

# ELL800: Assignment (5% weightage)

1. Write a program <sup>(function)</sup> that takes a vector  $x \in \mathbb{R}^n$  as an input and generates a matrix

(a) which is upper triangular s.t.

$$Lx = \begin{bmatrix} * \\ 0 \\ \vdots \\ 0 \end{bmatrix}, \quad * \rightarrow \text{non-zero entry.}$$

(b) which is orthogonal  $Q^T \in \mathbb{R}^{n \times n}$ .

$$\text{s.t. } Q^T x = \begin{bmatrix} * \\ 0 \\ \vdots \\ 0 \end{bmatrix}$$

solve Q.1(b) using both Givens's Rotations and Householder's Reflections (separately)

Q.2. In Q.1(a) do necessary adjustments in case first entry is zero. ~~Give~~ modified program to give adjustments in the output

Q.3 Use Q.1 and 2 to write a function that takes a matrix  $A$  as input

and  
a) gives  $L, U$  (lower & upper triangular matrices) s.t.  $A = LU$

b) gives  $Q, R$  (orthogonal & ~~lower~~ upper triangular) matrices s.t.  $A = QR$ .