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RESEARCH PERSPECTIVE

My research interests lie in arithmetic and Diophantine geometry, especially Arakelov geometry, adelic line bundles, positivity and height theory. I am interested in how global arithmetic quantities are described through local analytic and geometric constructions. The theory of admissible metrics on curves and non-Archimedean analytic geometry provide a starting point for my work.

MASTER'S THESIS: ADMISSIBLE PAIRINGS AND BOGOMOLOV BOUNDS

My 2026 ALGANT master's thesis, Admissible Pairing and Effective Bogomolov Results, was supervised by Pascal Autissier at the University of Bordeaux. Starting from Zhang's theory of admissible pairings on algebraic curves, I studied the relation between Neron-Tate pairings on Jacobians and intersection theory of admissibly metrized line bundles. I examined both archimedean Arakelov metrics and non-Archimedean constructions involving metrized graphs, Green functions and canonical measures.

The thesis reorganizes this framework in the language of adelic line bundles, compares local admissible pairings with Neron symbols, and reformulates Zhang's inequality for the essential minimum in terms of adelic intersections. It also examines residue-field assumptions and reviews recent quantitative Bogomolov results. This work provided training in moving between arithmetic surfaces, Berkovich geometry, metrics and global height inequalities.

CURRENT PREPRINT: ONE COMPLEX METRIC AND GEOMETRIC ADELIC NEFNESS

My single-author preprint, One complex metric and geometric adelic nefness (arXiv:2611.09319v1, submitted 6 November 2026), studies a positivity criterion for compactified line bundles on smooth quasi-projective varieties. It relates the semipositivity of a compatible prescribed complex metric to nefness of the geometric extension data. For arithmetic adelic line bundles over number fields, this yields geometric nefness from a suitable metric at a single complex embedding.

The proof uses extension of plurisubharmonic weights, multiplier ideals, Nadel vanishing and Castelnuovo-Mumford regularity to construct semiample approximations. Specialization and Galois descent then transfer the construction to the number field. An application establishes geometric nefness of Gao-Zhang's Gross-Schoen adelic line bundle. The manuscript discloses the use of generative AI and links to selected development records. This result concerns geometric nefness, while arithmetic positivity remains a separate motivating problem.

DIRECTIONS FOR DOCTORAL RESEARCH

1. Adelic positivity and global heights

I hope to investigate how local positivity of metrized line bundles relates to global arithmetic height inequalities. Gross-Schoen cycles and families of curves provide a natural setting for studying arithmetic intersection theory, degenerations and positivity.

2. Non-Archimedean analytic methods and degeneration

I am interested in Berkovich analytic spaces, skeleta, Chambert-Loir measures and differential forms and currents, especially the relation between local analytic semipositivity, algebraic positivity and local contributions to adelic intersection numbers.

3. Height inequalities on curves and abelian varieties

Building on admissible pairings and the effective Bogomolov problem, I would like to understand how positivity and equidistribution yield quantitative results about small points on curves, their Jacobians and related arithmetic families.

PREPARATION AND OUTLOOK

Training at SUSTech, Regensburg and Bordeaux has included algebraic geometry, Diophantine geometry, algebraic number theory, non-Archimedean Banach algebras, complex geometry, and seminars on arithmetic surfaces and Berkovich differential forms. I am a non-degree visiting student at

Peking University in 2026-2027. During doctoral study I hope to develop precise problems at the intersection of Arakelov geometry, non-Archimedean geometry and Diophantine questions.

Preprint: https://arxiv.org/abs/2611.09319 Website: https://dongkaicheng.github.io/