APS Scientific Computation Seminar Series

Speaker: Bachir Aoun
X-ray Science Division, SRS & CXS Groups

Title: Using Scedasticity to Find the Data That Matter

Date: Thursday, February 25, 2016

Time: 1:00 p.m.

Location: 401/A1100

Host: Nicholas Schwarz and Brian Toby

Abstract:
Experimental scientists are faced with two tasks: design/conducting measurements and data reduction/analysis, where the second task can require far more time than the former. While at present, most scientists are accustomed to determine their data analysis needs by straightforward visual inspection, it will be shown that this can be improved upon significantly.

Computer-assisted statistical analysis is becoming essential in all fields of experimental research. This seminar will show that simple model-free and data type-independent correlation analysis tools can be very effective to helping us find details in our data that we can't pick out with our bare eyes and also save us effort in data analysis. The statistical analysis concept of scedasticity (defined as "the distribution of differences") will be introduced. This concept allows us to differentiate between random changes (noise), changes with constant variance (statistical fluctuations, homoscedasticity) or those with a pattern that tells about what is changing during the experiment (heteroscedasticity).

The Advanced Photon Source (APS) Upgrade project, as well as better detectors and instrumentation, will bring major improvements in experimental capabilities (atomic-scale resolution; high-throughput measurements; multifunctional instruments, etc.) and thus will produce both huge volumes of data, as well as data that are much more complex than what we measure at present. It is only with high-level statistical tools that we will be able to cope with the data streams from the APS of the future.