# Moonshot

## Goal

Demonstrate my skills by completing the mission

* Critical thinking
* Plan and design
* execution

## Mission

Electromagnetic gun simulation as described in the task doc

## Execution principles

* Everything always can be better, concentrate on a basic version that works as time is limited.
  + basic V1 that works.
  + Map gaps.
  + Suggest improvements

## Design principles

* OOP
* AI to generate documentation
* AI to acquire the background knowledge
  + Electromagnetic
  + Python
  + MATLAB
* AI wherever it can multiply my productivity.
  + Code structure
  + Coding
  + Code review

## Design

Represent each component and each interaction between two components in the system as a class.

The benefits of this design are:

1. Easy to use, maintain and understand as it’s structure is the same as the simulated setup. Important because this simulation serves other non-software engineers.
2. scalable:

* Adding more objects i.e. connecting wires, power supplier, damping capacitor.
* Adding objects characteristics i.e. conductance, capacitance.
* Adding more interactions i.e. between the acceleration stages
* Adding more types of interactions i.e. mechanical interactions such as heat, air resistance and such

V1 system components:

* Capsule
* Acceleration stage
* Acceleration tube

V1 parameters:

* Coil current

## Plan

V1

Project template in PyCharm

Upload to a GitHub repository

Implement objects

Implement Objects Interactions

Run simulation

Plots

CLI

Sample run configuration

Documentation

MATLAB

Install

Compile first task

User interface

**Execution summary:**

Current implementation fulfill all the system requirements.

The execution leveraged Gen AI Agents:

* ROO (VS Code extension) for designing and coding
* Bing MCP for acquiring the agent with physical background and best practices for Python and MATLAB coding, OOP and TTD.
* ChatGPT for self validation.  
  \*Roo tended to overdo, next time need to strain him better.

Main gaps:

* Physical understanding of the system can and should be deeper.
  + The force is repulsing.
  + The capsule doesn’t move as expected (that’s why test\_simulation\_termination\_conditions is failing).
* More code cleaning iterations should be made.
* MATLAB integration can be simplified
* Output plots correctness should be verified i.e. final distance cant be 20mm