

## ARO Homework 3: 2D beacon SLAM.

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Robot has followed trajectory consisting of  $M$  unknown positions  $\mathbf{x}_j \in \mathbb{R}^2, j = 1 \dots M$ . From each  $j$ -th position,  $N$  distances  $\mathbf{d}_i^j \in \mathbb{R}$  towards  $N$  different beacons at unknown locations  $\mathbf{a}_i \in \mathbb{R}^2, i = 1 \dots N$  was measured. Given the set of  $M \times N$  measured distances  $\mathbf{d}_i^j \in \mathbb{R}$ , reconstruct the trajectory and beacon positions.

1. Download `nlsq_d.npy` data file, which contains  $2 \times N \times M$  array with measured distances.
2. Formulate the problem as a overdetermined set of non-linear equations.
3. Linearize the problem and impose additional constrains. Iteratively solve the problem.
4. Draw reconstructed trajectory and beacons into a common figure.