

TOPOLOGY AND GEOMETRY 2018 SUMMER SCHOOL

All activities will take place in the Math-Stat Building,
<https://facilities.uchicago.edu/construction/stevanovich-center/>
5727 South University Avenue
(Across the Street from the math department, Eckhart Hall, 1118 E 58th St.)

Here are the course descriptions, speakers, and schedule:

COURSE 1 (Jennifer Wilson and Jordan Ellenberg):

Braid groups and spaces of polynomials : connections to number theory

Wilson:

Topology of the ordered configuration space of \mathbb{R}^2 , (hyperplane complement viewpoint, relationship to unordered configuration space / polynomials, relationship to braid groups, Viete map, forgetful maps are fibrations, configuration spaces are Eilenberg-MacLane spaces, computations for low n), computation of the cohomology groups, the cohomology groups as S_n -representations and relationship to braid group cohomology with twisted coefficients, connection to point-counting statistics for polynomials over finite fields.

The aim is to make the first talk quite accessible, and the next talk a little more advanced (with the Serre spectral sequence and Grothendieck-Lefschetz machinery as blackboxes). For some of the topics the details may be left as a sequence of exercises.

Ellenberg:

What a number theorist would mean by the fundamental group of a punctured Riemann surface over \mathbb{Z} , and how the Galois group of \mathbb{Q} plays the role for us that a braid group or a mapping class group does for topologists, in that it acts on these arithmetic fundamental groups. Braid monodromy in the arithmetic sense.

COURSE 2 (Jesse Wolfson):

Resolvent degree (RD) and Hilbert's problems

Solvability by radicals, Bring's reduction of the quintic, Tschirnhaus transformations, the geometric perspective of Klein and Hilbert, Hilbert's problems, resolvent degree, essential dimension, versality and the connection to representation theory, the connection to enumerative problems.

COURSE 3 (Benson Farb):

Enumerative problems : revisiting an old perspective.

27 lines on a cubic surface, 28 bitangents on a smooth quartic, flex points, etc (proofs using covering spaces, chern classes, algebraic geometry), monodromy groups, Harri's "Galois groups of enumerative problems", the resolvent degree of enumerative problems (Klein-Burkhardt, connection to rep theory, relating lines on smooth cubic to bitangents on planar quartics), connection with locally symmetric varieties, del Pezzo surfaces.

SCHEDULE

Coffee and nibbles every morning, T-F, at 8:30 in the Math-Stat lounge.

Tuesday

- (1) Opening talk (overview of math, goals of workshop, how the mini-courses fit together, etc) 9:00 - 9:50
- (2) RD talk 1 (Jesse) 10:15 - 11:05
- (3) Braids talk 1 (Jenny) 11:30 - 12:20
- (4) Lunch 12:30 - 2:00
- (5) Enumerative talk 1 (Benson) 2:30 - 3:20
- (6) Problem session 1 (Exercises from sessions) 3:30 - 5

Wednesday

- (1) Jordan talk 1 9:00 - 9:50
- (2) Enumerative talk 2 (Benson) 10:15 - 11:05
- (3) RD talk 2 (Jesse) 11:30 - 12:20
- (4) Lunch 12:30 - 2:00
- (5) Jordan talk 2 2:30 - 3:20
- (6) Lightning talks 3:30 - 5
- (7) Pizza dinner/Evening problem session 7:00 - 9:00

Thursday

- (1) Enumerative talk 3 (Benson) 9:00 - 9:50
- (2) Braids talk 2 (Jenny) 10:15 - 11:05
- (3) Problem session 3 11:30 - 12:20
- (4) Lunch 12:30 - 2:00
- (5) RD talk 3 (Jesse) 2:30 - 3:20
- (6) Lightning talks 3:30 - 5
- (7) Pizza/Evening problem session (as desired) 7:00 - 9:00

Friday

- (1) Braids talk 3 (Jenny) 9:00 - 9:50
- (2) RD talk 4 (Jesse) 10:15 - 11:05
- (3) Problem session 3 11:30 - 12:20
- (4) Lunch 12:30 - 2:00
- (5) Enumerative talk 4 (Benson) 2:30 - 3:20
- (6) Closing session 3:30 - 5