KATO, Jun | Associate Professor

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Membership of academic societies:
The Mathematical Society of Japan

Research Interest:

- Partial Differential Equations
- Fourier Analysis

Research Summary:

My research area is the theory of partial differential equations. I am mainly interested in nonlinear partial differential equations arising in mathematical physics, especially nonlinear dispersive equations and nonlinear wave equations. Equations in this category includes nonlinear Schrödinger equations, KdV equations, nonlinear Klein-Gordon equations, Maxwell-Schrödinger equations, etc.

I am studying such type of equations in the frame work of functional analysis. Generally, it is difficult to give a explicit solution to nonlinear partial differential equations for a given data, e.g. initial data, boundary values, we first consider the existence of a solution (and uniqueness of solutions, continuous dependence of solutions to initial data) by using functional analytic techniques. After that, we study qualitative behavior of solutions, e.g. regularity, asymptotic behavior. Fourier analysis is crucial to catch properties of solutions to dispersive equations and wave equations.

I am also interested in equations which have a geometric background, such as wave maps and the Schrödinger maps. These are considered as the generalization of the wave equation and the Schrödinger equation to the evolution of the maps between manifolds, and give interesting problems in the field of analysis and geometry, e.g. properties of the target manifold would change the global behavior of solutions.

Major Publications:

[1] J. Kato, The uniqueness of nondecaying solutions for the Navier-Stokes equations, Arch. Rational Mech. Anal. **169** (2003), 159–175.

[2] J. Kato, Existence and uniqueness of the solution to the modified Schrödinger map, Math. Res. Lett. **12** (2005), 171–186.

[3] J. Kato, M. Nakamura, T. Ozawa, A generalization of the weighted Strichartz estimates for wave equations and an application to self-similar solutions, Comm. Pure Appl. Math. **60** (2007), 164–186.

[4] J. Kato, T. Ozawa, Endpoint Strichartz estimates for the Klein-Gordon equation in two space dimensions and some applications, J. Math. Pures Appl. **95** (2011), 48–71.

Awards and Prizes:

- The MSJ Takebe Katahiro Prizes (2008)

Education and Appointments:

2003 Ph. D., Hokkaido University
2003 COE Fellow, Tohoku University
2004 JSPS Research Fellow, Kyoto University
2006 Lecturer, Nagoya University
2007 Associate Professor, Nagoya University
2009 ∼ 2011, JSPS Postdoctoral Fellow for Research Abroad, New York University

Message to Prospective Students:

For the study of dispersive equations and wave equations, basic knowledge of functional analysis and the Fourier analysis is required. So, in my small class I am planing to begin to read basic books to make students be capable of reading recent research articles. The following books are examples of the textbooks.

[1] H. Bahouri, J.-Y. Chemin, R. Danchin, "Fourier Analysis and Nonlinear Partial Differential Equations," Grundlehren der Mathematischen Wissenschaften **343**, Springer (2011).
[2] C. D. Sogge, "Lectures on Nonlinear Wave Equations," International Press (2008).
[3] S. Alinhac, "Hyperbolic Partial Differential Equations," Universitext, Springer (2009).
[4] L. Grafakos, "Classical Fourier Analysis," 2nd Ed., Graduate Text in Math. **249**, Springer, 2008.
[5] F. Lin, C. Wang, "The Analysis of Harmonic Maps and Their Heat Flows," World Scientific (2008).