Statement of Motivation

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I started my academic studies at the Technion on a physics and mathematics program and coming into the studies I was leaning towards the physics side, which was also a top interest of mine growing up. However that changed in the course of the first year and a half of my studies. I didn't like labs nor the fact that our mathematical knowledge was severely lagging behind the methods we were using in the physics courses— things like Lagrange multipliers, differential equations and integration methods. So I switched to pure math and even within math, I was more interested in abstract algebra, set theory, logic and combinatoric rather than for example, numerical analysis and PDEs.

Afterwards although I left the university I didn't leave math and kept studying here and there, but I picked up additional interests. Eventually when I decided to get back to school I chose bioinformatics specifically because I wanted to deal with life science this time and I knew that my strength lies more on the math, algorithms and programming part of the business than the bio. As mentioned back in the day I had a need to explore everything from the ground up and it was very difficult for me to use any technique if I didn't personally knew the underlying theory and was convinced in its correctness. This time around that is no longer an issue. I will happily utilize anything as a black box as long as it does the work I need it for. Well it's not exactly like that I still try to learn everything but I can prioritize better for sure.

And now I've reached a point in my formal education where I need to narrow down my focus further. In the course of my master studies I became very interested and very involved with neural networks and machine learning [1]. My thesis deals with a particular VAE model. I think I gained same good insight into the topic of Gaussian mixture VAEs and perhaps VAEs in general. Still by no means do I claim to be an expert on the topic of machine learning, but I know some and I would really like to learn more. There are some big and bigger themes that I am curious about, probably too naively.

- Developing neural network architectures that are suitable for a specific class of datasets.

- What are the operating principles of real neural networks (nerves), can they be simulated and imitated.

- Machine–nerve interface. Is it feasible for example to create an artificial retina.

- Can concepts of thinking, abstraction, perception, intelligence etc. be mathematically formalized and implemented by a computer program.

And besides I am completely open for suggestions and directions.

So why apply to ISTA? You have interdisciplinary research groups, where neuroscience and machine learning are among the major research topics. It was actually difficult to choose only five professors for my application form because there are at least two or three additional research groups which I could see myself applying for. This type of interdisciplinary research environment matches closely what I envision for my future; It is the style of research that I want to be doing. And for that to happen, I am willing to downgrade my location from super cool Berlin to somewhat more boring Vienna (or its vicinity rather).

References

[1] Yiftach Kolb. *The "official" git for the c*GMΔVAE project*. URL: `https://github.com/zelhar/mg22`.

[2] Yiftach Kolb. *The Github repo with all the work done in the course of my thesis*. URL: `https://github.com/zelhar/mg22`.