

# 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*

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

The assumption that the above equations are non-decreasing with respect to the unknown function may not hold. So the comparison principle does not hold. 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**, 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>.

- 3 **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>.
- 4 **Panrui Ni** and L. Wang, "Aubry-Mather theory for contact Hamiltonian systems III," *Science China Mathematics, published online*,  URL: <https://doi.org/10.1007/s11425-022-2197-4>.
- 5 **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>.
- 6 **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**, "Weakly coupled Hamilton-Jacobi systems without monotonicity condition: A first step."  URL: <https://arxiv.org/abs/2112.04885>.
- 2 **Panrui Ni** and L. Wang, "A nonlinear semigroup approach to Hamilton-Jacobi equations–revisited."  URL: <https://arxiv.org/abs/2202.11315>.

## Manuscripts

- 1 A. Davini, **Panrui Ni**, and L. Wang, "Discounted approximation from the negative direction on the circle". in preparation.
- 2 **Panrui Ni**, "Time periodic solutions of first order mean field games from the perspective of Mather theory". in preparation.
- 3 **Panrui Ni** and L. Wang, "On Mather's Lipschitz graph theorem of the Aubry set for contact Hamiltonian systems", submitted.

## 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, <b>participant</b> , Grant No. 12171096.
2021	Qinghua Scholarship at School of Mathematical Sciences, Fudan University

## Miscellaneous Experience (continued)

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- 2020      Academic Scholarships for PhD Degree Students
- 2019      National Scholarship & Outstanding Student of Fudan University

## Conference Activities

- 2023.6      PDE seminar, University of Tokyo & University of Wisconsin-Madison, **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*.