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.

Anirudh Subramanyam
Categories: Math, Computer Science, Engineering

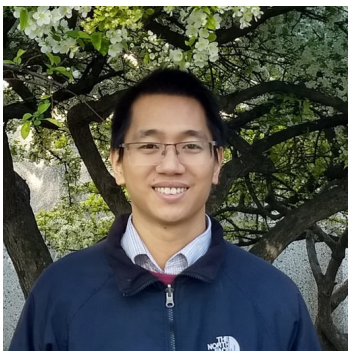
Math: discrete math (combinatorics, graph theory, operations research), analysis (calculus, differential equations), probability theory and statistics
Engineering: control, basic robotics and circuits (arduino), chemistry and its applications (chem-e-car)
CS: computer algorithms design and analysis,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

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.



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.

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.

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.

Nesar Soorve Ramachandra
Postdoctoral Appointee
Nesar Ramachandra is a cosmologist with interests in the dynamics of large-scale structure formation.

Nesar Ramachandra is a cosmologist with interests in the dynamics of large-scale structure formation; he is also working on the implementation of state of the art statistical and machine learning methods for cosmological data analysis and fast prediction tools (emulators) as part of the SciDAC-4 project led by CPAC.