ENSC USRA invitation –summer 2021: Innovative Communication Systems for 5G and beyond

5G NR (the 5th generation New Radio) access technology standards promise high-speed, low-latency, high-reliability, ubiquitous communication capability. 5G network can convey digital information faster than previous wireless communication networks by orders of magnitude and allow for connecting billions of devices to form the internet of things (IoT). Combining such communication technology with developing artificial intelligence may realize new applications such as self-driving cars, unmanned aerial vehicles, and autonomous robots.

This project will explore the design space of the digital communication system including the signal constellation, labelling schemes, combined with error correction coding. In particular, the student will learn basic ideas of digital communication systems and conduct simulation experiments with their components.

Experience with Matlab is desired, but the project welcomes any capable student who is willing to learn. The student must have completed a linear algebra course and should be able to apply linear algebra knowledge.

Learning objectives will be adjusted to the backgrounds of the student participating in this project. Example learning objectives are:

1) Understanding the basic concepts of the error correction code
2) Understanding the basic concepts of the LDPC code
3) Combining Matlab's LDPC code module and the mapper, which associates a block of coded bits to a modulation symbol
4) Collecting statistics from the symbol output data and analyze them

The student will have a weekly meeting with the supervisor (Prof. Daniel Lee) in person and report the progress of the project and learning. The supervisor will direct/advise the student's activities.