Stockholm Master Class in Mathematics - Tropical methods in curve counting and moduli spaces 14-25 August 2017

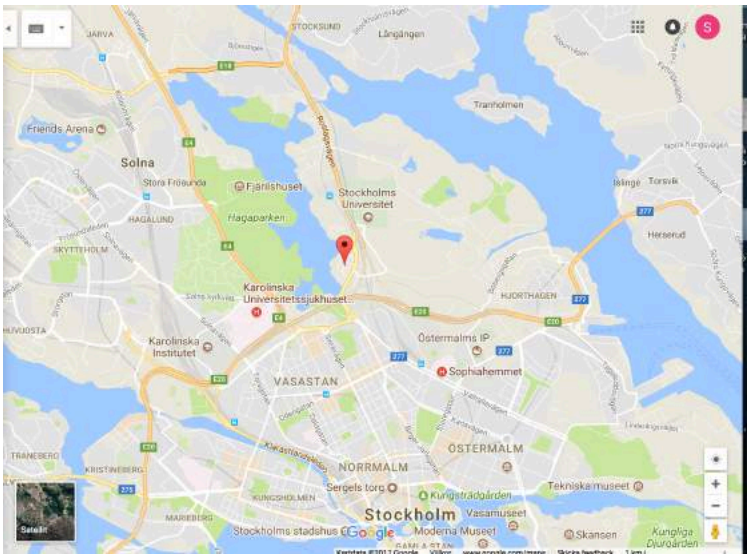
Stockholm Mathematics Center (SMC) together with the organisers Hannah Markwig, Renzo Cavallieri and Dhruv Ranganathan would like to welcome all registered participants to this two week Master Class in Stockholm.The objective is to give the participants 3 research-oriented crash courses in tropical algebraic geometry, organise them in small groups working on concrete research projects with the ambition of writing student papers in the area which (if their quality will be sufficient) will be posted on arXiv and submitted for publication.

Mini courses

- **Enumeration of tropical curves** by Hannah Markwig
- **Curve counting in tropical and algebraic geometry** by Renzo Cavalieri
- **Curve counting and logarithmic geometry** by Dhruv Ranganathan

Venue: The Master Class will take place at the **Department of Mathematics, Stockholm University**. We are located in Kräftriket, House 5 and 6. Our buildings are located a bit south of the main University area, at the nearest **bus stop Albano**. The lectures will be held in **Room 14, House 5, Kräftriket**

Maps: http://www.math.su.se/english/about-us/find-us



Wireless network: Eduroam will be working at our facilities. If anyone don´t have access to Eduroam, you can apply for a weekly One-time code (at least one day in advance) from Sara Woldegiorgis, to use the Stockholm University wireless network.

Food: There are a few lunch restaurants not too far away http://www.su.se/english/about/campus/lunch-venues, the nearest (and probably cheapest) is **Café Matte** in the lecture building, House 5, floor 2. They only accept cash payment.

Rooms in House 5: To see which classrooms that are booked in House 5, Kräftriket: www.math.su.se/today (The booked rooms are used for re-exams during this period). Classrooms that aren´t booked can be used by students (and participants in the Master Class).

Hotel: A hotel used by many participants is Hotel Vanadis http://www.vanadishotel.com/home.aspx within walking distance from the Department of Mathematics.

Contacts/Local organisers:

Boris Shapiro shapiro@math.su.se

Sara Woldegiorgis saraw@math.su.se

Welcome to Stockholm!

Schedule for **Stockholm Master Class in Mathematics: Tropical methods in curve counting and moduli spaces 14-25 August** 2017

The Master Class consists of 3 Mini courses, who will be taught in parallel:

1. **Enumeration of tropical curves** by ***Hannah Markwig***
   (6 lectures + Introduction)

2. **Curve counting in tropical and algebraic** geometry by ***Renzo Cavalieri***
   (6 lectures + Introduction)

3. **Curve counting and logarithmic geometry** by ***Dhruv Ranganathan***
   (6 lectures + Introduction)

All lectures will be given in the morning in room 14. The teachers will then be available for a couple of hours in the afternoon for exercises/discussions. Room 14 is booked for the Master Class 9 a.m.-5 p.m. all lecture days.

Week 1: 14-19 August

Monday 14 August

08.30-09.00 Registration outside Room 14, House 5, Kräftriket

09.00-09.10 Welcome + Practical information
09.10-10.00 Introduction: Curve counting in tropical and algebraic geometry (Renzo Cavalieri)
10.10-11.00 Introduction: Enumeration of tropical curves (Hannah Markwig)
11.10-12.00 Introduction: Curve counting and logarithmic geometry (Dhruv Ranganathan)

Tuesday 15 August

09.00-10.30 **1.1** Tropical polynomials and plane curves. (H.M)
10.45-12.15 **3.1** Crash course in toric varieties and tropicalization (D.R)

Wednesday 16 August

09.00-10.30 **1.2** Abstract tropical curves and maps to the plane. (H.M)
10.45-12.15 **2.1** Moduli spaces. (R.C)

