Some Project Idea

1. Distributed computation of convex hull, in parallel, in CONGEST model.

2. Efficiently estimating area of a convex polytope via Monte Carlo algorithms. For example, see the paper “Ants estimate area using Buffon’s needle”.

3. Different lifting techniques for different types of Voronoi diagrams or Delaunay triangulations. For example, to compute a weighted Voronoi Diagram, can one lift points to different types of paraboloids based on the weight of the point? A literature search on Bregman Voronoi diagrams may be a good place to start on this.

4. Applications of singular value decomposition (SVD) or Johnson-Lindestrass projection from high dimensional to low dimensional spaces. Possible application areas can include machine learning, motion planning, data structure design, etc.

5. Distributed gradient descent in a physical space. For example, say that $n$ robots are searching a space to find the source of a gas leak. They have sensors detecting the concentration of a gas. How can they most efficiently find the maximum concentration? Assume that the concentration function and search space are convex.