MINI-COURS : ≪ La topologie des variétés algébriques ≫
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**MINI-COURSES: "The Topology of Algebraic Varietie"
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Logarithmic genera and the BMY-inequality

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- A. Langer's Lectures

The main aim of the lectures is to show a generalization of the Bogomolov–Miyaoka–Yau inequality to log canonical surfaces and applications of this inequality. We will start with definition of log canonical pairs and logarithmic forms. Then we use generalization of the logarithmic ramification formula to prove the Bogomolov-Sommese vanishing theorem. This plays an important role in proving the Bogomolov–Miyaoka–Yau inequality. We also plan to show how to compute local orbifold Euler numbers for quotient singularities. Finally, we plan to give some applications of the BMY inequality to problem of bounding curves on surfaces of general type.

Apart from classical references the following will be useful :

D. Greb, S. Kebekus, S. Kovacs, T. Peternell, *Differential forms on log canonical spaces*, Publ. Math. Inst. Hautes Études Sci. No. **114** (2011), 87–169.

A. Langer, *Chern classes of reflexive sheaves on normal surfaces*, Math. Z. **235** (2000), 591–614.

A. Langer, *The Bogomolov–Miyaoka–Yau inequality for log canonical surfaces*, J. London Math. Soc. **64** (2001), 327–343.

A. Langer, *Logarithmic orbifold Euler numbers of surfaces with applications,* Proc. London Math. Soc. **86** (2003), 358–396.

G. Megyesi, *Generalisation of the Bogomolov–Miyaoka–Yau inequality to singular surfaces*, Proc. London Math. Soc. **78** (1999), 241–282.

Y. Miyaoka, *The orbibundle Miyaoka–Yau–Sakai inequality and an effective Bogomolov–McQuillan theorem*, Publ. Res. Inst. Math. Sci. **44** (2008), 403–417.

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- R. Kobayashi's lectures

What I have in mind as a topic which is directly connected to the BMY inequality is the second main theorem (still a conjecture) in Nevanlinna theory. Here is an abstract.

The idea behind the conjectural second main theorem in Nevanlinna theory belongs to the same circle of ideas as BMY inequality. In my lecture, I will start with basic definitions and standard facts in this topic for beginners. Then I will introduce you the original R. Nevanlinna's second main theorem with a proof following R. Nevanlinna's original idea. The key is an algebro-geometric Lemma on logarithmic derivative. This clarifies the role of Gauss-Bonnet theorem (or the canonical bundle) in Nevanlinna's second main theorem. Then I will state and give a proof of Cartan's second main theorem for the approximation to hyperplanes of holomorphic curves in $P^n(C)$. The proof is again based on the algebro-geometric Lemma on logarithmic derivative. If I have time, I would like to say something about holomorphic curves in abelian varieties.