## Exercises with Matlab codes

- Problem 1: Test influence of discretization, filter size, penalization power, filter type and the run time on the topology of the MBB-beam (default example) using the following three Matlab codes.
  - top(nelx, nely, volfac, penal, rmin)
  - top88(nelx, nely, volfac, penal, rmin, ft)
  - top99neo(nelx, nely, volfac, penal, rmin, ft, ftBC, eta, beta, move, maxit)



## Exercises with '99 line Matlab code' (1)

- Problem 2: Implement other boundary conditions
  - Change boundary and support conditions in order to solve the optimization problems sketched in the figure. Does the direction of the forces change the design?



## Exercises with '99 line Matlab code' (2)

- Problem 3: Implement multiple load cases
  - Extend the algorithm such that it can solve the two-load case problem shown in the figure. Discuss the difference in topology compared to the one-load case solution.



## Exercises with '99 line Matlab code' (3)

- Problem 4: Implement passive elements
  - In some cases, some areas may be required to take the minimum density value (e.g. a hole for a pipe). Add the necessary lines to the program such that the problem shown in the figure can be solved. What is the difference in compliance compared to Problem 2 (left)?

