(Term 2, 2017/2018: Jan, 2018 -- April, 2018)

MATH 606D:201 Topics in Differential Equations.

"Geometric approaches to partial differential equations."

Class: TBA. **First organization meeting on Wednesday, Janunary 3, at 4:30pm in MathAnnex 1101.**
Location: TBA

[Instructor] Young-Heon Kim.

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Office hours (subject to change): TBA.

[Tentative plan]

- We will consider geometric methods for studying partial differential equations, where one of the most important challenges is to understand regularity/singularity of solutions. First, we will cover convexity and related estimates, such as Alexandrov estimates, in studying elliptic equations. This will include the method of Caffarelli for studying the Monge-Ampere equation. Some more recent advances will also be treated, including quantitative stratification as developed by Cheeger, Naber and collaborators, for estimating singular/critical sets of elliptic equations, as well as the geometric method of Logunov and Malinnikova for estimating nodal sets of Laplace eigenfunctions.

[Key references]

- The Monge–Ampère Equation and Its Applications, by Alessio Figalli (Book, 2017, EMS)
- Quantitative Stratification and the Regularity of Harmonic Maps and Minimal Currents, by Jeff Cheeger, Aaron Naber. Communications on Pure and Applied Mathematics Vol 66, Issue 6 (2013), 965–990.
- Nodal sets of Laplace eigenfunctions: estimates of the Hausdorff measure in dimension two and three. Aleksandr Logunov and Eugenia Malinnikova. https://arxiv.org/pdf/1605.02595.pdf

[Prerequisites] Solid background in measure theory and graduate level partial differential equations. Background in differential geometry will help.

[Grading] Class participation: 50%. One assignment in the form of term paper (about 5 pages): 50%.