Arvind Ramanathan
Categories: Computer Science, Biology/Microbiology, Medicine & Health

Arvind Ramanathan is a computational biologist in the Data Science and Learning Division at Argonne National Laboratory and a senior scientist at the University of Chicago Consortium for Advanced Science and Engineering (CASE). His research interests are at the intersection of data science, high performance computing and biological/biomedical sciences. His research focuses on three areas focusing on scalable statistical inference techniques: (1) for analysis and development of adaptive multi-scale molecular simulations for studying complex biological phenomena (such as how intrinsically disordered proteins self-assemble, or how small molecules modulate disordered protein ensembles), (2) to integrate complex data for public health dynamics, and (3) for guiding design of CRISPR-Cas9 probes to modify microbial function(s). His research has been highlighted in the popular media, including NPR and NBC News. He obtained his Ph.D. in computational biology from Carnegie Mellon University, and was the team lead for integrative systems biology team within the Computational Science, Engineering and Division at Oak Ridge National Laboratory.

Jeremy Love
Categories: Physics, Computer Science

I am a Particle Physicist working on the ATLAS Experiment at the Large Hadron Collider at CERN in Geneva, Switzerland. I study the interaction of subatomic particles to try and understand the fundamental forces of the Universe and perform data analysis to search for new particles like the Higgs Boson that was discovered in 2012. I am also interested is using Artificial Intelligence to make smart particle detectors.

Anirudh Subramanyam
Categories: Math, Computer Science, Engineering

Math: discrete math (combinatorics, graph theory, operations research), analysis (calculus, differential equations), probability theory and statistics
Engineering: control, basic robotics and circuits (arduino), chemistry and its applications (chem-e-car)
CS: computer algorithms design and analysis, Matlab, Julia coding

Vangelis Kourlitis
Categories: Physics, Computer Science

I am an experimental physicist seeking answers to fundamental questions such as: What are the basic building blocks of matter? What are the fundamental forces of nature? For this purpose, I participate to and analyze data from the ATLAS experiment, at the European Organization for Nuclear Research (CERN) in Switzerland. The amount of data available is immense as about 40 million individual experiments were conducted per second, for four years! The computing facilities at Argonne National Laboratory are used to process these data, understand the underlying physics laws and potentially discover new phenomena. A project using data from the ATLAS experiment will teach you not only basic knowledge of particle physics but also precious computing skills. These include, among others, 1) coding computer programs in python, 2) analyze large amount of data using artificial intelligence algorithms, which can devise novel solutions to problems by exploiting hidden features of the data, and 3) create figures to visually understand the experimental data and the results.

Virendra Ghate
Categories: Earth & Space Science

The Earth's climate has been changing at an unprecedented rate for the past 30 years, and is expected to continue to change at even a faster rate for the next 50 years. This change in climate is caused by increased greenhouse gas emissions from human activity. Climate change is causing an increase in the number of extreme precipitation events (floods and droughts), extreme temperature events (cold winters and warm summers) and an increase in forest fires. Primarily my research is focused on improving our understanding of the workings of clouds and precipitation systems, so that they can be better represented in models used for predicting the future climate. For my research I use data collected by instruments onboard satellites, airplanes, and ground based facilities (e.g. radars) together with high resolution models.

Fatima Foflonker
Categories: Biology/Microbiology, Computer Science

My research involves using computational tools to understand biological questions in microbes and plants at a cellular level. My previous research has focused on discovering unique functions of genes in the genomes of environmentally and industrially relevant algae and understanding how genomes of algae might have evolved to survive extreme habitats. This was done combining both experiments in lab and computational analyses. I am currently working in the data science and learning department at Argonne, and using computational tools to simulate a cell's metabolism or all the biochemical pathways in a cell. We can use these models of cell metabolism to make predictions of how a cell might react to changes in its environment or mutations in genes.

Mukund Raj
Categories: Computer Science

My research broadly concerns with data summarization and visualization for large scientific data sets. The focus of my current work is on developing visualizations for an ocean simulation. Previously, I have worked in developing visualizations of computer networks, road networks, brain MRI images, and high dimensional data from a range of domains. Such data are often large in size and complex in structure, which makes them challenging to analyze. As a result, we sometimes need to develop new techniques to effectively gather insights from the data. Challenges in developing visualizations include development of efficient parallel algorithms as well as addressing issues of clutter, occlusion, and layout.

