

## Mini-course: Analytic techniques in algebraic geometry

Oct.17–Nov.9

**Instructor:** Professor *Valentino Tosatti* at Northwestern University.

### Schedule:

Lecture 1: Oct. 17, Monday, 3:00pm-5:00pm  
Lecture 2: Oct. 19, Wednesday, 3:00pm-5:00pm  
Lecture 3: Oct. 24, Monday, 3:00pm-5:00pm  
Lecture 4: Oct. 26, Wednesday, 3:00pm-5:00pm  
Lecture 5: Oct. 31, Monday, 3:00pm-5:00pm  
Lecture 6: Nov. 2, Wednesday, 3:00pm-5:00pm  
Lecture 7: Nov. 7, Monday, 3:00pm-5:00pm  
Lecture 8: Nov. 9, Wednesday, 3:00pm-5:00pm

**Prerequisites:** Familiarity with basic differential geometry and complex analysis.

**Course description:** This course is an introduction to complex analytic techniques in algebraic geometry. Topics that will likely be covered include:

- (1) Plurisubharmonic functions and closed positive currents, Lelong numbers;
- (2) Hörmander's  $L^2$  estimates for  $\bar{\partial}$ ;
- (3) Ohsawa-Takegoshi extension theorem (as a consequence of Hörmander);
- (4) Demailly's regularization theorem for currents;
- (5) Multiplier ideal sheaves and Nadel vanishing theorem;
- (6) Applications to algebraic geometry;
- (7) Invariance of plurigenera;
- (8) Fujita's approximation theorem;
- (9) Boucksom-Demailly-Paun-Peternell's characterization of uniruled manifolds;
- (10) Openness conjecture and strong openness conjecture.

### References

- [1] Demailly, J.-P. *Analytic Methods in Algebraic Geometry*, Higher Education Press, Surveys of Modern Mathematics, Vol. 1, 2010.
- [2] Lazarsfeld, R. *Positivity in algebraic geometry*. I, II. Springer-Verlag, Berlin, 2004.
- [3] Guan, Qi'an; Zhou, Xiangyu. A proof of Demailly's strong openness conjecture. *Ann. of Math.* (2) **182** (2015), no. 2, 605–616.