithmic Game Theory. Understanding the dif-



Okke Schrijvers on the Stanford campus.

ferences between European and American programs can be a key difference in deciding which style would fit you best. Secondly, I would like to expand on the application process, which is quite different from the Dutch system. Good Dutch students are generally excellent candidates for PhD programs in the US and by demystifying the admissions process; I hope to put these students in a position to get into the right university.

Before expanding on my research in Algorithmic Game Theory (I promise to tell you what that means in a little bit) it is necessary to explain why I am doing research in this area: it was not what I had in mind when I applied for Stanford's PhD program. A key difference in doing a PhD in Europe, or doing one in the US, is that for the former you apply for a specific PhD position, whereas for the latter you apply to a program. This difference may seem subtle, but what it means is that a PhD in the US does not begin with a predetermined topic. Admissions are done department wide, and in case of Stanford Computer Science that means that, about 40 new PhD students are admitted to the department every year. Your first year is all about finding the right research area and advisor for the remaining years. Some students have a good idea of what they want to do, so they might align with an advisor within a couple of months. Others shop around for a bit, do some research with different people, and may end up in an area they did not know existed beforehand. That is what happened to me: when coming to Stanford I thought I wanted to do graphics research, but when I came across Algorithmic Game Theory I got so excited about this field that I ended up aligning with professor Tim Roughgarden.

So what is this "Algorithmic Game Theory" you keep talking about? Game theory is a branch of economics that deals with the interaction between different people (or organizations, companies and even countries), where each entity is self-interested. The goal of game theory is to come up with systems where self-

interested behaviour does not negatively influence the interaction. Let's look at a concrete example to see what this means in practice: let's say that I have a video game console that I no longer need (because I bought the latest one as soon as it came out) and I want to give it to someone else who would value it more than I do. I do not care about making any money, but I want to make sure that whomever I give the console to, will value it most out of all the people I have considered. One way to do this would be the following: I ask everyone I know how much money they would value the console at and I will give it to the person who values it the most. Can you see a problem with this approach? If people know that the person who names the highest number will receive the console at no charge, then they might as well name a very high number in the hopes of getting it. It turns out that in order to incentivize people to be truthful; I need to charge them money to account for the externality they impose on others (who will not get the console).

## *"A PhD in the US does not begin with a predetermined topic"*

Computer Scientists are interested in the intersection between Game Theory and Computer Science (and have called this field Algorithmic Game Theory) for two reasons. Firstly, the advent of the internet has given rise to many situations where self-interested people interact. Game theory is needed to analyse this behaviour and propose mechanisms where this behaviour is not harmful: from the physical network that is maintained by ISPs, to BitTorrent file sharing, to user reviews on Yelp. A good understanding of self-interested behaviour is needed to make sure these systems work properly. Secondly, Computer Scientists bring the idea of "worst-case behaviour" and computability to the table. Economists typically analyse average-case behaviour, but guarantees on worst-case behaviour can yield much stronger claims. Moreover, some optimization problems cannot be solved exactly in polynomial time, so approximation algorithms are needed that take individual incentives into account. Algorithmic Game Theory is an exciting, young field (it was 'founded' in a seminal paper in 1999) with

many open challenges. My research in it is currently focused on incentives in online interactions. Take for instance the crowdsourcing platform Amazon Mechanical Turk, where workers do small tasks for a small payment (typically of a couple of cents). Workers are incentivized to join the platform and take on work, but how are they incentivized to do their work well? In order for crowdsourcing to be a viable means of getting work done, the incentives of workers need to be aligned with the incentives of work-requesters.

The opportunity to switch research topics is one thing that I have only now really come to appreciate. It can be hard to find the right project to work on for multiple years and this institutionalized way of finding it is one of the benefits of doing your PhD in the US. Another thing that I really enjoy is campus life. It is one thing to come to work every day, but it is a completely different experience to work on campus, live on campus, go to movies on campus, and even go to major sports events on campus. I really enjoy the sense of community it creates and with so many new students starting at the same time, (most departments only allow PhD students to start in September); there are plenty of opportunities to make new friends. While you have the option to live off-campus and treat it similarly to the way a European PhD student would treat his university, it is great that you have the choice to be a part of it all.

As you can tell, I am excited about my PhD career so far and many of my Dutch peers have shown interest in doing a PhD in the US, but few actually apply. Whenever I ask them why not, there are three answers that keep coming up: it will cost too much and I cannot afford it; it is too competitive and I will probably not get in and when I wanted to apply, the application deadline had already passed. The last one is due to lack of information, and hopefully by raising awareness through this article I can save you from this issue, but the first two are unnecessary limiting beliefs. While officially tuition would be prohibitively expensive, PhD students rarely end up paying any of it, particularly in the exact sciences. Whether it is through research assistantships, teaching assistantships or a

fellowship, no one has to pay to obtain their PhD. Moreover, while American universities can be very competitive, Dutch students are in a great position to apply: they have typically studied more than their American counterparts have (who usually only have a Bachelor degree) and face less of a language barrier than their international peers. Motivated Dutch students, who are well informed about the application process, are in an excellent position to get a PhD position at an American university.

The main pitfall in the American process is how much earlier the application deadline is, and how much applicants are required to provide. For programs that start in September, the deadline for application is typically in early December: a full 9 months earlier. On top of that, I would recommend students to start compiling their application packages a couple

*“I am excited about my PhD career so far!”*



Okke Schrijvers during a presentation about a PhD in the United States.

of months before that. Because it needs to include certified transcripts and degrees, a statement of purpose, at least three letters of recommendation, a resume, an English proficiency test, an American graduate school standardized test (the GRE), and any additional material that could improve your chances of getting in. Most universities receive many more applications from qualified students than they have space for (for example, Stanford Computer Science gets more than 800 applicants for about 40 positions), so you would need to apply to multiple schools, adding to the administrative complexity. The most important quality when universities decide to accept students is the ability to do research. You should therefore ask for letters of recommendation from professors who you have a personal relationship with and with whom you have done research. If you include the time to do this into the bigger picture, that means that you should start thinking about it roughly 18 months before you plan to start your PhD! For European PhD positions, you could start thinking about it during your final project; this is decidedly not the case if you want to go to the US.

I had no idea about this, but I was fortunate enough to have already done research with different professors, and that I considered the US in time to get through the application process unscathed. To raise awareness among Dutch students about this and to provide accurate information about the application process, I founded UCAN (University Connection America-the Netherlands). In December of 2013, I visited five Dutch universities to give talks about the subject and on my personal website; I have a 10-page document with in-depth information about the application process. Please feel free to consult the document for more information, and contact me if you found it useful or have questions that are not addressed in this. Doing a PhD in the US is a unique experience and I hope that my experiences can help other Dutch students with their American aspirations •

## About Okke Schrijvers

Okke is a second-year PhD student in computer science at Stanford University. He obtained his Bachelor's degree from Hanze University of Applied Sciences Groningen in 2008, and his Master's degree from Eindhoven University of Technology in 2012. At Stanford, he is a student member of the computer science PhD admissions committee, president of the Dutch@Stanford student association, and member of Stanford's debate team. With his position on the admissions committee, his experience as an applicant in 2012, and his network as the president of Dutch@Stanford, he wants to raise awareness and provide information about the application process of American universities for Dutch students.

## Contact information

Website: [www.okke.info](http://www.okke.info)

E-mail: [okkes@cs.stanford.edu](mailto:okkes@cs.stanford.edu)



Okke Schrijvers during a presentation about a PhD in the United States.