

# TEACHING STATEMENT

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## 1. PERSONAL EXPERIENCE AND MOTIVATION

Through out my personal life, I have had the fortune to meet some brilliant teachers who have left a lasting impression on me when they taught me their subject matter. I have somewhat pondered on their styles and have my own convictions that I would like to elaborate in this document.

I feel I am most motivated by the *Moore's method* of teaching mathematics. The concepts and definitions should be logically chanced upon from the axiomatic foundations. This would be closest to giving a feel of a mathematician's journey of discovering the concepts. I realise this is the ideal and having experienced this in very rare occasions, I realise this might not be practical. I think the job of a teacher involves a performance from which the students are supposed to be motivated, engaged and learn the material taught through some form of osmosis. Perfecting such a craft can only be something that will take years of experience.

I feel Theoretical Computer Science, a sub branch of mathematics, cannot be learnt by engaging in classroom discussions alone! I remember an engineering professor I had back in the university days, who had proposed to us the challenge of building a radio to get comfortable with the theory of signal processing and see it working in reality. Such a temperament is also required for the subjects we have at our disposal, where a heady mix of home work problems that build upon the classroom lecture is always needed to actually impart the material to the students.

The topics of computer science also deviate from the core mathematics curriculum in the sense that we deal with a lot of combinatorial objects. I have always felt a lack of flow when we talk about different algorithms in contrast to say how we would pick up linear algebra from any standard book. I realise the subject being in its infancy might be a reason why it appears so "jagged" in contrast to topics that developed over centuries. I would like to be able to understand this phenomenon better and if I find any methodologies that can aid my discomfort that I mentioned here, I'd like to share it with everyone.

Though I haven't taught a full semester course I would like to list down some opportunities where I got to lecture and have feedback from the audiences there.

- (1) Gave a talk on an introduction to **Descriptive Complexity** at IIT K student seminar series called SIGTACS, in January 2023. The audience comprised mostly Nitin Saxena's group, who had asked illuminating questions during my talk. It was an experience to cherish for me because I too got to realise certain nuances that I had glossed over while preparing for the material.
- (2) Gave a **presentation talk** in a summer school hosted by Council of Scientific and Industrial Research, CSIR, and Central Scientific Instruments Organisation, CSIO, and Ashoka University, India for the Summer Institutes of Computational Social Science, SICSS, 2022. This was an interesting summer school that consisted of participants engaging in **Experimental Game Theory**. It needed us to form a team and submit some preliminary investigation on a problem of our choice. I lead our team for this activity.

- (3) Gave an **offline talk** at the TARK conference held at Toulouse, France in 2019. This was my first conference talk and my presentation was appreciated by the audiences. They also asked questions to which I feel I couldn't do a fair enough job during the talk duration, but it was a good learning experience for me.
- (4) Gave the **logic and automata tutorials** for the [summer school](#) at IMSc during 2018. This was the closest I came towards teaching a course. I gave the students a set of stimulating questions. And, had taken the tutorial to the problem set.
- (5) Talked about the notion of connectivity (Konigsberg's bridge problem and linked möbius strips when cut) to school children aimed at promoting women in science in IMSc in 2017. This was a really difficult exercise to pull off, but magically the ideas of connecting them through the ideas of connectivity came in use. There was also a slight showmanship during these talks ( since they were aimed at students below class 10 ) through the creation of möbius strips! Those tricks I had learnt from the brilliant lecture series of Dr. Tadashi Tokieda available on Youtube.

## 2. COURSE PROPOSALS

I wish to propose to take up the following courses if given an opportunity.

- (1) Introduction to Mathematical Logic.
  - *Course Outline* : Would like to follow the famous Enderton's Book, the online lecture notes by Prof Achim Blumensath on [Logic, algebra and geometry](#) and the CMI lecture notes by Prof. Madhavan Mukund and Prof. R. Ramanujam.
- (2) Descriptive Complexity Theory.
  - *Course Outline* : I would love to teach this course following Leonid Libkin's and Neil Immerman's books on this topic. The objectives would be to illustrate the celebrated theorems of Fagin and Immerman-Vardi.
- (3) Algorithms.
  - *Course Outline* : Go over the theoretical study of algorithms. Would like to cover the material from CLRS and Tardos' books. Prof. Venkatesh Raman from IMSc, had done a stellar work of motivating us to see algorithms as evolving objects from the initial rudimentary ones to its more technically complex versions. I would like to replicate the feel Prof. Raman had instilled in us.
- (4) Automata Theory.
  - *Course Outline* : The introduction to the first models of computation like the finite automata, the pushdown automata, etc. I would follow Sipser's book and touch upon the computational models and their properties.