CMI STUDENT TALKS: REPORT FOR AUG-DEC 2006

VIPUL NAIK

ABSTRACT. Chennai Mathematical Institute (CMI) has initiated a system of student talks effective from August 2006. There have so far been fifteen talks, spanning across mathematics, physics and computer science. This report describes the student talk effort so far, as well as problems faced on the way.

1. BEFORE THEY BEGAN

1.1. **Precursors to student talks.** In the academic year 2005-06, a group of interested third-year students decided to conduct student talks in the T. Nagar lecture room (located where the T. Nagar office was earlier) on nights. However, logistic and technical problems prevented the talks from materializing.

Towards the end of the second year, I sent an email on "T. Nagar talks" asking people for suggestions on conducting talks in the T. Nagar room. There were many enthusiastic responses, and we got off to a good start with talks by Indraneel, Pranab Sardar, Ravitej, Arghya and me. Most of the talks were held after the semester-end examinations, so not many people were present.

1.2. **Move for the new student talks.** Keen to start Student Talks on a good note this semester, I sent an email on July 9th to people asking for suggestions/ideas on student talks. There was general consensus to hold the talks in the main Siruseri campus during working hours, for the following reasons:

- Greater facilities within the institute campus for giving presentations and talks; bigger halls
- Easier for local students (Chennaiites)
- No intrusion on non-working time

Still, many points remained to be ironed out, in particular:

(1) **Talk timings**: We wanted minimal clashes with lectures so that people did not have to sacrifice lectures to attend student talks (or vice versa).

   When the time-table for the new semester was released, we saw that the evening slots on Wednesday and Friday were free for all students. Thus, we thought that student talks could comfortably be arranged for the 3:30 slot on these days, and that further student talks could be arranged on Monday, say at 5:00 p.m., requesting one bus to stay back.
(2) **Venue**: Initially, we planned to hold the lectures in one of the lecture halls, though the seminar hall was also on our mind.
(3) **Talk duration**: We expected talks to vary from 30 minutes to 90 minutes in duration. Further, it was hoped that we would get volunteers both for single talks and for series of talks.
(4) **Getting volunteers**: This is always the toughest task in any endeavour! Many people were willing in principle but we wanted people who were ready and prepared to give talks.

1.3. **The first few volunteers.** The story of how we got our first few volunteers is interesting:

(1) Anirbit Mukherjee was among the first volunteers. He proposed to talk on Gauge potentials. He had already given a few talks in T. Nagar.
(2) Vipul Naik (that's me) was also a volunteer. I had already given a talk on Arithmetic functions in T. Nagar, but the audience had been very small. I intended to repeat the talk at Siruseri.
(3) For a somewhat offbeat talk, I invited T. M. Harish, who had been working with data mining and the search world, to give a talk on Practical Data Mining.
(4) Nivedita Bhaskhar, a to-be first-year student, learnt about CMI student talks from Anirbit Mukherjee, and volunteered to give a talk on A Certain Card Trick.

1.4. **Topic-wise coordinators.** Anirbit Mukherjee suggested that there be topic-wise coordinators for the student talks. I sent a mail requesting for coordinators for each topic. Ramprasad volunteered to be the Computer Science coordinator, and he sent a list of the subtopic break-up in computer science, along with some suggestions on how to organize the computer science talks.

There were no volunteers for mathematics coordinator, so I took the post by default.

There were some problems regarding the selection of physics coordinator.

The "coordinator" idea did not take off well this semester, as is discussed later.

2. Talks in the month of August

2.1. **Indraneel's talk on MAXCUT.** Ramprasad and I decided that to give the student talks a great start, we would begin by inviting some of the passing-out students to give talks. Indraneel Mukherjee, who had just finished the 3-year B.Sc. Mathematics course and was about to begin Ph.D. studies in Computer Science at Princeton, agreed to give a talk during his 2-3 day last visit to CMI.

Indraneel's talk had an unusually high audience, due to interesting circumstances.

The CMI semester officially began on August 2nd. The CMI system administrator Prakash Chandrasekharan asked all students to assemble in Lecture Hall 5 for an update on recent changes in the computer facility, at 3:30. Indraneel's talk had also initially been scheduled for 3:30, in the same Lecture Hall, so we decided to have Indraneel's talk as soon as the "briefing" by Prakash ended. Once Prakash had finished, very few people left the room, and so Indraneel delivered his talk to a packed audience.

