Quiz Topic: Outlier Removal via OMP
EECS 16ML: Fall 2020
Team RAAAK

Problem 1. Use the following matrix equation setup to run OMP for two iterations. Please box the intermediate and final residuals as well as the two components identified to have non-zero entries. For notational uniformity, denote each of the columns of $\begin{bmatrix} \boldsymbol{A} & \boldsymbol{I} \end{bmatrix}$ as $\vec{c_1}, \vec{c_2}, ..., \vec{c_8}$.

$$\begin{bmatrix} \boldsymbol{A} & \boldsymbol{I} \end{bmatrix} \begin{bmatrix} \vec{x} \\ \vec{f} \end{bmatrix} = \vec{y} \Rightarrow \begin{bmatrix} 1 & 1 & 0 & 1 & 1 & 0 & 0 & 0 \\ 1 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \\ d \\ e \\ f \\ g \\ h \end{bmatrix} = \begin{bmatrix} 2 \\ 0 \\ 2 \\ 1 \end{bmatrix}$$

Problem 2. Ignore the calculations done in the first problem. Suppose that a genie ran OMP for the problem above and told you the following about the sparse solution:

$$\vec{x} = \begin{bmatrix} \frac{1}{2} \\ 1 \\ -\frac{1}{2} \\ 1 \end{bmatrix}, \vec{f} = \begin{bmatrix} 0 \\ 10 \\ -\frac{1}{2} \\ 0 \end{bmatrix}$$

Interpret the results by identifying the outlier(s). Provide justification/explanation.

Problem 3. In each of the three parts below, describe a potential stopping condition discussed in this course for OMP. In addition to naming the stopping condition, describe potential (dis)advantages and/or use cases. The order you list them in does not matter.

- Stopping Condition 1:

- Stopping Condition 2:

- Stopping Condition 3: