**ECE 4822: Engineering Computation IV**

**Homework No. 2: Fast Algorithms in C++**

**Goal:** Learn how algorithms can be made more efficient by streamlining operations.

**Description:**

Repeat HW #1, but implement a fast algorithm for matrix multiplication:

*https://en.wikipedia.org/wiki/Matrix\_multiplication\_algorithm*

and the autocorrelation computation described here:

J.D. Markel and A.H. Gray, Jr.,

*Linear Prediction of Speech*, Springer-Verlag Berlin Heidelberg,

New York, New York, USA, pp. 218, 1976.

The original Fortran code from this textbook can be found here:

*https://www.isip.piconepress.com/courses/temple/ece\_4822/resources/book\_excerpts/factored\_autocorrelation\_markel\_and\_gray.pdf*

There is also a Wiki page that describes the process of reducing the computational burden:

*https://en.wikipedia.org/wiki/Autocorrelation#Efficient\_computation*

Alternately, try a chatbot or Google search for “fast autocorrelation.” The above code is clean and well documented and can be adapted for your use. You must write your own implementation of these algorithms (later we will use library functions).

Produce plots that verify the actual speed up in your code matches the theoretical prediction. Demonstrate that your code produces identical results to assignment no. 1 but is much faster.

Note on the cluster you can find a lot of interesting C++ algorithm code here: */data/isip/data/ifc\_archives/ifc/class/algo*. For example, the above fast autocorrelation computation can be found here: */data/isip/data/ifc\_archives/ifc/class/algo/Correlation*.