Astronomy Club, IITK
SnT Summer Project
Blast Off
Assignment 5

Submission Deadline: 23:59:59, 12/07/2022

Try to attempt all the questions

1. Using Open Rocket, simulate the ideal specifications that will let the rocket achieve maximum height while being in the stable region using the *Rocket optimization* feature with the following parameters:

   - Rocket Engine: Estes E9
   - Rocket outer diameter: 1.5 *inch*
   - Body material: PVC
   - Nose cone material: Polycarbonate
   - Fins material: Cardboard

   Remember to design inner tube and coupler accordingly. Payload mass should be kept at 150 g, consisting of an altimeter.

2. Using a Multi Objective Genetic Algorithm, compute the optimal point for a SSTO Rocket model in the within the bounds of the following parameters (pay close attention to the units):

   - Thrust Vector:
     - $T_1 = [10.1, 10.3]\ MN$
     - $T_2 = [\ 9.7,\ \ 9.9]\ MN$
     - $T_3 = [10.0, 10.2]\ MN$
     - $T_4 = [\ 3.7,\ \ 3.9]\ MN$
     - $T_5 = [\ \ 2,\ \ \ 4]\ kN$
   - Angle Vector
     - $\alpha_1 = [350, 450]\ m$
     - $\alpha_2 = [320, 330]\ km$
   - Cone half angle = $\theta_C = [0.10, 0.15]\ radians$
   - Rocket radius = R = [3.8, 4.2] m
   - Total mass = $M_i = [950, 980]\ tons$

   You may use the conversion constants for mass and cost calculation as provided in the slides. Some extra information to keep in mind:

   - Specific Impulse = $I_{sp} = 400\ s$
   - Mutation Probability = 4% per gene
   - Population size per generation = 100
   - Generations ≥ 10