Indraneel gave his talk on MAXCUT using a slide presentation. The talk was well-received. More importantly, the high attendance for this talk set a precedent for future Student Talks.

2.2. **Nivedita's talk on a card trick.** As earlier mentioned, Nivedita Bhaskhar was a fresher (newly joining student) and had volunteered to give a Student Talk after hearing of Student Talks from Anirbit. She planned to talk on a certain card trick which involved iterating a card operation sufficiently many times. She promised to keep the talk short (to about 20 minutes).

Since it was difficult to find a slot where everybody would be free, I scheduled Nivedita's talk at 5:00 p.m. on Monday, 7th August. I requested the CMI buses to leave a bit late on Monday.

The talk enjoyed high attendance (though not as high as Indraneel's) and was well-received.

2.3. **Harish's talk.** T. M. Harish is an M.Sc. Computer Science Second-year student. After completing his first-year, he did a three-month project at Pinstorm, a web-based advertising solutions company. After his three-month stint, he has been hired as head of the Research and Development team at Pinstorm.

At my suggestion, Harish gave a talk on "Practical Data Mining". The talk was to explain the issues of data mining, the perspectives of big giants like Google and Yahoo, and the perspective of small but promising companies like Pinstorm.

The talk was very well-received and aroused a lot of interest. CMI students bombarded the speaker with questions once the talk was over.

Unfortunately, Harish's talk has remained a one-off with no similar talks since then.

2.4. **Vipul's talk.** I (that's Vipul) gave a talk in number theory on Monday, August 14, at 3:30 p.m. The talk was a repeat of an earlier talk I had given in T. Nagar, and, far from being a general-purpose talk, was intended only for *interested* students. However, with a precedent of three general-purpose talks, many people turned up for my talk.

On the whole, the talk was well-received.

2.5. **Raghav's talk.** Raghav Ramesh Kulkarni is a CMI alumnus, currently working as a Ph.D. student in Computer Science at the University of Chicago. He was visiting CMI for the month of August, doing joint work with Meena Mahajan, Nutan Limaye and Samir Datta. Raghav planned to give a seminar in CMI's official Colloquium slot on recent work related to the Permanent. He wanted to give a preliminary talk to students so that they could easily follow results covered in his big talk.

I requested Raghav to give a student talk. The date was fixed as August 18th, and the time as 3:30 p.m.

The talk had a select audience of interested individuals, and was very well-received.

2.6. **Anirbit's talk.** Although Anirbit was among the first students to volunteer for a Student Talk, a series of unfortunate accidents led to his talk getting delayed.

Initially Anirbit had planned to hold his talk on Wednesday, August 9th. But since Harish has to shuttle between Chennai and Mumbai, and 9th was the only convenient date for him, Anirbit graciously agreed to postpone his talk. August 11th saw an inter-college contest (at SVCE) where a lot of Anirbit's potential audience planned to go. Then, again, August 18th was Raghav's talk.

Anirbit finally managed to schedule his talk on Wednesday, August 30th, at 3:30 p.m. I myself had a class at IMSc so I was unable to attend Anirbit's talk.

3. September

3.1. **The steam was getting over.** With the initial stream of volunteers completely depleted, I had to quicken my search for new volunteers. Ramprasad, who had volunteered to coordinate talks for computer science, had been working hard at preparing slides using beamer for a whole series of student talks. This reduced the pressure on me somewhat, but I was still trying to collect as many volunteers as possible. I sent mails to people who had vaguely mentioned the idea of contributing to Student Talks, asking them for more definite indications. Some of these people had been secretly working on their student talks, and I did manage to get a few more volunteers. However, it was fast becoming clear that the initial stream of volunteers had been a burst speed that may not be matched in the coming months.

Another problem that we were increasingly encountering was tightness of schedule. In the original time table, the afternoon slots (3:30 onwards) on Wednesday and Friday were *completely free.* However, the diverse course ambitions of students and commitments of instructors led to various optional and compulsory courses eating up these free slots. The evening scene was now as follows:

- Monday, 3:30 p.m.: Physics third-year students had compulsory laboratory sessions; Arul, Ananyo, Swarnava and I had Abelian varieties (except on the occasions when it was cancelled)
- Tuesday, 3:30 p.m.: First-year students had Classical Mechanics
- Wednesday, 3:30 p.m.: Arul, Ananyo, Swarnava and I had Abelian varieties (except on the occasions when it was cancelled)
- Thursday, 3:30 p.m.: First-year students had Classical Mechanics
- Friday, 3:30 p.m.: Second-year students had Algebra III.

