Report for The East African School on Applicable Algebraic Geometry
8th to 26th of July 2013
Bandari College, Mombasa

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Executive Summary

The school on applicable algebraic geometry was held at Bandari College Mombasa in Kenya from the 8th of July to the 26th of July 2013. We had a total of 43 participants from Kenya(17), Uganda(10), Tanzania(6), Rwanda(4) and Zambia(4). We had a total of 7 lecturers staggered over the 3 weeks. The school involved lectures and excercise sessions as well as mini projects for the participants. The sponsors were CIMPA, EAUMP, ISP , AMMSI and LMS and University of Nairobi. The lectures were covered as follows;

Time	Topics	Lecturers
Week 1	Linear Algebra, Commutative Algebra	Gavin Brown and Joseph Grant
Week 2	Affine and Projective Algebraic Geometry	Gergely Berczi and George Hein
Week 3	Groebner bases, Algebraic statistics,Toric Varieties	Tom Denton, Ruriko Yoshida, Balazs Szendroi

The lectures were timed as follows   9am-10.30am, 11am-1pm   2pm to 3.30pm, and 4pm-5pm. The excercise sessions were interactive and provided lots of examples for the participants and an opportunity for the lecturers to continously adapt their mode of lecturing. Computing using Sage, R and 4ti2 was introduced in the third week by Tom Denton and Ruriko Yoshida in the Grobner bases and Algebraic statistics lectures. The lecturers provided lecture notes and exercise sheets on soft copy and all the participants recieved printed copies. A total of 39 mini-projects in different areas were submitted by the participants. On the final day there were talks given by Dr. Damian Maingi and Jared Ongaro, from the Univesrsity of Nairobi, on their research areas. The top 10 students were given certificates of merit and some presents (mostly books) as a form of encouragement. The feedback from the students was very positive. Some of the students have mantained contact with the lecturers. After the school, Tom Denton gave two more 2 hour workshops on Sage at the University of Nairobi for the local participants.

We wish to acknowledge that this would not be possible without support from our sponsors. Special thanks also go to AMU for providing a platform for African mathematicians to benefit from CIMPA funding. The bulk of the funding was from EAUMP and the network made it easy to avail students for the school. Balazs Szendroi played a big role of putting together the team of lecturers. Course director Gavin Brown was with us for the whole duration and did an excellent job of organising the lectures, exercises and mini projects. The lecturers and participants were also very committed and this made it a very big success.

School structure and Organisation

Although algebraic geometry is an active area of research within mathematics, it is hardly present in African universities. It is important to break ground and bring some expertise and eventually develop research groups in algebraic geometry in Africa. This school was built around a few individuals who work in Algebraic Geometry at Kenyan universities, primarily the University

of Nairobi and Maseno University, and one of its aims is to help in creating a critical mass of expertise to form a viable research group there.

The main aims of the school were

- To teach the necessary background in linear and commutative algebra to a wide audience, some of whom may work in different fields.

- To introduce graduate students and young faculty to algebraic geometry and current trends and provide research topics for masters and PhD students.

- To provide a forum for African Mathematicians to interact exchange ideas and initiate collaborations.

- Identify talented students for possible PhD programs.

- Prepare some lecture notes in advance to be used during the lectures and to be made publicly available online.

- To initiate some research groups, and in particular strengthen the University of Nairobi algebraic geometry group.

The lectures were largely built around these objectives. There was plenty of emphasis on examples and exercises throught the school and all the participants were provided with hard copies of the lecture notes and exercises. There was 24 hour access to the internet which turned out to be very useful for both the lecturers and the participants.

The lecturers opted to assess the participants through mini projects given in the second week of the school. A list of suggested topics was provided but students were free to submit their own projects outside the list. The projects were based on the topics covered in the first two weeks. The students were free to consult each other and the lecturers but were expected to submit individual projects.

From the assesment of the lecturers the following students' work was outstanding and they were given certificates of merit and some recieved books on Algebraic geometry and commutative algebra.

Name	University	Mini Project Title
Irene Mumbua	University of Nairobi	Group structure on cubic curves
David Kihato	University of Nairobi	Groebner Bases
Bazeyo Tumuhimbise	Makerere University	Primary Decomposition
Denis Kikete	University of Nairobi	Group structure on cubic curves
Fidele Ruganzu	KIST(Rwanda)	Localization of rings)
Stephen Kamau	University of Nairobi	Free Resolutions
Agnes Joseph	University of Dar es Salaam	Primary decomposition
Xavier Mbale	University of Zambia	Group structure on cubic curves
Uledi Ngulo	University of Dar es Salaam	Group structure on cubic curves
David Angweny	University of nairobi	Cayley Hamilton Theorem

The local organising committee consisted of Prof. Patrick Weke, Dr. Jamen Were, Dr James Katende and Dr. Damian Maingi.

Recommendations and Observations

- The school's objectives were largely achieved. Three students from the university of Nairobi will do their MSC projects on Toric varieties suggested by Balazs Szendroi. Currently they are reading Atiyah's Introduction to commutative algebra.

- One student from the university of nairobi is currently in touch with Ruriko Yoshida for possible PhD in algebraic statistics. Another student from the University of Nairobiis in touch with Tom Denton for possible links for PHD.

- Due to the success of the school Balazs Szendroi, along with CIMPA, AMU and EAUMP, is organising a school on Representation theory in Tanzania for 2014.

- The Duration of three weeks and two lecturers per week seems to be ideal for such schools and we recommend the same for future schools.

- All students received soft copies of the material but a website will be constructed for the school where all the material, including pictures, lectures, exercises and mini project topics, will be available. James Katende will be responsible for this.

- The students had access to internet and this was quite useful for them as well as the lecturers.

- From the feedback forms all the participants said they would highly recommend such a school to other students.