Lindsey Bleem
Categories: Physics, Earth & Space Science

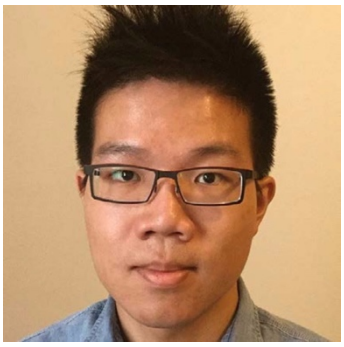
Does the accelerating expansion of the universe require a modification to our theories of gravity or does there exist some new form of energy, so-called "Dark Energy"? Dr. Bleem seeks to answer such questions by studying of clusters of galaxies---the largest gravitationally-bound systems in the universe. Their abundance is a powerful cosmological probe as it depends upon both the expansion history of the universe and the growth of density fluctuations. A member of the South Pole Telescope collaboration, her research interests also include large-scale structure, the cosmic microwave background, and the development of bolometric detectors for measurements of the millimeter-wave sky.

Jini Ramprakash
Categories: Computer Science

My interests lie in how to measure the operations of a supercomputer specifically to take the data generated by the systems that manage the supercomputer to process and analyze to gain useful insights.

Antonella Palmese
Categories: Earth & Space Science, Physics

My main research interest is to understand the evolution of the Universe. The way I do this is by looking at galaxies and at collisions between compact objects such as black holes and neutron stars. These collisions can give rise to highly energetic events that can be ”seen" (through photons, i.e. light) and even “heard” (though gravitational waves, waves that propagate similarly to sound waves but though the fabric of spacetime instead of through the air!) from Earth. I combine these observations to understand how the Universe expands and how galaxies and stars form and evolve. I use data from two big experiments in which Fermilab is involved, the Dark Energy Survey (DES) and the Dark Energy Spectroscopic Instrument (DESI).
More information on these experiments can be found here:
https://www.darkenergysurvey.org
https://desi.lbl.gov



Jody Ti-Lin Chou
Categories: Earth & Space Science, Physics

Ever since I was a child, I've been amazed at the beauty of the solar system and the immensity of our universe. In addition, I prefer to use astronomy as a tool to study physics, not the other way around. It’s an astounding coincidence that, this complex world around us can be perfectly described by mathematical equations that originate within us. Despite the success of physics and technological advancements in the past couple centuries, today there's still unsolved fundamental problems on large scales when we look deep into the universe, namely Dark Matter and Dark Energy. (Some call the Dark Energy problem "the largest discrepancy between theory and experiment in all of science.") This field of study where astronomy intersects with fundamental physics is called cosmology. I'm currently part of the South Pole Telescope group,

where we observe the Cosmic Microwave Background -- the very faint light across the entire seemingly-dark night sky. This light came from almost the beginning of the universe and travelled all the way here, so it's a very important tool for studying the early universe conditions as well as the expansion history of the universe.

Benjamin Diroll
Categories: Engineering

My research is chiefly related to laser-based measurements of materials to measure their interaction with light and how they transduce energy into light or heat. Applications are in light-emitting technologies, like lasers, TVs, etc.

John Hood
Categories: Physics

My research interests include both experimental and observational astrophysics. My experimental interests include trying to develop a more polarization sensitive detector to be used in CMB observations. I seek to test new detectors for the CMB-S4 experiment. The CMB-S4 experiment seeks to explore the physics of inflation, dark matter, neutrinos and dark energy, through precision measurements of the anisotropies of the Cosmic Microwave Background radiation. Although, I aim to help improve these detections to advance a key objective for CMB-S4, which is to search for the primordial B-mode signal predicted by inflation. While my observational interests have lead me to studying millimeter wave variabilities of AGN found in the SPTPol database in order to search for possible correlations between millimeter and other wavelength observations i.e. Gamma-ray etc.

Karia Dibert
Categories: Earth & Space Science, Physics

I'm a second year PhD student in the Astronomy & Astrophysics department at UChicago. I'm interested in instrumentation for cosmic microwave background experiments, meaning I help build and analyze the data from a telescope that measures the oldest light in the universe. Right now I work with the South Pole Telescope (SPT) group designing detectors for the

next version of SPT and trying to predict the telescope's sensitivity to certain astrophysical signals.

Victor Mateevitsi
Categories: Computer Science

I am a Computer Scientist at Argonne National Laboratory, where I work on creating visualizations for simulations which run on the supercomputer. From Cosmology, to Biology, to Chemistry, I take the raw numbers of the data and construct the ,Äúpretty images,Äù that help scientists better understand the problem they are solving. My research interests are Computer Graphics, Data Visualizations, Virtual and Augmented Reality and Wearables.