Thursday 17 August

09.00-10.30 **1.3** Counts of tropical curves, the lattice path algorithm. (H.M)
10.45-12.15 **2.2** M_0,n classical and classical psi classes. (R.C)

Friday 18 August

09.00-10.30 **1.4** Moduli spaces of tropical stable maps. (HM)
10.45-12.15 **3.2** Moduli spaces of maps from genus 0 curves to toric varieties. (D.R)

Week 2: 21-25 August

Monday 21 August

09.00-10.30 **2.3** Tropical psi classes. (R.C)
10.45-12.15 **3.3** The degeneration formula. (D.R)

Tuesday 22 August

09.00-10.30 **2.4** Hurwitz numbers, classical and tropical (R.C).
10.45-12.15 **1.5** Tropical enumerative numbers as intersection products. (H.M)

Wednesday 23 August

09.00-10.30 **3.4** Logarithmic structures as a distinguished class of maps to toric varieties (D.R)
10.45-12.15 **2.5** Introduction to the Fock Space. (R.C)

Thursday 24 August

09.00-10.30 **3.5** Tropical moduli spaces and curve counting using logarithmic geometry. (D.R)
10.45-12.15 **1.6** Kontsevich's formula and/or Caporaso-Harris formula for tropical curves. (H.M)

Friday 25 August

09.00-10.30 **3.6** Where does the tropical multiplicity come from? A case study in admissible covers. (D.R)
10.45-12.15 **2.6** Tropicalization is Bosonification. (R.C)

List of Participants: Stockholm Master Class in Mathematics: Tropical methods in curve counting and moduli spaces 14-25 August 2017

First name	Last name	Level of studies	University	Country
Charles	Arnal	Master/PhD	UPMC	France
Garnet	Akeyr	PhD	Universiteit Leiden	Netherlands
Nima	Amini	PhD	KTH	Sweden
Emelie	Arvidsson	PhD	Frei universität	Germany
Dori	Bejleri	PhD	Brown University	United States
Lev	Blechman	PhD	Tel Aviv University	Israel
Nathan	Bliss	PhD	University of Illinois at Chicago	USA
Madeline	Brandt	PhD	University of California, Berkeley	United States
Raffaele	Caputo	PhD	Hamburg University	Germany
Karl	Christ	PhD	Roma Tre University	Italy
Marina	Dudina	Master	Skolkovo Institute of Science and Technology	Russia
Simon	Felten	PhD	JGU Mainz	Germany
Eugenia	Ferrari	PhD	University of Bergen	Norway
Sara Angela	Filippini	Post Doc	University of Cambridge	United Kingdom
Andrew	Fry	PhD	Colorado State University	United States
Tim	Gabele	Master	Hamburg University	Germany
Honghao	Gao	PhD	Northwestern University & IMJ-PRG	France
Christoph	Goldner	PhD	University of Tübingen	Germany
Marvin	Hahn	PhD	University of Tuebingen	Germany
Nicolas	Hemelsoet	Master	University of Geneva	Switzerland
Max	Hully	PhD	University of Massachusetts Amherst	United States
Giovanni	Inchiostro	PhD	Brown University	United States
Jan Niklas	Jost	PhD	Ruprecht-Karls-Universität Heidelberg	Germany
Cheikh	Khoule	PhD	University Cheikh Anta Diop of Dakar	Senegal
Kathlén	Kohn	PhD	Technische Universität Berlin	Germany
Khazhgali	Kozhasov	PhD	SISSA	Italy
Sara	Lamboglia	PhD	University of Warwick	UK
Souaad	Lazergui	PhD	Abd Alhamid ben badis mostaganem	Algeria
Tobias	Magnusson	Master	SU/KTH	Sweden
Stefano	Marseglia	PhD	Stockholm University	Sweden
Anja	Meyer	Master	Georg-August Universität	Germany
Leonid	Monin	PhD	University of Toronto	Canada
Gleb	Nenashev	PhD	Stockholm University	Sweden
Harry	Richman	PhD	University of Michigan	USA
Ghozali	Sabri	Master	Paris 1 Pantheon-Sorbonne	France
Axel	Sarlin	Master	KTH	Sweden
Johann	Selewa	Master	Stockholm University	Sweden
Ashgarli	Shamil	PhD	Brown university	USA
Ben	Smith	PhD	Queen mary University Of London	United kingdom
Jeff	Sommars	PhD	University of Illinois at Chicago	United States
Simon Andres	Soto Ochoa	Master	University of Los Andes	Colombia
Christian	Steinhart	PhD	Universität des Saarlandes	Germany
Sahar	Tahvili	Master	Mälardalen University	Sweden
Kolatschek	Tamara	Master	Eberhard Karls Universität Tübingen	Germany
Ayush Kumar	Tewari	PhD	Eberhard Karls University of Tübingen	Germany
Pol	van Hoften	Master	Utrecht University	Netherlands

Alejandro José	Vargas De León	PhD	University of Bern	Switzerland
Yuto	Yamamoto	PhD	The University of Tokyo / University of Geneva	Japan / Swiss
Innokentij	Zotov	Master	KTH	Sweden