Obserwatorium Astronomiczne Uniwersytetu Warszawskiego
zaprasza kandydatów na studia doktoranckie
w nowopowołanej Szkole Doktorskiej Nauk Scisłych i Przyrodniczych
Uniwersytetu Warszawskiego

Poniżej zamieszczamy listę proponowanych tematów naukowych i opiekunów.

Ewentualni kandydaci powinni skontaktować się z osobą proponującą wybrany temat i uzyskać jej zgodę na objęcie opieką w przypadku pozytywnego wyniku rekrutacji.

Informacje i zapisy w systemie Internetowej Rekrutacji Kandydatów UW
https://irk.oferta.uw.edu.pl/pl/offer/SzD2019/programme/3-SzD-NSP-Astro

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Poszukiwanie i analiza masywnych ukladów podwójnych gwiazd w dysku galaktycznym

OPIEKUN: *dr hab. Paweł Pietrukowicz* (pietruk@astrouw.edu.pl)

Masywne gwiazdy (powyżej 8 mas Słońca) pełnią szczególną rolę w procesie ewolucji Galaktyki. Są one progenitorami niezwykłych obiektów astrofizycznych, jak gwiazdy neutronowe i czarne dziury. Projekt ma na celu poszukiwanie w danych projektu OGLE dla dysku galaktycznego układów zaćmieniowych złożonych z masywnych gwiazd i ich wszechstronną analizę.

Doktorant będzie miał możliwość wykonania obserwacji na najwyższej klasy instrumentach, przeprowadzenia analizy fotometrycznej i spektroskopowej przy użyciu własnego i specjalnie przygotowanego oprogramowania.

Big Data and Machine Learning exploration of astronomical data

OPIEKUN: *dr hab. Łukasz Wyrzykowski* (lw@astrouw.edu.pl)

Astronomy produces vast amounts of digital data these days. In order to process it, all the novel approaches are necessary. Machine Learning is a new way to explore archival and recent large data sets. In this project we will apply ML techniques to datasets including Gaia DR3 (2020/21), Gaia alerts and their photometric follow-up data, as well as Public time domain photometric datasets from ZTF or Catalina. We will also investigate the possibilities of time domain science on very long time scales with the historical observations, which were recently digitised.

Skills required: computing engineering experience, previous use of Machine Learning tools.

Black Hole lensing theory and practice

OPIEKUN: *dr hab. Łukasz Wyrzykowski* (lw@astrouw.edu.pl)

Black holes come in all sizes and configurations. Gravitational lensing is currently the best way to detect and study the properties of these mysterious objects. In this project we will investigate the theoretical aspects of spacetime bending by black holes ranging from stellar to intermediate mass and supermassive, single, binary and in clusters, rotating and not. We will then study the observational effects which could possibly be detected by current and future astronomical instruments.

Skills required: strong background in theoretical physics, including General Relativity; programming.

The position will benefit from generous funding possibilities for travels to our research partners and international conferences.

Dark matter content in the Milky Way and the constraints from microlensing

OPIEKUN: *dr hab. Łukasz Wyrzykowski* (lw@astrouw.edu.pl)

OGLE and Gaia data can provide new and tight limits to the Dark Matter content in the Milky Way from microlensing observations. In this project the data from major microlensing surveys will be used to detect events due to primordial black holes, which are thought to be one of the explanations for part of the Dark Matter.

Skills required: programming, scripting, data mining, basic understanding of astrophysics of the Galaxy.

In cooperation with the Warsaw OGLE group, Gaia European consortium (Cambridge, Geneva, Heidelberg).

The position will benefit from generous funding possibilities for travels to our research partners and international conferences.

Supernovae and other transients from Gaia space mission alerts and LSST

OPIEKUN: *dr hab. Łukasz Wyrzykowski* (lw@astrouw.edu.pl)

We now live in a timedomain era of astronomy. Observations of large portions of the sky taken regularly over many years provide a new and unprecedented view on the changing sky. In this project we will be studying the alerts from the Gaia space mission and newly initiated LSST telescope to study transient events, eg. supernovae, tidal disruption events, microlensing events, lensed supernovae, etc. This will include gathering follow-up data in photometry and spectroscopy (ESO, SALT), preparing observing proposals and going to the observatories around the world.

Skills required: experience in astronomical observations, data reductions, programming, scripting.

In cooperation with Turku, Finland, Dublin, Ireland and Belfast, UK.

The position will benefit from generous funding possibilities for travels to our research partners and international conferences.

Gravitational Wave Events optical counterparts and their applications

OPIEKUN: *dr hab. Łukasz Wyrzykowski* (lw@astrouw.edu.pl)

Nobel Prize in 2017 was awarded to the discovery of the first gravitational waves. But only the discovery of their optical counterpart in GW170817 kilonova proved the GW detections to be connected to the events visible in electromagnetic waves. In this project we will work together with a larger collaboration ENGRAVE which hunts for optical counterparts of GW events. Their properties can help understand the merging mechanism and potentially indicate new physics around BHs.

Skills required: large data sets handling, some experience with astronomical imaging or spectroscopy observations, programming.

The position will benefit from generous funding possibilities for travels to our research partners and international conferences.