There was also the fact that apart from Harish's talk, none of the talks so far had been attended by any M.Sc. students or research scholars. Even among B.Sc. students, not too many seemed actively interested in student talks.

Confronted with these issues, Student Talks began the month of September.

3.2. **Ramprasad's talk on Drunkard's Walk.** Ramprasad had prepared an attractive talk with an attractive title: "An electric story of a drunkard". The talk was scheduled for Friday, 3:30 p.m. Second-year students had Algebra III at the time, but I was unaware of this complication while scheduling.

Ramprasad delivered a presentation with SVG graphics plugged into a PDF file prepared from LaTeX using the beamer document class. The talk was held in Lecture Hall 1. The audience for the talk was small, but the talk was really well-appreciated.

3.3. **Yet another talk by Ramprasad.** Although this had not been his original intention, Ramprasad ended up giving both his Student Talks back-to-back. Ramprasad's second talk, titled "Which game is harder?" was intended as an introduction to the theory of important complexity classes, using games. It was held on September 6th, at 3:30 p.m.

This talk again had a select and highly focussed audience and the talk was well-received.

3.4. **The second talk in Anirbit's series.** Anirbit delivered the second talk in his series on "Vector Potentials and Gauges" on September 8th, at 3:30 p.m. This talk was well-received, but also met with some negative feedback of requiring a high degree of mathematical prerequisites.

Based on this feedback, Anirbit decided to parallelly begin a workshop on physics to focus on teaching mathematical formalisms in physics. The workshops were intended to have a high teacher-student ratio with individual attention, and with greater mutual cohesion.

This talk was also a marker of the decline in Student Talks. Disagreements between Anirbit and Shouvik over technicalities of physics (and other matters) resulted in lack of coordination among physics students for creating a vibrant Student Talks programme. Apart from one further talk by Ravitej, there were no more physics Student Talks. This matter (which has been discussed later) will hopefully receive closer attention and correction in the coming semester.

3.5. **My talk on LaTeX.** When two first-year students (Jayanth and Nivedita) asked me about LaTeX, I got a brainwave of conducting a talk on the use of LaTeX. I asked Nivedita whether she and the other first-years are interested in attending such a talk, and I got many enthusiastic responses. I decided to have my talk as part of the Student Talks. It was left to find a convenient slot for my talk.

After exhausting the 3:30 slots for all five days, I realized that on each day, there was a *nonzero* number of students who *wanted* to attend but could not attend due to other commitments. The only slot that was free was the morning of Thursday, September 14th. However, that was the very day for which I had scheduled my General GRE examination at 9:00 a.m.

After a lot of deliberation, I decided to schedule my talk on Monday, September 11th, at 5:00 p.m. I had prepared a PDF document with detailed explanations of writing in LaTeX. This was the first talk held in the Seminar Hall, and it set a good precedent.

The audience, though not huge, was sufficiently diverse to justify the late timings. The talk was well-received.

3.6. **Time for feedback collection.** I decided to collect feedback regarding how to make student talks more effective. I sent general mails (to all students) as well as talked to particular "regular" students seeking ideas on how to improve Student Talks and make them more effective. I got a diverse range of suggestions, one of them being that talks should be held within regular college hours, and another being that talks should be held in the (air-conditioned) Seminar Hall.

3.7. **Ved's talk on irrationality of π^2.** Ved, a second-year student, had long ago expressed interest in giving a talk related to the Riemann-Stieltjes integral. In the beginning of September, I reminded him of this and he proposed to give a talk on a proof of the irrationality of π^2. The talk was fixed for Monday, September 18th, 3:30 p.m. This slot was assumed to be convenient for all interested students, because my Abelian varieties class for the day had been cancelled, and it seemed that the physics third-year students were unlikely to attend.

The first-year students were attending a non-credited quarter course called "Overview of Physics". The course instructor decided to schedule an extra class in the subject on Monday at 3:30 p.m., despite the pre-scheduling of the Student Talk for that slot.

4. October: after the mid-semester exams

4.1. **Shortage of volunteers.** By the beginning of October, the number of student talks on the cards was steadily approaching zero. While I had a few talks of my own to give, I was concerned about the shortage of volunteers.

