

PhD project

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GEOMETRY OF THE ALBANESE MAP

OVERVIEW

This is a project in *algebraic geometry*, concerning the study of smooth projective and quasi-projective varieties.

Algebraic varieties are not all equal: some of them, such as abelian varieties, possess additional structures which provide a greater set of tools to investigate their geometry. Now, to any smooth projective variety X we can associate an abelian variety $\text{Alb}(X)$, called *Albanese* variety of X , together with a morphism $\text{alb}_X : X \rightarrow \text{Alb}(X)$. Then, it is natural to leverage on the pair $(\text{Alb}(X), \text{alb}_X)$ to find meaningful geometric insight on X .

This picture has an analogue in the setting of smooth quasi-projective varieties, where the role of abelian varieties is played by the so called semi-abelian varieties. However, the study of the geometry coming from the Albanese varieties for quasi-projective varieties is still at an embryonic stage. This project is, thus, born from the desire to fill this gap by developing new tools to study the geometry of smooth quasi-projective varieties.

Possible Initial Problems

Depending from the background and the interests of the hired student several starting points are possible. Here I list some examples

1. Characterize semi-abelian surfaces in positive characteristic.
2. Study the geometry of Brauer–Severi varieties over abelian varieties.
3. Investigate twisted derived invariants arising from the Albanese map.

Background

Any of the proposed subprojects will require a good knowledge of basic algebraic geometry (i.e. algebraic varieties, Hartshorne chapter 1). Familiarity with cohomological methods and the geometry of schemes (Hartshorne Chapters 3 and 2) will be also really useful.

Funding

The PhD student to be hired will work within the research project no. 2023-03837 *Generic vanishing and characterizations of semi-abelian varieties* funded by the Swedish Research Council (VR).