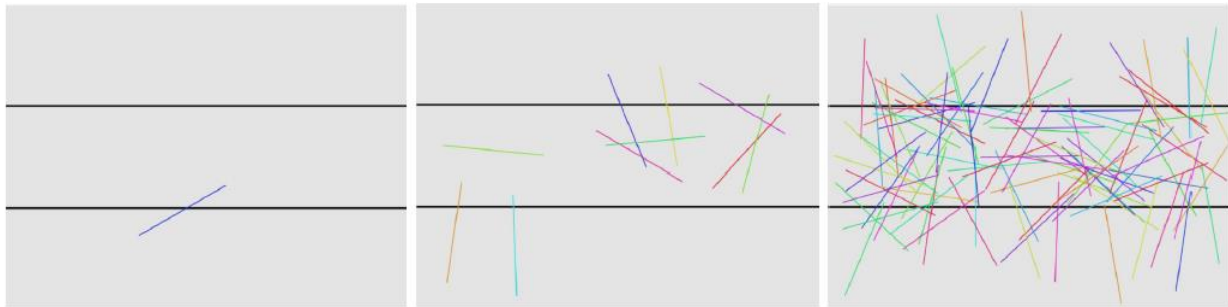# CmpE49G - Project 1

Monte Carlo Simulation for the Problem named Buffon's Needle

Suppose, a needle of size L is dropped on a lined and infinite-size sheet of paper, where the distance between lines is D with satisfying $L < D$. We are interested in the probability of the needle crossing one of the lines on the sheet. In fact, this probability is $\frac{2L}{D\pi}$.

For investigating this probability, you are expected to provide an analytical solution and do Monte Carlo simulations with at least three different D and L cases. You should simulate the system for 10^2, 10^3, 10^4, 10^5, and 10^6 needles and track the number of needles that are crossing one of the lines to evaluate the probability of crossing a line. By doing Monte Carlo simulations, you will be able to validate the probability is converging to $\frac{2L}{D\pi}$ as we increase the replication count (number of needles).

Submission:

- Submission will be done over Moodle (please note that the file size can be at most 2MB)
- You should submit a zip file with the name <studentID_prj1_name_surname.**zip**> and it should include **i)** a detailed (minimum 3 pages and at most 5 pages) **report** for presenting the problem, analytical solution approach, Monte Carlo simulation approach details, the results with plots and figures, and the observations/conclusion; **ii) code** of the simulator; **iii)** a **readme file** for the instructions to run the code with example parameters.
- You may use **any** programming language