Homework 2

Based on the sparse assumption described by Friedman et al. (2010), we implement coefficient estimation for a regression model using the L1 penalty, known as the LASSO approach. To find the optimal parameter estimation, we utilize both the coordinate descent method and Particle Swarm Optimization (PSO).

The goals are:

1. 1. Implement the coordinate descent method to identify the optimal tuning parameter for the LASSO penalty using a cross-validation approach, and then compute the LASSO estimates for the linear regression model.
2. 2. Using the same tuning parameter, apply Particle Swarm Optimization (PSO) to calculate the LASSO estimates. Beyond the default PSO parameters, evaluate the impact of particle size and the number of iterations on the results.
3. Use the simulation setups found in Section 3.1 of Chen et al. (2011) to demonstrate the performance.

References:

Friedman, J. H., Hastie, T., and Tibshirani, R. (2010). Regularization Paths for Generalized Linear Models via Coordinate Descent. Journal of Statistical Software, 33(1), 1–22.

Chen, R.-B., Chu, C.-H., Lai, T.-Y. and Wu, Y. N. (2011). Stochastic Matching Pursuit for Bayesian Variable Selection. Statistics and Computing, 21(2), 247-259.