Paul Reimer
Categories: Physics

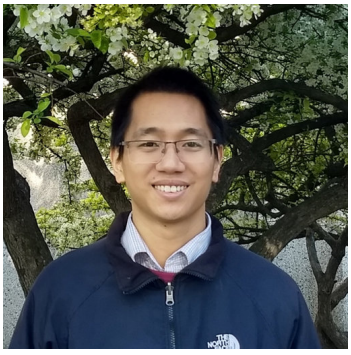
As an introduction, I'm in the medium energy group of the physics division. For a global view of our group, an old summary of what the MEP group does can be found at https://www.phy.anl.gov/mep/. (The modern dupral4 compliant web site has much less information). My work focuses around three questions. First, what is inside the proton? Here I led an experiment at Fermilab that measured the ratio of different flavors of anti-quarks inside the proton. This ratio can then be interpreted to help understand how the anti-mater inside the proton forms. Second, what is the size of the proton? Physicists believed this was a well known quantity until recently, when a very precise new measurement was made that disagreed with previous measurements. The experiment on which I am working is taking place at the Paul Scherrer Institute at PSI in Switzerland and is examining one possible difference between the two measurements. This experiment hopes to record data in the next year. Finally, is the Standard Model completely correct? The Standard Model is the basic theory that governs certain interactions and predicts the existence of particles. One way to test the Standard Model is to search for new particles--that's what is done by CERN in Switzerland. Another way is to look for very subtle changes in the way known particles interact at much lower energies. That is one of the goals of an experiment that we are planning for the Thomas Jefferson National Accelerator Facility (JLab) in Virginia. This experiment will hopefully be built by 2026.

Emily Ann Sprague
Categories: Physics, Chemistry

I am a chemical physicist in the Solar Energy Conversion Group at Argonne National Lab and Northwestern University. My research involves studying light-matter interactions in biomimetic inorganic materials for water-splitting reactions and CO2 reduction as a source of clean fuel and renewable energy. I utilize state-of-the art ultrafast optical spectroscopy and high-energy X-ray synchrotron radiation to elucidate both the structural and electronic dynamics of atomic and molecular motion to create real-time 'movies' of how chemical bonds vibrate, distort, and rotate following excitation from a 'pulse' of visible light.

Marius Stan
Categories: Engineering, Chemistry, Computer Science

Dr. Marius Stan is a Senior Scientist in the Applied Materials Science division at ANL. He is also a Senior Fellow at University of Chicago and Northwestern University. Marius and his group use artificial intelligence (machine learning, computer vision and natural language processing) and high performance computing to understand and predict physical and chemical properties of materials. Marius has extensively published in the scientific literature and is currently writing a book on modeling and simulation. He is an avid soccer player and a published author of short-stories and poetry. You may also recognize him as Bogdan, the car wash owner, in the acclaimed TV series “Breaking Bad”.



Tung T. Nguyen
Categories: Mathematics

My research is on number theory and algebraic geometry. Specifically, I am interested in solving a system of equations using geometric and analytic methods. I am also interested in applications of number theory to cryptography. Recently, I am also interested in Bayesian statistics and Machine Learning. Here are two topics that I find interesting enough for a high school student.

1. Modular arithmetics and cryptography. In particular, we can cover RSA.

2. The Pythagorean triple problem x^2+y^2=z^2. It seems to have a rich history with some nice applications.

Chinwe Ewenighi Amankwah
Categories: Medicine & Health

My Phd study focused on Mother and child study. I assessed the immune strength of Hiv infected mothers treated with HAART and their exposed infants outcome. This study was done at UIC during my exchange research training at UIC. I am currently at UIC where I am doing research study on triple negative breast cancer (TNBC). Triple-negative breast cancer (TNBC) is the most aggressive subtype of breast cancer characterized by lack of expression of estrogen receptor, progesterone receptor, and human epidermal growth factor receptor 2 (HER2) overexpression. TNBC is known for its aggressiveness, organ metastases, and poor prognosis than other types of breast cancer. TNBCs are more common among African-ancestry populations. TNBC accounts for 39% of breast cancers in African American women under the age of 50, but only 16% in Caucasian women of the same age group. Because TNBC lacks receptors for estrogen, progesterone, and HER2 overexpression, there are no targeted therapies, and affected patients rely only on chemotherapy. Notch4 from a family of the Notch signaling pathway plays crucial roles in cellular developmental pathways, including proliferation, differentiation, and apoptosis. Of all four Notch receptors, Notch4 is more attractive in TNBC. A positive correlation exists between TNBCs and high expression of Notch4. There is a need for targeted therapy for TNBC, and notch4 seems promising. My study investigates the role of Notch4 in tumor endothelium, growth, vascularization, metastasis, and therapeutic targeting.

