



Hiroki Kawai

PhD. student
The University of Tokyo, Chiba University

PERSONAL DATA

Place of birth / Nationality : Gifu (Japan) / Japanese
Date of birth : February 25th, 1998
Present work address :

- Department of Physics, School of Science, The University of Tokyo, Bunkyo, Tokyo 113-0033, Japan
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EDUCATION

04/2022 - : PhD. student in Physics from the University of Tokyo
Research student in Physics from Chiba University
Supervisor : Masamune Oguri (Chiba U.)
04/2020 - 03/2022 : **Master in Physics from the University of Tokyo**
Master's Thesis : Cosmological Structure Formation with Fuzzy Dark Matter
Supervisor : Naoki Yoshida (U. Tokyo)
04/2020 - 03/2022 : **Bachelor in Physics from the University of Tokyo**

RESEARCH GRANTS

04/2022 - 03/2025 : JSPS KAKENHI Grant Number JP22J21440

LANGUAGES

Japanese :	Mother language
English :	Very good level reading, writing and speaking
German :	Low level of understanding/speaking ("3-year-old child level")
Italian :	Low level of understanding/speaking ("1-year-old child level")

COMPUTING EXPERIENCE

Operative system :	MacOS
Programming language :	C
Scripting language :	bash, zsh, python
Machine learning :	Convolutional Neural Network (CNN), Generative Adversarial Network (GAN)

RESEARCH INTEREST and PUBLICATION

Research Interest

My research focuses on cosmology and cosmological structure formation, especially topics related to dark matter. I study the dark matter distribution with both theoretical and observational approaches. There are three projects that I have done/am now working on.

My first project focuses on the granular structures in fuzzy dark matter (FDM) halos, which is one of the general features found by previous FDM cosmological simulations. We firstly model these structures and calculate the subgalactic matter power spectrum. We then compare the power spectrum with that obtained from real observational data of the strong gravitational lens. We have already submitted a paper (see Publication).

My second project focuses on the other important feature in FDM halos, a soliton core. While the core-halo mass relation is the important quantity to determine the structures in FDM halos, they are not well understood. We construct a model for the core-halo mass relation based on the physical consideration, which can explain various simulation results. We are now writing a paper.

My third project is about the caustic crossing event in galaxy cluster lens by using the software "glafic". Since the small scale structures such as dark matter subhalos and single stars distort the shape of caustic, the observational results must be changed according to the amount of them. We now studying the statistical properties of them through modeling.

Publication

An Analytic Model for the Subgalactic Matter Power Spectrum in Fuzzy Dark Matter Halos, [ADS link](#)

Hiroki Kawai, Masamune Oguri, Amruth Alfred, Broadhurst Tom, Lim Jeremy, 2022, ApJ, 925, 61

Number of citations : 7

Invited Presentation

An analytic model for the structures in FDM halos
JpDe Joint Seminar (Online, May 25, 2022), [Link](#)

Talk or Poster in International Conference

An analytic model for the the core-halo mass relation in fuzzy dark matter halos
XV International Conference on Gravitation, Astrophysics and Cosmology (Gyeongju, Jul 3-7, 2023), [Link](#)

An analytic model for the the structures in fuzzy dark matter halos
Tonale Winter School on Cosmology 2022 (Passo del Tonale Italy, Des 4-10, 2022), [Link](#)

An analytic model for the the core-halo mass relation in fuzzy dark matter halos (Poster)
Kashiwa Dark Matter Symposium 2022 (Kashiwa Library Media Hall of the University of Tokyo, Kashiwanoha Campus, Nov 29 - Des 2, 2022), [Link](#)

The core-halo mass relation in fuzzy dark matter halos
RESCEU Summer School 2022 (Online, Aug 17-19, 2022), [Link](#)

An analytic model for the subgalactic matter power spectrum in fuzzy dark matter halos (Poster)
Kashiwa Dark Matter Symposium (Online, Nov 29-Des 2, 2021), [Link](#)

An analytic model for the subgalactic matter power spectrum in fuzzy dark matter halos
Workshop on Very Light Dark Matter 2021 (Online, Sep 27-29, 2021), [Link](#)

An analytic model for the subgalactic matter power spectrum in fuzzy dark matter halos
RESCEU Summer School 2021 (Online, Aug 18-20, 2021), [Link](#)

Awards

Hiroki Kawai, Poster award, Tonale Winter School 2022, 2022/12/09

Other than research

Part-time job

- A cram school teacher (4 years)
- Customer service job at American restaurant and Bar (half-year)
- ...

Soccer

I have been playing soccer seriously for more than 17 years. I am now a member of a soccer team in the Tokyo Metropolitan Second Division League. This league consists of people who were members of athletic teams in college and who have experience in national competitions. I work hard not only in team training but also in daily independent training.

Piano

When I was an undergraduate student, I took piano lessons for two years. I played Mozart's Twelve Variations on "Ah vous dirai-je, Maman" at a recital.

Last update : Oct 15, 2023