Research positions

Institut d'Astrophysique de Paris France
Sorbonne fellow, *October 2022–September 2023*

Inria Nancy France
Postdoc fellow, within the group of Dr. Bruno Lévy, *September 2021–September 2022*

Institut d'Astrophysique de Paris France
Invited researcher, *January 2021–August 2021*

Johns Hopkins University, Baltimore USA
Invited researcher, with Prof. Emanuele Berti, *October – December 2019*

IPMU, Tokyo Japan
Invited researcher, with Prof. Sugiyama, *March 2018*

Institut d'Astrophysique de Paris France
Phd in Astrophysics, Sorbonne University, *2017– 2020*
Supervisors: Prof. Joseph Silk and Dr. Roya Mohayaee,

My past and current research

As a PhD,

The cusp-core problem in dwarf galaxies: new solutions in ΛCDM

- Primordial black holes *Boldrini+20a*
- Globular clusters with dark matter minihalo *Boldrini+20b*
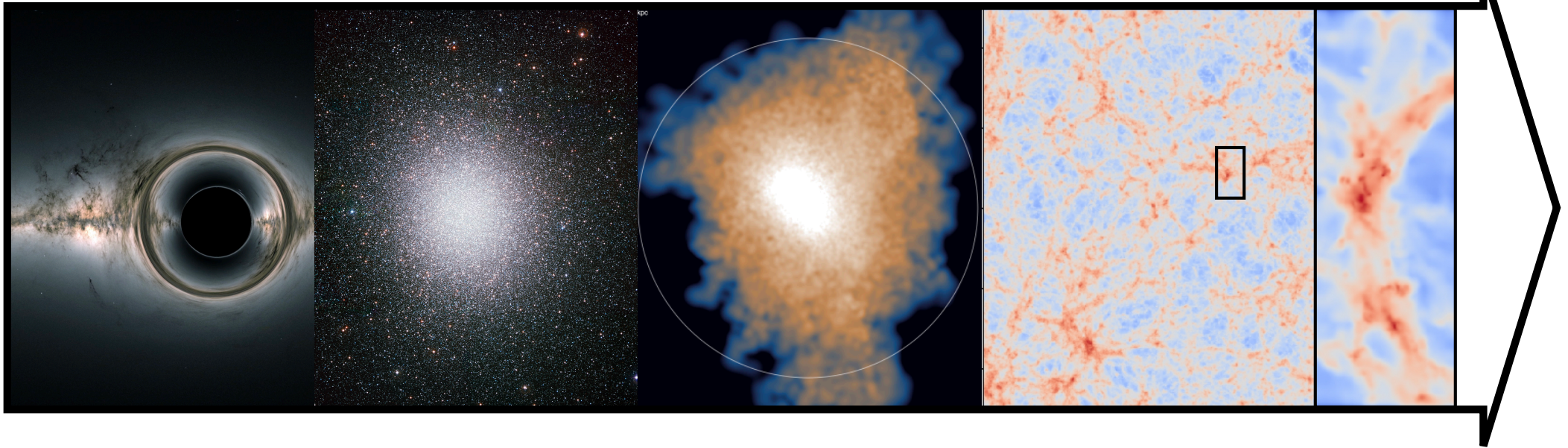- High eccentric galaxy mergers *Boldrini+20e*

As a postdoc,

- Globular cluster dynamic with Gaia data
  Boldrini & Vitral+21, Boldrini & Bovy+21, Vitral+22

- Off-centre black holes
  Boldrini+20c, Boldrini+20d, Chu+22

- Alternative theory of gravity: Monge-Ampère gravity tested at cosmological scale
  Boldrini+23 in prep.

