

**Teaching interests.** *At the undergraduate level*, I can and happy to teach most theory courses, from introductory math courses such as linear algebra, calculus, and probability theory to advanced math courses such as measure theory and functional analysis. More so, since I have an engineering background, I can well teach courses such as rigid body dynamics, control theory, fluid mechanics, and electromagnetism. *At the graduate level*, I am interested in teaching the fundamentals of machine learning, information theory, and neural network theory. For neural network theory, I would like to combine it with a hands-on approach since I think it is vital for doing meaningful theoretical work in the field (necessary for building a proper intuition and inspiring new lines of research).

Teaching has accompanied my life from an early age since my mother is a school teacher. During high school, she encouraged me to give private lessons to other students. During my BSc, I continued tutoring university students, and I was also an extracurricular instructor on astronomy and physics for gifted children from low socioeconomic status. As an aerospace engineer, I volunteered and tutored kids towards their matriculation exams. During my PhD, I taught two courses every semester. As a postdoc, I led and worked closely with three PhD students and overseen a project of two BSc students.

These years of teaching and my own academic experience formed my teaching philosophy. Here are some of my insights and anecdotes.

**Motivation.** Coming from high school, most students do not share a great love for mathematics (I was one of them), even the talented ones. I try to convey that artists and mathematicians are similar; both attempt to draw elegant concepts inspired by their experiences and imagination. For example, Ramsey theory- some order must appear even in arbitrary constructs. So as with good art, I hope that the mathematics my students learn will transform their perspective and perception of the world (as it did for me). I feel proud when, from time to time, even engineering students ask my advice about adding a mathematics minor.

**Conveying purpose and conciseness.** There are some lengthy definitions and theorems. Therefore, a student can lose clarity and a sense of purpose. To make the definitions and theorems easier to digest, I draw pictures on the board and attach a visual meaning for every detail in the definitions and theorems. For example, encountering the definition of a limit of a sequence for the first time can be daunting. In this case, 'drawing' this definition is mandatory. To emphasize the conciseness of this lengthy definition, I challenge and encourage the students to establish a simpler definition. A definition that still rightly distinguishes between the converging and diverging sequences that we have encountered so far. Such an investigation allows the students to appreciate better the elegance of this definition.

**Building good intuition and attentiveness to details.** Excelling in any scientific field requires good intuition. Such intuition comes from treating every new topic as a new toy that should be played with, pushed, and prodded to its limits (and even breaking it). So when I teach new theorems, I encourage my students to think about what happens if we remove some conditions: can we achieve more? is the other direction correct? and so on. Finally, I make sure that they know how to apply the theorems accurately. For this purpose, I give them counter-intuitive examples; they blurt out the wrong answer, and after I give them the true answer, we go through why the immediate (and maybe 'intuitive') solution was wrong. For example,  $\lim_{n \rightarrow \infty} \frac{1}{\sqrt{n^2+1}} + \frac{1}{\sqrt{n^2+2}} + \dots + \frac{1}{\sqrt{n^2+n}}$ . Some students are quick to apply limit arithmetic and claim that the answer is 0, although it is 1. Such examples have two benefits, it dismantles wrong intuition and shows the students how easy it is to make mistakes. That makes them more careful and thorough (be it mathematicians or engineers).

**Personal connection.** Whenever possible, I try to know my students by name and get to know them a bit. The students then feel more comfortable asking questions during class, visit me during office hours, and are generally more engaged with the course. That gives me insight into how to adapt to their preferences and needs. More specifically:

*Setting the pace.* I can recognize the level of understanding among students. That allows me to make sure the majority of the class follows me, and otherwise, I rehearse the material over the next lesson. Contrastingly, to keep the interest of the stronger students, I may go into more detail and show how the material connects to other fields (given enough time).

*Applications.* To engineering students, mathematical courses often seem like a chore. They often don't see the connection of the math courses to their major field of study. Therefore, for example, when teaching calculus 2, I always spend time explaining how Gauss's theorem and Stokes' theorem relate to hydrodynamics and electromagnetism.

*Practicality.* Some students only want to succeed in the exam. Therefore, I incorporate questions from past exams to capture their attention.

To summarize, my teaching efforts are focused on making my students individual critical thinkers. So during their studies, they will be cautious of the steps they are taking when solving a problem (and hopefully, have fun while at it). Because today, we already have computers to follow blindly after algorithms. We need bright and creative people to understand when and where algorithms or formulas apply and how to devise new ones when necessary.

On a personal note, I enjoy teaching and interacting with students. So it is always heartwarming to receive good feedback that reflects your work and the goals you tried to achieve as a teacher. For example (Google translate from Hebrew):

### **Engineering:**

*Probability theory* (lecturer) "Ido is an amazing lecturer! Thanks to him I fell in love with probability and he made me think of directions for further study that I had not thought of before. The lectures are interesting and active. It always makes me understand why I do what I do and how I will use it in the future. I really liked all the enrichment material that was transferred."

*Linear algebra.* (teaching assistant) "An unmatched personal attention. A caring and supportive teaching assistant. Has infinite knowledge in the field. Always available to help (also in other courses). His tutorials are the most interesting lessons I participated in."

*Calculus 1.* (teaching assistant) "Mr. Ido Nahum is just a cannon<sup>1</sup>. A good person. Which gives a good feeling to the students. Always explained to us what we did not understand in the lecture. In a terribly clear and "grounded" way. Taught us techniques of how to deal with problems. And what form of thought we should adopt. And in a situation where I feel there is nowhere to study in lectures in a way that I will be able to approach at all. He is the one who "saved" me and gave the explanations and tools so as not to get stuck in the course and be able to understand and progress."

*Calculus 2.* (teaching assistant) "You taught the material very clearly. And you were able to find for almost every theorem and definition an intuitive explanation for their correctness and purpose. Your explanations have contributed a lot to understanding and solving exercises and I thank you for that."

### **Mathematics:**

*Infinitesimal Calculus 1.* "A cannon. Marriage material."

*Linear algebra.* (teaching assistant) "Excellent teaching assistant. Explains beyond. He tries to explain the intuition behind the material. The reasons for learning it. He is trying to help everyone understand the material in depth. He deals a lot with "why" things are true and he is not running over exercises without at least making sure the majority understand."

*Introduction to topology and metric spaces.* (teaching assistant) "It's fun to be in Ido's tutorials. I really like it when he expands upon the material and tells us more about advanced topics. It is excellent that he gives intuition to most of the topics studied. You can see that he cares a lot about the students. He explains every question and exercise thoroughly and always answers questions even if it delays the tutorial (which I think is excellent)."

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<sup>1</sup>Hebrew slang, see <https://www.haaretz.com/.premium-word-of-the-day-totakh-1.5319010>