MA324 : TP2

Exercice 1 *(Dealing with outliers : full ransac algorithm)*
Last time we tested a simplified version of ransac. We now implement the full algorithm. The simplified version worked with outliers but we doesn't take into account for the noise. The full version can work on noisy samples, which is more realistic. Begin by implementing the simplified version if not done then do the following.

1. Using the numpy/linspace create an 1D array x that contains 100 samples uniformly distributed on $[0, 1]$ and build the model $y = 10 + 2x + \varepsilon$, where ε are centered normal iid with variance 2
2. Write a function that given a model and the threshold returns the set of inliers
3. Write a function that compute the model given a set of observed data
4. Modify the main loop so that the model is re-estimated on the inliers given by the current-model
5. Compare the simplified version and the full version.

Exercice 2 *(Non linear least squares with a toolbox)*
Begin by reading the documentation of scipy optimize least squares `https://docs.scipy.org/doc/scipy/reference/generated/scipy.optimize.least_squares.html`

1. We observe the following data of TP2

Angles in degrees	43	45	52	93	108	126
Observed values	4.7126	4.5542	4.0419	2.2187	1.8910	1.7599

2. Use the toolbox to estimate a non-linear least square solution to this model

Exercice 3 *(Using the SVD toolbox)*
Begin by reading the documentation of the SVD `https://numpy.org/doc/stable/reference/generated/numpy.linalg.svd.html`

1. We see that the main difference between the lecture and the output of the toolbox is the Σ matrix, that is now

   ```
   Vector(s) with the singular values, within each vector
    sorted in descending order. The first a.ndim - 2 dimensions
    have the same size as those of the input a.
   ```

2. Create a simple matrix say $\begin{pmatrix} 1 & 2 \\ 3 & 4 \\ 4 & 6 \end{pmatrix}$ apply the svd method and recompose A from the output of the svd toolbox
3.