

Panrui Ni, PhD

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🌐 <https://panrui-ni.github.io/>

🎂 Birth: 16/07/1996



Research Interests

- 📖 Hamiltonian Dynamics, Hamilton-Jacobi Equations, Aubry-Mather Theory and Weak KAM Theory.
- 📖 During my PhD training, my project mainly focused on the *contact-type Hamilton-Jacobi equations*

$$H(x, Du(x), u(x)) = 0, \quad \text{and} \quad \partial_t u(x, t) + H(x, \partial_x u(x, t), u(x, t)) = 0.$$

We use the Aubry-Mather theory for *contact Hamiltonian systems* to analyze the above two equations.

Academic Position

2023 – 2024 **Postdoc Faculty, Sorbonne Université, CNRS, IMJ-PRG, Paris, France.**

Research Project: *Discrete and continuous weak KAM theory.*

Mentor: Maxime Zavidovique

Education

2018 – 2023 **PhD, Fudan University, Shanghai, China** Mathematics.

Thesis title: *Viscosity solutions of contact-type Hamilton-Jacobi equations.*

Advisor: Jun Yan

2014 – 2018 **Bachelor, Southeast University, Nanjing, China** Engineering Mechanics.

Thesis title: *Variational principle for contact Hamiltonian systems and its applications.*

Advisor: Changwen Mi

Research Publications

Journal Articles

1 **Panrui Ni**, “Multiple asymptotic behaviors of solutions in the generalized vanishing discount problem,” *Proceedings of the American Mathematical Society*, vol. 151, pp. 5239–5250, 2023, 🔗 URL: <https://doi.org/10.1090/proc/16420>.

2 **Panrui Ni**, “Time periodic solutions of first order mean field games from the perspective of Mather theory,” *Journal of Differential Equations*, vol. 412, pp. 881–901, 2024, 🔗 URL: <https://doi.org/10.1016/j.jde.2024.09.006>.

- 3 **Panrui Ni**, “Weakly coupled Hamilton-Jacobi systems without monotonicity condition: A first step,” *Communications on Pure and Applied Analysis*, vol. 23, no. 7, pp. 961–983, 2024, [URL](#): <https://doi.org/10.3934/cpaa.2024042>.
- 4 **Panrui Ni**, K. Wang, and J. Yan, “A weakly coupled mean field games model of first order for k groups of major players,” *Proceedings of the American Mathematical Society*, published online, [URL](#): <https://doi.org/10.1090/proc/16342>.
- 5 **Panrui Ni**, K. Wang, and J. Yan, “Viscosity solutions of contact Hamilton-Jacobi equations with Hamiltonians depending periodically on unknown functions,” *Communications on Pure and Applied Analysis*, vol. 22, no. 2, pp. 668–685, 2023, [URL](#): <http://doi.org/10.3934/cpaa.2023005>.
- 6 **Panrui Ni** and L. Wang, “A nonlinear semigroup approach to Hamilton-Jacobi equations–revisited,” *Journal of Differential Equations*, vol. 403, pp. 272–307, 2024, [URL](#): <https://doi.org/10.1016/j.jde.2024.05.039>.
- 7 **Panrui Ni** and L. Wang, “Aubry-Mather theory for contact Hamiltonian systems III,” *Science China Mathematics*, published online, [URL](#): <https://link.springer.com/article/10.1007/s11425-022-2197-4>.
- 8 **Panrui Ni**, L. Wang, and J. Yan, “A representation formula of the viscosity solution of the contact Hamilton-Jacobi equation and its applications,” *Chinese Annals of Mathematics, Series B*, to appear, [URL](#): <https://arxiv.org/abs/2101.00446>.
- 9 **Panrui Ni** and B. Shen, “On variation of action integral in Finsler gravity,” *Annals of Physics*, vol. 404, no. 1, pp. 93–114, 2019. [URL](#): <https://doi.org/10.1016/j.aop.2019.02.009>.

Preprints

- 1 **Panrui Ni** and L. Wang, “On Mather’s Lipschitz graph theorem of the Aubry set for contact Hamiltonian systems,” submitted.
- 2 **Panrui Ni** and M. Zavidovique, “Nonlinear and degenerate discounted approximation in discrete weak KAM theory.” [URL](#): <https://arxiv.org/abs/2403.04563>.

Skills

Languages Chinese (Native), English (Fluent).
Software Mathematica & Python

Miscellaneous Experience

Scholarships and Grants

2023 Award of Outstanding Graduate of Shanghai
2022 National Natural Science Foundation of China, **participant**, Grant No. 12171096.

Miscellaneous Experience (continued)

- 2021 Qinghua Scholarship at School of Mathematical Sciences, Fudan University
- 2020 Academic Scholarships for PhD Degree Students
- 2019 National Scholarship & Outstanding Student of Fudan University

Conference Activities

- 2024.1 ANR meeting, École Normale Supérieure de Lyon, **Invited speaker**.
Title: *On discrete nonlinear vanishing discount problem.*
- 2023.6 PDE seminar, University of Tokyo, **Invited speaker**.
Title: *Hamilton-Jacobi equations depending Lipschitz continuously on the unknown function.*
- 2022.7 Conference on Differential Equations and Dynamical Systems, Beijing Institute of Technology, **Invited speaker**.
Title: *A nonlinear semigroup approach to a class of nonmonotone Hamilton-Jacobi equations.*

Teaching Activities

- 2021 Teaching assistant in Fudan University, Course: *Calculus*.
- 2020 Teaching assistant in Fudan University, Course: *Classical Mechanics*.
- 2019 Teaching assistant in Fudan University, Course: *Classical Mechanics*.