

# Yanpu Wu

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## EDUCATION

|                                                                                       |                                   |
|---------------------------------------------------------------------------------------|-----------------------------------|
| <b>Peking University</b>                                                              | Sept. 2022 – July 2027 (Expected) |
| <i>School of Mathematical Sciences</i>                                                | Overall GPA: 3.69/4.00            |
| (Transferred from <i>School of Earth and Space Sciences</i> , Sept. 2022 - July 2023) |                                   |

## SUMMER SCHOOLS

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|----------------------------------------------------------------------------------------------------------|-------------------------------|
| <b>Stanford University</b>                                                                               | June 2023 – Aug. 2023         |
| <b>Beijing-Shanghai Summer School in Mathematics (on topics related to Langlands program)</b> (Shanghai) | June 29, 2025 - July 11, 2025 |
| <b>Geometric Aspects of the Langlands Correspondence</b> (Univ. of Duisburg-Essen)                       | Aug. 24, 2025 - Aug. 29, 2025 |

## SELECTED COURSES

| Course                                     | Content                                                                                                                                                                                            | Score |
|--------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| Geometry I (Honor)                         | Classical geometry for conic curves, projective geometry and hyperbolic geometry, also with an introduction to point-set topology.                                                                 | 97    |
| Theory of Functions of Complex Variables   | Single variable complex functions: residue theorem, conformal maps and Riemann mapping theorem, etc.                                                                                               | 93    |
| Groups and Representations                 | Representation theory of finite groups; example of representation for permutation groups and Coxeter groups.                                                                                       | 96    |
| Geometry Seminar                           | Discussion on J. Stillwell's <i>Geometry of Surfaces</i> ; geometric classification of surfaces; elementary geometric group theory.                                                                | 98    |
| Functional Analysis                        | Fundamental theorems of functional analysis; structure theory of compact operators.                                                                                                                | 91    |
| Homology Theory and Characteristic Classes | Construction, motivation and application of Chern, Euler, Pontryagin, and Whitney classes; Chern-Weil theory.                                                                                      | 90    |
| Algebra II (Honor)                         | Classical commutative algebra (covering Atiyah & MacDonald's <i>Commutative Algebra</i> ), elementary homological algebra.                                                                         | 87    |
| Algebraic Geometry I*                      | Introduction to schemes, morphisms, sheaf cohomology (covering Hartshorne's <i>Algebraic Geometry</i> Ch. II.1-5, III.1-4).                                                                        | 89    |
| Algebraic Geometry II*                     | Divisors, relative differentials, cohomology and base change, construction of Hilbert schemes (covering Hartshorne Ch. II.6-8, III.5-12).                                                          | 89    |
| Topics in Algebra*                         | Representation theory of infinite Coxeter groups; introduction to Hecke algebras and their representations.                                                                                        | 95    |
| Algebraic Combinatorics*                   | Irreducible representations of permutation groups; Schubert calculus for Grassmannians and Flag varieties; symmetric polynomials (Pieri rule, Borel presentation etc.); elementary lattice theory. | 98    |
| Moduli of Curves*                          | Moduli space of stable curves, starting from definition of fine/coarse moduli spaces to that of moduli stacks; intersection theory and calculations on moduli spaces.                              | 99    |
| Machine Learning (CS 129)                  | The most classical theory of machine learning and deep learning: mathematical aspects and basic coding (taken at Stanford University.)                                                             | A     |

| Course                                 | Content                                                                                                                              | Score |
|----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-------|
| Topics in Algebraic Geometry*          | General theory of perverse sheaves; decomposition theorem (de Cataldo & Migliorini's approach); $P=W$ theorem for Hitchin fibration. | 98    |
| Selected Topics in Algebraic Geometry* | Theory of algebraic cycles; classical results on 0-cycles; applications of algebraic K-theory to algebraic cycles.                   | A+    |
| Number Theory I*                       | Introduction to algebraic number theory: rings of integers; ramification theory; local fields, etc.                                  | B+    |

\* denotes graduate-level courses. Courses without scores are current semester courses.

## STUDY INTERESTS

**Primary Interests:** Algebraic Geometry (especially moduli spaces), Geometric Representation Theory, Mathematical Physics.

### Main Focus Recently:

- **Moduli of Higgs Bundles:** Simpson's correspondence between Betti, de Rham, and Dolbeault moduli spaces; geometric invariant theory (GIT) construction and "beyond GIT";  $P = W$  conjecture.
- **Calabi-Yau Geometry:** Special Kähler geometry of moduli space of Calabi-Yau 3-folds; variation of Hodge structures and period domains; BCOV ring and Gromov-Witten invariants; mirror symmetry.
- **Langlands Program:** topics related to geometric Langlands program via non-abelian Hodge correspondence, such as homogeneous affine Springer fibers and classical limit of geometric Langlands.

These are some keywords to what I've learnt recently. I find the work of categorification of Donaldson-Thomas invariants and the structural analysis of BPS states in recent years (by Davison, Padurariu, and Halpern-Leistner, etc.) stand at the crossroad of my interests, hence looking forward to learning and working on these topics in the further future. A more detailed explanation on what I have learnt and what I'm planning to learn, and also many other interests of mine, are included in the research statement.