“In this age of big data, people are urging to have methods to deal with the increasing amount of data day by day with limit time and source of computing. Thus, an efficient algorithm and insightful understanding of data itself will be priceless. On the other hand, seeking an algorithm with a serial of constrain is always a huge topic in signal processing community and we have some successful experience on algorithm and understanding of signal at same time.

In this dissertation, I start with extending successful theoretical research in signal processing area to a more realistic setting. We demonstrate the potential of building a time and cost saving Fourier Ptychography system with the help of our theoretical knowledge. Then we use such experimental result to build a comprehensive understanding of data and signal in real world. A useful Fourier Ptychography algorithm could be polished by prior knowledge of data/signal structure, including sparsity and low-rankness. In the end, we iterate our research between theoretical explore and real-world application to build a more useful method to contribute to the community. An updated Fourier Ptychography algorithm design for time seriers signal with lower sample needed is presenting here.”