```
LUP-DECOMPOSITION(A, n)
 1  let π[1 : n] be a new array
 2  for i = 1 to n
 3      π[i] = i                          // initialize π to the identity permutation
 4  for k = 1 to n
 5      p = 0
 6      for i = k to n                    // find largest absolute value in column k
 7          if |a_ik| > p
 8              p = |a_ik|
 9              k' = i                    // row number of the largest found so far
10      if p == 0
11          error "singular matrix"
12      exchange π[k] with π[k']
13      for i = 1 to n
14          exchange a_ki with a_k'i      // exchange rows k and k'
15      for i = k + 1 to n
16          a_ik = a_ik/a_kk
17          for j = k + 1 to n
18              a_ij = a_ij − a_ik a_kj   // compute L and U in place in A
```