Daniel Santiago
Categories: Phhysics

My background is on experimental nuclear physics. Broadly speaking, I'm interested in 1) how the properties of atomic nuclei change for different combinations of protons and neutrons, and 2) studying nuclear reactions relevant for stellar evolution. The tools I use to probe atomic nuclei and nuclear reactions include low-energy particle accelerators, such as the Argonne Tandem Linear Accelerator System (ATLAS), particle detector systems, and computer codes to process the experimental data.

Romit Maulik
Categories: Engineering, Physics

Romit Maulik is interested in using scientific computing and artificial intelligence (AI) to solve pressing problems in climate science, engineering, and plasma physics at Argonne National Laboratory. For instance, he uses AI to provide accurate and inexpensive weather forecasts, reduce the costs of aircraft wing design, and improve the performance of nuclear fusion reactors. To meet these goals, he deploys AI algorithms with weather and engineering simulation codes on the very large computers at Argonne. A student may utilize this experience to learn more about applied mathematics, scientific programming, artificial intelligence, and high-performance computing while contributing to one of several exciting research projects.

Stephen Southworth
Categories: Physics

My research uses x rays at the Advanced Photon Source to study the physics of how atoms, molecules, and materials respond to absorbing x rays. The experimental techniques we use include x-ray absorption, x-ray emission, and photoelectron spectroscopy. The measurements are compared with theory to understand the basic physics and how particular samples interact with x rays. That is the essence of physics - to understand basic concepts and applications to particular samples.

Charudatta Phatak
Categories: Engineering, Physics

My research interests are focused on understanding the behavior of nanoscale magnetic materials. This encompasses understanding the effect of changing their size and shape at nanoscale, understanding proximity (bringing them closer or farther), arranging them on various types of lattices (periodic, square, aperiodic) and then understanding how they interact with each other.

Tom Sobyra
Categories: Earth & Space Science, Engineering

My research uses X-rays and other imaging techniques to explore the flow and interaction of ions between two-dimensional nanomaterials. These nanomaterials are super thin like graphene but contain metal ions that improve their ability to store charge, which make them excellent for batteries. My prior research focused on studying the reactions of atmospheric gases (nitrogen oxides and small acidic molecules) with the surface of water droplets in the troposphere (the area of the atmosphere where we live). I would be interested in projects related to earth/space, materials, and atmospheric science. Outside of the lab, I enjoy video games, board games, cooking, and watching baseball (Go Cubs!).

Amy Bender
Categories: Earth & Space Science, Physics

I'm an experimental cosmologist, building instruments and their components that get installed into microwave telescopes. The data collected measures some of the earliest light in the universe (called the cosmic microwave background) which is then used to try and understand physics and evolution of the universe. The most recent instrument I worked on is currently mounted on the South Pole Telescope, and I helped to develop the custom superconducting detectors and the superconducting readout components. The signals the telescope is trying to detect are ultra-faint, so these specialized detectors are specially developed to have extraordinary sensitivity to microwave photons. I also work on analyzing the data from the telescope, with the goal of connecting the signals seen there with the structures observed in the universe today (like galaxies and clusters of galaxies) and learn about things like dark energy, dark matter, and other exciting physics.

Gracelyn Newhouse
Categories: Engineering,

I am a software engineer with expertise in machine learning, networking, and infrastructure provisioning. Most of my ML projects have focussed on natural language understanding (NLU) with RNNs and image processing with CNNs. I have recently been experimenting with reinforcement learning applications, but would not call myself an expert in RL. I develop mainly with Python and Tensorflow, Keras, and Pytorch. Of course, the secret to

successful modeling lies in effectively cleaning, processing, and understanding the data before finding the most suitable approach. I am interested in pursuing ML or other data analysis projects related to environmental sustainability, or more generally public-policy or cellular/molecular modeling.

Krishnan Raghavan
Categories: Computer Science

My research interests lie in the intersection of engineering, mathematics and data analysis. One prime example of such is robotics where I am very interested in constructing, modelling and controlling the robot. I am interested in both hardware and software development in robotic applications. Other interests include analysis and modeling for physical systems, game theory, artificial intelligence and others.

Peng Yang
Categories: Biology/Microbiology

I studied Soil Science during my Ph.D. program. My projects were about mineralogy (study of minerals) and chemistry. For instance, I studied how naturally occurring minerals change when reacting with other reactants. The goals of the projects were to understand how certain minerals may change in real natural environment and what the changes mean to nutrient elements, heavy metals, and organic pollutants. At Argonne, my research interest is the reaction of crystals with aqueous solutions containing toxic elements. The aim of the projects is to understand how toxic elements attach to common naturally occurring crystals and how the attachment can affect the mobility of toxic elements in natural environment.

Manolis Kargiantoulakis
Categories: Physics

I am a Research Associate in Fermilab, workingon experimental particle physics. My experiments search for new physics with fundamental particles called murons.

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