The first week of October as spent in the famed inter-college contest Shaastra (organized by IIT, Chennai). Also, many students had gone home during the first week of October. So we decided to resume student talks in October.

4.2. **A talk by Ravitej.** Anirbit had long ago told me that Ravitej planned to give a series of talks on the KAM theorem. In September, I had contacted Ravitej asking him about his plans for the talk on KAM theorem. Ravitej had given details of a three-part talk series, and the first part had been scheduled for September 15th. However, the talk could not be held on that day, due to reasons I cannot now recall.

Ravitej's talk was thus the first one after the mid-semester examinations. It was held on Friday, October 13th, at 3:40 p.m. Again, I was unable to attend Ravitej's talk. After the talk, Ravitej informed me that he had decided to defer the other two talks of the series and instead focus on the workshop effort with Anirbit.

4.3. **My group theory talk.** This was yet another of those talks for which I kept trying to find a suitable slot. I was now occupied on Mondays and Wednesdays, and the first-years (many of whom were keen to attend my talk) had a class on Tuesdays and Thursdays. Finally, I fixed Tuesday 5:00 p.m. as the slot for my talk. I requested for the 35-seater bus going via IMSc to stay back, and a mail informing everybody about it was sent on Monday morning.

It turned out that the 55-seater bus, that usually goes via Velachery, suffered a tyre puncture, and hence, the 35-seater bus was sent back via Velachery, and the 55-seater bus was asked to stay back to go via IMSc.

The decision to make the bus going via IMSc go back late inconvenienced many people, including the system administrator, Prakash. Luckily, one of the other CMI vehicles going to IMSc had a vacancy, and Prakash managed to leave. However, the feedback I received made me decide to hold talks within working hours if possible.

I had prepared slides for my group theory using LaTeX and the beamer document class (taking a leaf out of Ramprasad's book). The talk was well-received.

5. November

5.1. Things getting worse and worse.
With the supply of physics talks cut off, and with people getting busy with exam preparations and "wrapping up" for the semester, it was getting more and more difficult to have talks for the month of November. However, hope is never lost! Despite a number of accidents and mishaps, two student talks were held in November.

5.2. A mailing list for student talks.
On receiving Soumendra's mail inviting people to the Movie Club mailing list, I decided that issues of spam for mails on student talks could be settled once and for all, with the creation of a Student Talks mailing list. I requested the System Administrator (Prakash) to create a Student Talks mailing list, and volunteered to be the administrator for this mailing list. Most of the people actively interested in Student Talks signed up for this mailing list in a few days' time.

5.3. Swarnava's talk: the talk that never happened.
Swarnava had long ago planned to give a talk on the representation theory of a certain finite group. In mid-October, I asked him whether he could give the talk in November. Swarnava told me that this topic was not completely ready, but suggested that he give a talk on Liouville's theorem. I promptly agreed and we scheduled his talk for Thursday, November 2nd, morning 9:15 a.m.

However, the talk could not be held in that slot because a bus delay earlier in the week resulted in Professor Madhavan Mukund scheduling an extra class for the first-year students in the Thursday morning slot.

Since more talks were lined up for next Thursday morning, and since there were very few free slots left, Swarnava proposed to postpone this talk for next semester as well.

5.4. Ramprasad's talk on sorting networks.
Ramprasad had yet another of his wonderful slide shows ready for presentation on Thursday, November 9th. The talk was scheduled for 9:15 a.m., but unfortunately, the CMI bus going via IMSc came late. Most students boarded the other bus. However, a first-year student, Nivedita Bhaskhar, who had expressed keen interest in attending the talk, was supposed to board the bus going via IMSc. The starting time of the talk was thus postponed to 9:45 a.m.

The talk had a select and focussed audience and was well-received.

5.5. My talk on algebraic geometry.
For a long time, I had dreamed to give a talk on algebraic geometry, and the connections with high school geometry. Towards the end of October, I turned these dreams into a concrete proposal and asked for interested people. After getting some enthusiastic responses, I set about preparing for my talk.

I had initially scheduled my talk for Thursday, November 16th. But on discovering that the first-years were free on Tuesday afternoon, I preponed my talk to the 2:00 slot on Tuesday afternoon.

Unfortunately, the Seminar Hall was locked due to cleaning for a Felicitation Function in the offing. As a result, I lectured in Lecture Hall 1. The talk went on till 3:30 p.m.

The contents of the talk were more than that of the average student talk, and it was criticized in some circles as being too heavy. However, the overall feedback was positive and encouraging.

