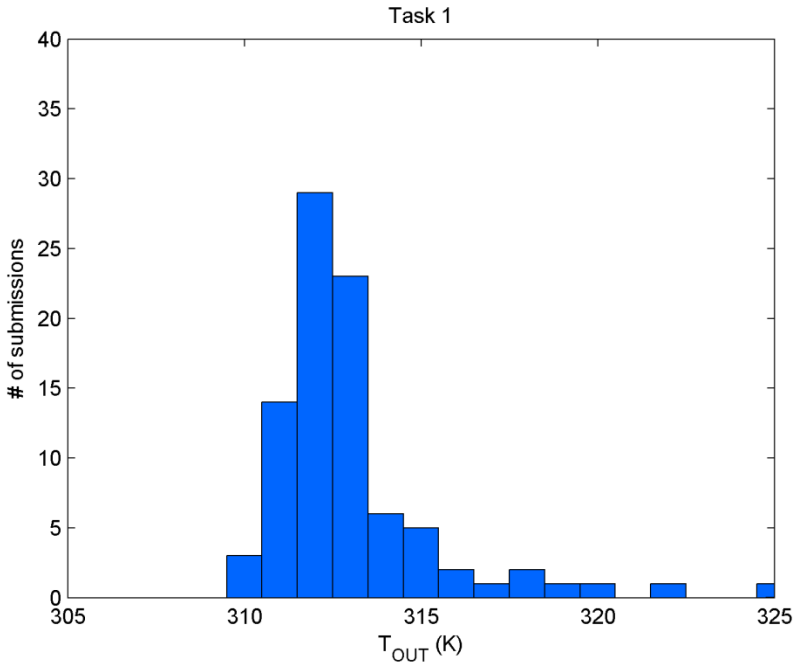
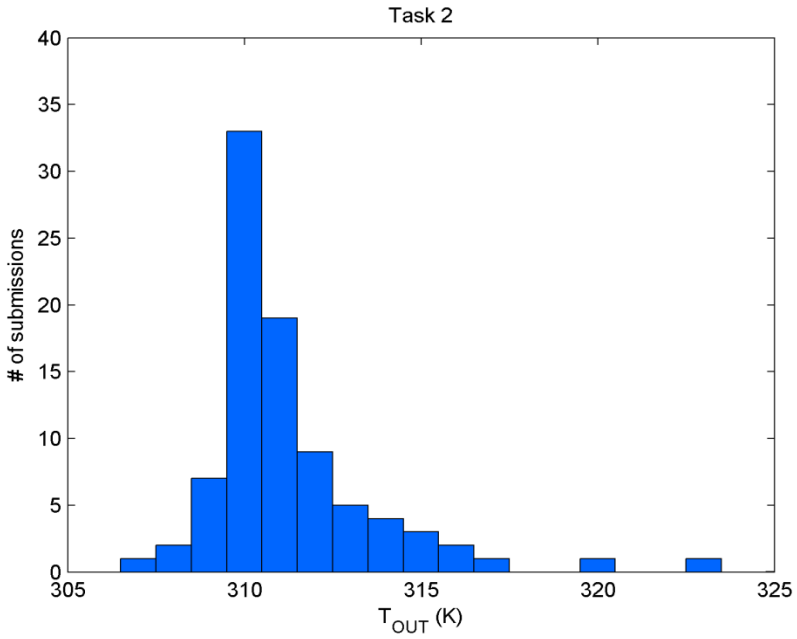
ACFD 2017, Project 1, Instructor's remarks

Statistics of outlet temperature (T_out) for Task 1-3:

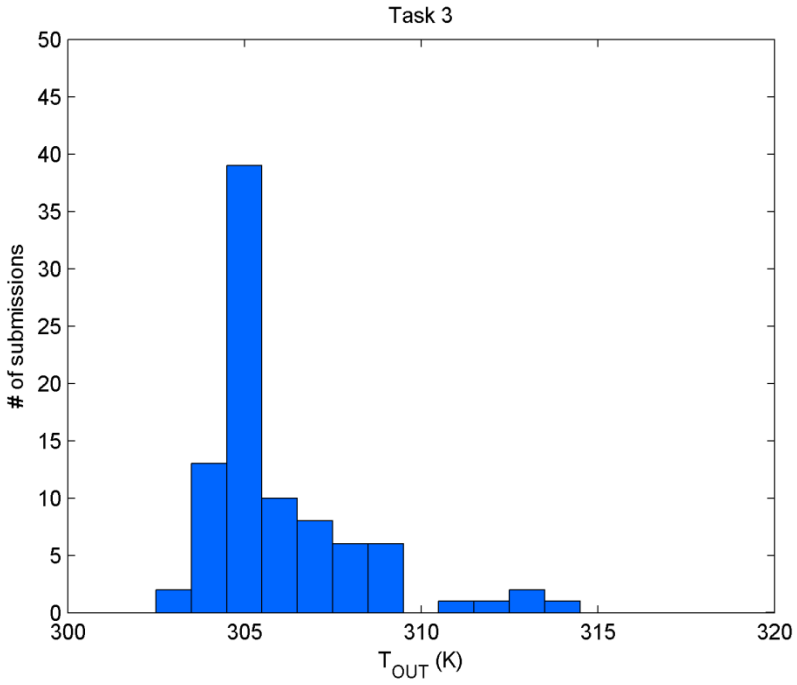
Task 1



Task 2



Task 3



The outlet temperature for Task 3 is significantly lower compared to the other 2 tasks.

Task 4

From the submitted reports, a wide range of "time step size" worked for the transient simulation. The reasons are that (i) No issue with numerical instability when an implicit scheme is used, and (ii) The system has a simple and unique steady state which is easily reachable. "All roads" lead to that steady state. (The runs with a smaller Δt should still produce more accurate flow patterns in the transient stage of the simulation, although we did not emphasize this aspect for this task.)

Task 5

The total rate of heat transfer in (a) is around 900-1300 W. The heat flux in (b) is around 9000-13000 W/m^2. The outlet temperature in this case should be very close to that obtained from Task 1. We expect an asymmetric pattern of temperature at bottom. This is because, to maintain a uniform heat flux, the vertical temperature gradient has to be uniform. This would imply a colder spot below the cold "waterfall", as illustrated in Fig. 1.

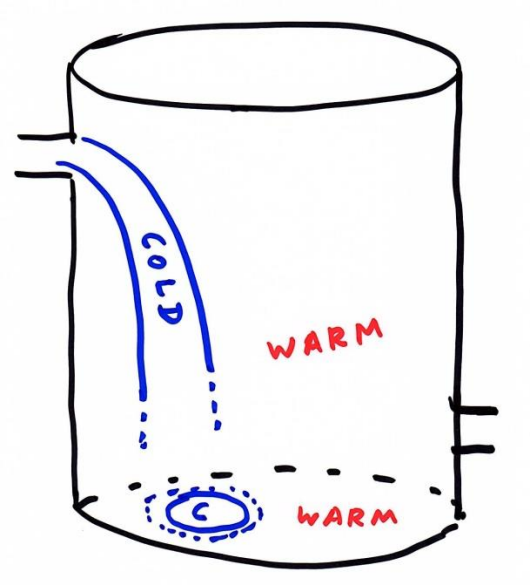


Fig. 1