

Diving for Unexpected Treasure in Complex Data

Navigating an ocean of high-dimensional data and searching for hidden information requires novel data-mining techniques. Dynamic Quantum Clustering, a new, unbiased, visual data-mining technology, is such a method. DQC, and its predecessor QC, excel at discovering and extracting unexpected structure hidden in the data without making any a-priori assumptions.

The underlying principles of QC and DQC will be explained and demonstrated. Two major applications will be shown: The first is an analysis of a data set containing more than half a million x-ray absorption spectra (XAS). Although it is large and complex DQC, with remarkable sensitivity, groups these spectra and identifies distinct mineralogical phases. DQC even manages to isolate an unexpected cluster (containing metallic iron and magnetite) that comprises less than 0.01 percent of the data. The second example comprises all earthquake data gathered in the Middle East within the last two decades. This has been analyzed both by DQC and QC. Analyzing some 6000 data in a five dimensional parameter space of seismogram characteristics, we uncover one cluster that turns out to be located in the Eilat region and associated with the major earthquake of 1995. It can be correlated with geophysical observations.