6. Summary and analysis

6.1. Overall success.
Given the feedback I received from students throughout the Student Talks, I feel that the Student Talks weer a success. The reasons:

(1) Many people volunteered to give student talks, even if all the proposed talks did not materialize
(2) There was high attendance in many of the student talks
(3) People, particularly first-year students, made efforts to reschedule and cancel classes to accommodate student talks
(4) Many people joined the mailing list and also responded with constructive suggestions for improving the Student Talks
(5) Students said they benefited from the Student Talks not just in terms of knowledge but also in terms of perspective, and that it aroused their interest in areas of mathematics, physics and computer science

6.2. **Topic-wise analysis.** Of the student talks, 3 were in hardcore physics, 5 were in hardcore computer science, 4 were in hardcore mathematics, and 3 were general.

(1) **Physics talks**: Anirbit's two physics talks and Ravitej's one physics talk faced two major drawbacks: first-year students did not have the adequate mathematical background, and others (third-year physics students and non-physics students) were uninterested. Thus, they switched to the workshop mode.

None of the other physics students volunteered, nor did I send express invitations to any of them. Arghya could have been asked to give talks on Nonlinear dynamics, given that he had talked on the subject back in T. Nagar. However, neither he nor I took up the chance.

There was some debate and acrimony over who would be coordinator for the Student Talks in physics. Shouvik had volunteered for the job, and so had Anirbit. Being rather uninvolved with physics myself, I suggested that the physics students get together and decide these issues. However, due to various reasons, this getting together never happened.

(2) **Computer Science talks**: The computer science talks started on a promising footing, with Ramprasad volunteering to be coordinator for Computer Science student talks. The first two Student Talks in computer science were by alumni, and necessarily with somewhat higher prerequisites than what first-years possessed. Ramprasad himself delivered the remaining three Student Talks, in splendid slide presentations. These talks were well-appreciated by their audience, but the audience was severely limited. On the whole, however, Ramprasad's talks managed to give the students a reasonable idea about the leading notions in Complexity Theory.

(3) **Mathematics talks**: There was a total of four hard-core talks in Mathematics. Three of them were delivered by me: number theory, algebraic geometry, group theory. The fourth was delivered by Ved Datar in analysis. On the whole, the mathematics talks had a reasonable spread in the subject, though they were woefully few in number. They were also accessible to most students, particularly first-year students.

(4) **General talks**: These included my talk on mathematical writing, Harish's talk on practical data mining, and Nivedita's talk on a card trick. All of these talks were greatly appreciated. A greater number of general talks would probably be desirable.

6.3. **Profile of interested students.** Among those interested in the student talks, a majority are first-year students, both from mathematics and from physics. There are also a few second-year (mathematics and physics) students and a few third-year (mathematics) students. 3 M.Sc. students and a couple of research scholars have signed up for the mailing list, but they are not among those regularly attending the student talks.

6.4. **General problems we experienced.** The overall problems we experienced are as follows:

(1) **Lack of volunteers**: We had a total of nine distinct speakers for the student talks. Moreover, most of the volunteers had volunteered right at the start, so the stream of volunteers kept becoming slower and slower as time progressed.

I plan to address this problem so that it does not recur next semester.

(2) **Lack of interested students**: This was a problem for some talks but not in general; there were enough interested students to justify each student talk.

This problem will be automatically solved if the student talks are interesting, valuable and convenient to attend.

(3) **Lack of time slots**: This was a severe problem, due to: varying time tables, bus schedules, and extra classes.

With the move to the new hostels, this problems is likely to be present in smaller measure. Of course, there is danger of competition with other organized student activities, but given the current degree of organization of these activities, no serious threat is posed to the Student Talks.

(4) **Lack of overall purpose or organization**: Though the Student Talks did end up covering a wide range of topics, there was no systematic effort to ensure a good coverage in mathematics, physics and computer science. A systematic effort may have resulted in more value to those regularly attending student talks.

(5) **Lack of written record for some of the student talks**: Complete slide presentations or documents are available for Ramprasad's talks, Indraneel's talk, three of Vipul's talks, and Ravitej's talk. For the others, the only memories of student talks are the scribbles we took down while the speaker was talking. Thus, it is hard to revive the content after a long period of time.

A written record of all student talks can be a great help. This written record may be in the form of a formatted document, or may even be a copy of handwritten notes prepared for the talk.