

Master's Thesis at Harvard



A quick overview

In the context of my master's thesis in Data Science at ETH, I got the privilege to spend six months in Boston, visiting the John Quackenbush Lab at Harvard University. Throughout my stay I designed GIRAFFE, a novel data-driven algorithm for the inference of Gene Regulatory Networks. By combining ideas from matrix factorization and gradient-based optimization, the algorithm can be used in downstream biological applications to better understand the factors driving the development and progression of cancer. Collaborating on a day-to-day basis with an amazing team of postdoctoral researchers has been a very enriching experience, both professionally and personally. I'm hence looking forward for the summer, where I will join the lab as a Research Fellow to further extend our research.

Before you go

The first step is finding a suitable lab to write the thesis. In my case, I came across this opportunity through the professional network of a postdoctoral researcher with whom I collaborated at ETH. While in my experience this seems the most efficient way to find a good match, it is also possible to get opportunities by contacting the research groups directly. Having tried this strategy before choosing Harvard, collecting failures and successes, I feel like sharing some personal insights:

1. Don't write generic e-mails that you can copy-paste to multiple groups. Instead, study the group's work to some level of detail and write personalized applications.
2. Explain that a master's thesis is **unpaid** work where you con-

duct **independent** research.

3. Never take unanswered e-mails personally. Most probably, the group gets hundreds of applications, and some of them get unnoticed.
4. Take this with a grain of salt, but in my experience applications sent on Sundays had a higher response rate.

After finding a good match, it is time to request a visa. The *J1 short-term scholar* visa, which is usually the most suitable category to write a thesis as a visiting student, can be obtained as follows:

- Getting in contact with the responsible administrative person at Harvard.
- Sending all the required documents to the Harvard International Office (HIO). These

include a letter signed from an ETH representative, various academic transcripts, proofs of funding (at least 3800 USD per month), and a health insurance coverage statement.

- After these documents have been processed, you get a DS-2019 form. This counts as a *passport extension*, and it is needed to formally request the visa.
- Using the DS-2019, the SEVIS ID and DS-160 forms must be filled online. Afterwards, it is possible to fix an appointment at the consulate or, in case of a waiver, the documents can directly be sent via mail.

Since the entire process can be quite lengthy, I recommend to start early. In my personal experience, there was a

span of approximately seven months from the initial email to the official starting date of my thesis.

Accommodation

Living expenses in Boston tend to be higher than in Switzerland. In my situation, a room in an apartment shared with three roommates was 1300 USD per month, excluding utilities. On average, the total monthly cost came to around 1600 USD. Note that the utilities might be slightly cheaper if you are visiting in summer time. I resided in Mission Hill, a conveniently located neighborhood within walking distance from the Longwood Medical Area, which includes the *Harvard Medical School*, the *Harvard School of Public Health*, *Boston's Children Hospital*, and *Brigham and Women's Hospital*. If you are working in Longwood, Fenway/ Kenmore, Jamaica Plain, and Brookline are valuable alternative locations. To secure accommodation, I utilized *SplitSpot*, a property management agency with multiple properties across the United States. While their process was efficient (I found the apartment in less than a week, and the paperwork was minimal), the rent included commissions. Consequently, the quality of the room was below average considering the price. Possibilities to find cheaper solutions (perhaps 1100-1300 USD) include the website *Craiglist*, *MIT Vista* on Telegram, and the *Swiss Link Boston* group on Whatsapp.

Research

Similar to a typical master's thesis at ETH, I conducted independent research on a relevant topic for the lab and kept my supervisors updated during weekly meetings. Concretely, I proposed an innovative model to predict interactions between genes and a particularly relevant type of protein called transcription factors. Be-

ing one of the first mechanisms altered by tumors, accurately estimating these interactions has applications in early detection and drug discovery, with the potential of improving cancer patients' lives. As a computer scientist without a background in biology, diving into algorithmic research within this field posed initial challenges for me. Before my departure, I dedicated significant time to familiarizing myself with fundamental concepts and the papers published by the lab. Upon my arrival in Boston, I had the privilege of being mentored by the exceptional post-docs in the lab, who actively engaged me in the daily activities of the research group. Our routine consisted of a lab meeting every Tuesday - where we shared updates and presented our latest discoveries - and journal clubs on Thursdays, where we presented research papers relevant to our investigations. Developing strong bonds with the postdocs, both professionally and personally, has undoubtedly been the most valuable aspect of this experience, fostering significant personal growth for me. Moreover, I also got the chance to attend a course on reproducible data science, there-with experiencing the atmosphere of Harvard lectures: compared to ETH classes, there is more interaction between students and lecturers, and I really liked the particular attention to practical aspects and the fine-tuning of the topics according to the students' individual interests. I made treasure of this experience in its totality!

Life in the US

With more than twenty universities, Boston offers a vibrant environment for students. From conferences and talks (for ML people, the invited talks at the Broad Institute on Tuesday evening are a great opportunity to chat with some of the best researchers in the world) to social gatherings and parties (the monthly Harvard museum night and the clubs in

South Boston should definitely be on your must-do list). If you are into sports, there are great facilities both at Harvard and MIT: particularly recommended is rowing on the Charles river, and enjoying the famous regata in autumn. Taking a break from studies to enjoy live sports can be a delightful diversion, with options including attending NBA and NHL games at the TD Garden, or immersing in the electrifying atmosphere of a baseball game at Fenway Park. Boston truly has something for everyone. To further enjoy the university atmosphere, I suggest heading to a college Basketball or Football game, especially against the "rivalry" teams from Princeton and Columbia. For nature-lovers, New England offers some great parks and forests, with beautiful foliage in fall. To fully take advantage of the experience in the US, low-cost airplane tickets are an amazing opportunity to visit other regions and appreciating the incredible diversity of this country.

Useful tips and tricks

- To minimize exchange and credit card commissions, Revolut allows to transfer money from a Swiss bank account to a virtually generated American credit card.
- To enjoy internet connectivity and make calls without the need of purchasing a physical SIM card, services such as DENT and MINT provide affordable e-SIM based solutions.

Conclusion

Visiting Harvard and Boston has been a great experience for me, and I highly recommend it to anyone. If you are interested to know more, don't hesitate to drop me a line: I'm more than happy to assist you in any way I can!