Our Team

Young-Kee Kim

Research Field: Experimental Physics

Kavli IPMU Principal Investigator

I am an experimental particle physicist. I have been devoting much of my research to understanding the origin of mass for fundamental particles. My group measured the mass of two of the most massive particles (the W boson and the top quark) at the Tevatron's CDF experiment, providing information about the mass of the Higgs boson, discovered at the LHC in 2012. In recent years, my focus has been to (i) find a deeper understanding of the nature of the Higgs, (ii) search for new physics using the Higgs as a new tool, and (iii) search for a new messenger particle that couples to dark matter, using the ATLAS detector at the LHC. Achieving these goals requires significant improvement of detectors and triggers. My group has been working on the new tracking trigger that has more capability and flexibility than the current trigger system. In addition, my group is exploiting novel concepts in accelerator science and technology, studying limitations affecting the acceleration and intensity of particle beams at a fundamental level, and developing new approaches to overcome these limitations. I am a member of the particle and accelerator physics group at the University of Chicago and a member of the Kavli IPMU.

Eiichiro Komatsu

Research Field: Cosmology

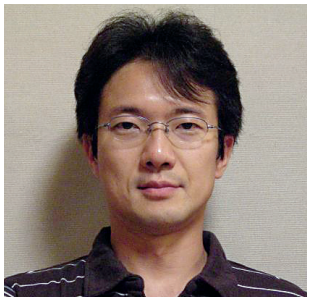
Kavli IPMU Principal Investigator

I study the beginning and an end (if any) of the Universe using the laws of physics and state-of-the-art measurements. I spend 2/3 of my time on theoretical research, and remaining 1/3 on providing theoretical underpinnings to experiments, and analysis and interpretation of the new data. My main weapons are the cosmic microwave background (CMB) and the large-scale structure of the Universe. I was a member of the Wilkinson Microwave Anisotropy Probe (WMAP), with which we determined the age and composition of the Universe. We also found strong evidence for cosmic inflation by discovering adiabatic and Gaussian super-horizon fluctuations that are nearly, but not exactly, scale invariant. Over the next decade I would like to find definitive evidence for inflation by measuring B-mode polarisation of the CMB, rule out the standard cosmological model (ΛCDM) by mapping cosmic structures up to a redshift of $z=3.5$, and determine the mass of neutrinos. To this end I am co-leading two galaxy surveys with the Prime Focus Spectrograph (PFS) on the Subaru telescope led by the Kavli IPMU, and with the Hobby-Eberly Telescope in the McDonald Observatory. For CMB, I am a member of the LiteBIRD team, and I am leading a team investigating impacts of the Galactic foreground emission on B-mode polarisation. I also enjoy thinking about what new physics we can learn about inflation in case of the discovery of primordial gravitational waves.

Shigetaka Moriyama

Research Field: Experimental Physics

Kavli IPMU Principal Investigator



My fields of interest include dark matter, axions, neutrino physics, and proton decay. My research comprises of two experimental approaches based on the energy scale of signals. The first approach involves the use of a liquid xenon scintillator that is sensitive to an energy scale ranging from sub-keV to MeV. The XMASS detector with 1 ton of liquid xenon is used to study dark matter particles, axions, and rare decay of xenon nuclei. To discover if dark matter is an elementary particle, we are searching for any deviations of observed events from background expectations, in addition to search for events caused by WIMPs or their relatives. The second approach involves the use of Super-Kamiokande, a large water Cherenkov detector. The hierarchy of neutrino masses and CP violation in the lepton sector may be crucial for understanding the existence of matter in the Universe, and an observation of proton decay clearly indicates a large framework of particle physics. We are working to realize a much larger detector, the Hyper-Kamiokande, which will have a sensitivity far beyond that of Super-Kamiokande. I would like to work together with the members of Kavli IPMU to achieve big discoveries.

Hiromi Yokoyama

Research Field: Science and Society

Kavli IPMU Professor

I have been promoting science communication research based on science and technology sociology. In our post-truth era today, I am interested in how science maintains to be highly trusted by society, how it can develop in harmony, and how academia should fulfill their responsibility to society. In particular, I am interested in the following three studies:

1. Research on patronage of basic science (the difference between science born out of crowd funding and ordinary science, changes in scientific view as seen from society, etc.)

2. Big science and mega science policy and communication strategy (research on the relation between a big science facility such as TMT or SK and a local community, comparison between SSC and ILC, etc.), and

3. Communication strategy for the basic science (research on scientists' information dissemination and trust from society using social psychology, etc.).

I will focus on discussing how to communicate with society in each research.

Tomoko Morii

Research Field: Experimental Physics

Postdoc

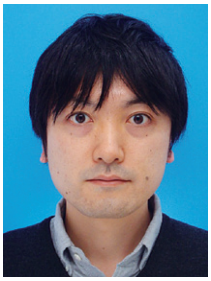
I am producing the silicon vertex detector (SVD) for the Belle II detector. In the Belle II experiment, we will search for new physics from the deviation between the standard model and the result of experiment using a large amount of data. For this purpose, it is necessary to precisely measure the decay points of particles, and the SVD is a very important detector for it.

At Kavli IPMU, I have been involved in the production of the SVD. Development of the SVD took time due to its complicated structure, but in the spring of 2016 we started to mass-produce them. If things go smoothly, it will be installed in the Belle II detector around the fall of 2018, and we will start taking data around the end of 2018. I would like to start research on new physics using the Belle II experiment data after mass production of the SVD.

Yusuke Nakajima

Research Field: Mathematics

Postdoc



My research interests focus on commutative algebra and singularity theory. I am studying these subjects from the viewpoint of Cohen-Macaulay representations. For example, I am interested in non-commutative crepant resolutions, cluster tilting modules and their variants. Some interesting classes of these notions are given by dimer models, which are certain graphs on the real two-torus. In my recent research, I am trying to understand singularities and non-commutative crepant resolutions arising from dimer models by paying attention to the operation called the mutation.

Wenting Wang

Research Field: Astronomy

Postdoc

My research interests lie in galaxy formation, dark matter haloes, and their connection to the underlying cosmology. My past research has been devoted to the properties of satellite galaxies, the connection between galaxies and dark matter, understanding the standard cosmology model with faint satellite galaxies, and constraining Milky Way halo mass through dynamical modelling of galactic haloes. These studies were carried out both theoretically and observationally, with experiences in large galaxy surveys, cosmological numerical simulation, gravitational lensing and dynamical modelling.