

# SHASHPAL SINGH

## Master's Student in Astrophysics at QMUL (Applying for PhD)

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Shashpal/Research\_Codes

## PROFILE

Dedicated master's student with over 2 years of experience in conducting academic research. Competent in using Python to create automated plot codes for analysing data from research-focused software and file types. Have practical research experience in writing academic papers by working as a research assistant at the University of Hong Kong. Developed strong communication and presentation skills through research projects and presentations.

## PUBLICATIONS


### Journal Articles

- A. Amruth, S. Singh, J. Lim, R. Lewis, and I. He, "Smooth lens models for 7 lensed quasars using positions and narrow-line emission fluxes: The need for substructure," 2025 (In Writing).

## EDUCATION


MSc in Astrophysics

Queen Mary University of London

 Sept 2025 - Ongoing

BSc of Science in Physics


The University of Hong Kong

 Sept 2020 - Aug 2024

## EXPERIENCE

Research Assistant II

Research Assistant

 Sept 2024 - Jul 2025

 The University of Hong Kong

- Gained the ability to use the research software packages glafic and imfit to a high degree of proficiency
- Learnt how to incorporate research data analysis with Python
- Improved my research paper writing skills through constructive feedback from my professor and postdoctoral co-author by writing the initial draft of the methodology section of the paper
- Currently a co-author on a gravitational lensing paper in preparation

Conference Attendee

Dark Matter Under the Gravitational Lens Conference


 April 2025

 Hosted by HKU

- Was granted the privilege to attend all Conference talks by assisting at the Conference
- Found the solution to a pixel stacking issue by having a conversation with Dr. Benjamin Beauchesne from Durham, whereby I realised the issue with the PSF I was creating for my imfit light morphology models

Spain Experiential Learning

Experiential Learning Trip

 Jun 2024

 CEFA Spain

- Had the rare opportunity to use a telescope to capture scientific images of astronomical objects

- Learnt astronomical image processing (image calibration, noise reduction, etc.) to utilise self-taken telescopic images to perform science

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## Undergraduate Final Year Research Project

### Research Project

📅 Sep 2023 - May 2024

📍 The University of Hong Kong

- Learnt how to perform research analysis on academic journal articles to grasp the core concepts of a research field
- Began to develop skills in Python, LaTeX and research software packages usage
- Was granted the privileged opportunity to be a research assistant due to my ability to conduct research as an undergraduate student

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## Research Poster Presentation

### CosPA 2023 Conference

📅 Nov 2023

📍 The Chinese University of Hong Kong

- Created a research poster for presentation at a conference, having conducted a year of prior research
- Responded to challenging questions from experienced scientists in the field during my poster session
- Gained valuable insight from esteemed scientists at the conference who were kind enough to discuss my work with me

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# SKILLS

## Python Coding

### Data Analysis and Research-based Software Integration

📍 Codes: [https://github.com/Shashpal/Research\\_Codes](https://github.com/Shashpal/Research_Codes)

- General codes created for Research-based data analysis - both for presentation and interpretation
- Glafic (Gravitational Lensing software) based codes include: MCMC, lensing anomaly plots, parity checking, lens centre offset and file-based automation codes
- Imfit (Galaxy Image fitting software) based codes include: masking, noise map, cropping and pixel subtraction codes
- LaTeX based codes include: automated LaTeX parameter and lensing anomaly table codes for inputting model data from glafic

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## Glafic (Gravitational lensing software)

### Strong Gravitational Lens Models

📍 Primary research software for Journal Article

- Can create strong gravitational lens models with different profiles (Singular Isothermal Elliptical (SIE), Elliptical Power Law, (PL), Navarro-Frenk-White and Shear profiles (NFW)) and constraints (image positions and flux ratios)
- Have created Python codes to study the flux ratios at the observed positions of the quasar images which requires reading the fits file created from the modelling process, and isn't directly available from the glafic software
- Markov chain Monte Carlo (MCMC) runs can be performed to test parameter tolerances, degeneracies and model performance
- Have created Python codes to study the parity of images for hundreds of models at once for analysis

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## Imfit (Galaxy Image Fitting software)

### Light Morphology Modelling of Lensing Galaxy

📍 Secondary research software for Journal Article

- Capable of constructing Sérsic models to map the light morphology of the lensing galaxy, and study the resulting parameter values in detail to then create accurate gravitational lens models
- Able to build point-spread function (PSF) models and noise maps for more accurate light morphology modelling

Both were created by clever use of Python and made sure to be consistent with the research software package imfit

- General usage of Python to perform pixel subtraction, cropping and masking was also necessary to build light morphology models of lensing galaxies using imfit

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## LaTeX Documentation

### Documentation for Research Purposes

- Able to cleverly use Python to create codes that input research data in LaTeX format for convenient data representation
- Have cultivated a decent understanding of utilising LaTeX documentation to create necessary plots, tables and format changes to create documents independently (this CV was created using LaTeX)

Most of the plots and tables seen in the Journal article publication titled "Smooth lens models for 7 lensed quasars using positions and narrow-line emission fluxes: The need for substructure" were created by me.

## LANGUAGES

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English | Native

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Cantonese | Conversational

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Hindi | Near-Native

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Punjabi | Native

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Japanese | Beginner

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## REFEREES

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