Example — Observer Design

- Given a system characterized by $A = \begin{bmatrix} 1 & 3 \\ 3 & 1 \end{bmatrix}, C = \begin{bmatrix} 0.5 & 1 \end{bmatrix}$
- Find linear state-observer gain $L = [l_1 \ l_2]^\top$ such that the poles of the estimation error are -5 and -3
- Characteristic polynomial:
  $\lambda^2 + (-2 + l_2 + 0.5l_1)\lambda + (-8 + 0.5l_2 + 2.5l_1) = 0$
- **Solution:** $L = \begin{bmatrix} 8 \\ 6 \end{bmatrix}$
- MATLAB command: $L =$ `place(A',C',eig_desired)`