$$\Delta \phi = Tr(D^2\phi) = 4\pi G(\rho - \bar{\rho})$$ Poisson

$$det(\mathbb{1} + \frac{1}{4\pi G\bar{\rho}} D^2\phi) = \frac{\rho}{\bar{\rho}}$$ Monge-Ampère
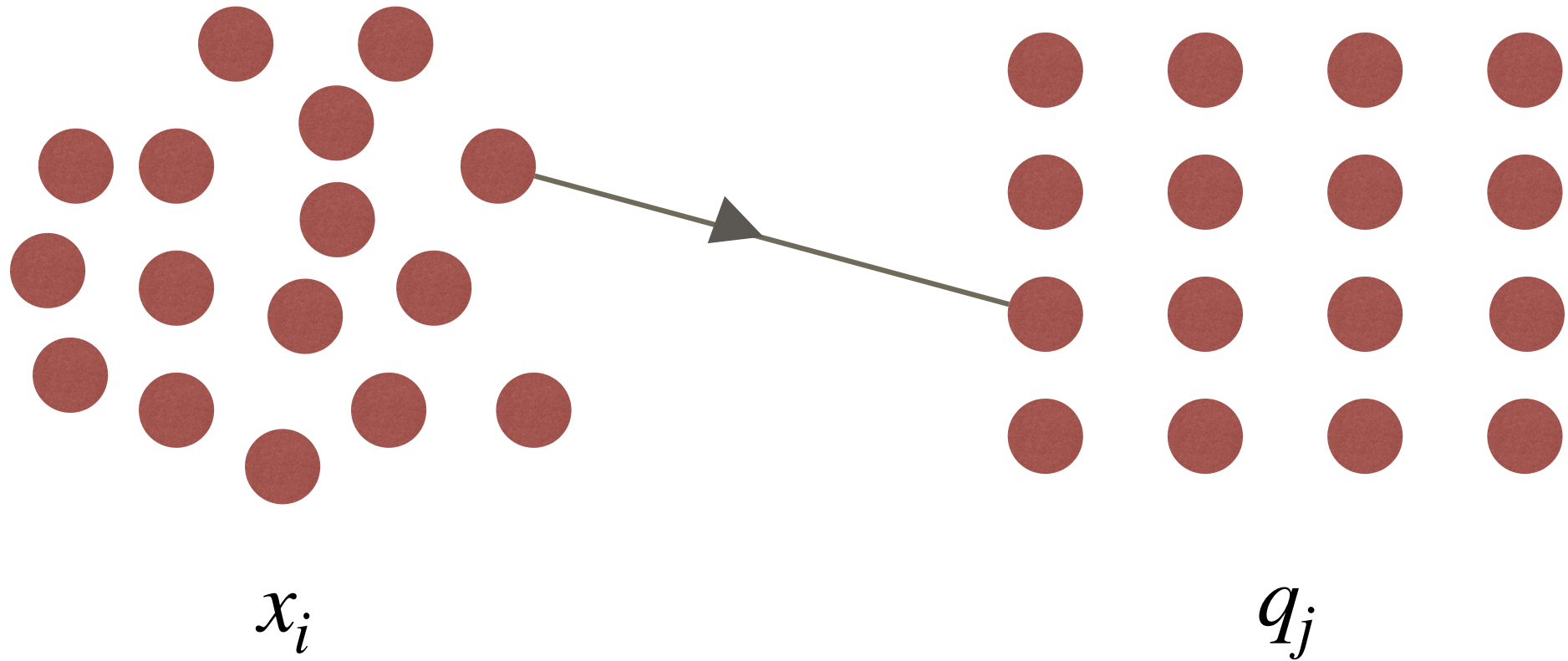
My expertise

In Astrophysics

- Dark matter dynamic
- Globular cluster dynamic
- Black hole dynamic
- HST, Gaia data

In numerical methods

- N-body simulations on GPU
- Orbital integration methods
- Analysing large cosmological simulations
- Optimal transport algorithms

Optimal transport

x_i

q_j

$$\inf \sum_i |x_i - q_j|^2$$

My research projects

- **Monge-Ampère gravity**

  ☑ Properties of filaments (e.g. connectivity) for Euclid

  ☑ Cusp-core problem via « zoom-in » simulations

  ☑ Adding baryonic physics

- **Origin of dwarf galaxies and globular clusters**

  ☑ Coupling the Peebles method and optimal transport theory

  ☑ Extensive use of numerical simulations & Gaia data

My research projects

- **Monge-Ampère gravity**

  ☑ Properties of filaments and connectivity + Euclid

  ☑ Cusp-core problem via « zoom-in » simulations ⟶ Use of GenetIC

  ☑ Adding baryonic physics ⟶ Compatibility with AMR code RAMSES

- **Origin of dwarf galaxies and globular clusters**

  ☑ Coupling the Peebles method and optimal transport theory

  ☑ Extensive use of numerical simulations & Gaia data ⟶ Use of simulations from EDGE project