**Project Outline**

*Document requirements:*

* *< 500 words, plain text, one page maximum*
* *Outlines the physical system I will model (including key properties of the system: mass, charge, fields etc), any Python packages I will use, any equations describing the system I will model, any approximation methods, and any programming techniques I will use*
  + *Abstraction and inheritance to build more sophisticated classes, to model objects with more complicated properties, or chaotic systems with a wide range of possible motion*
  + *What sorts of random number generators will I use? How will I store the data and analyse it?*
* *How will I test functionality of the simulation, and what is a simple version of the system that can be used to validate the simulation? Need thorough testing of all individual components*

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I want to simulate something to do with **energy** – perhaps modelling batteries or gas properties? Since the complexity of batteries would be more appropriate as a developed end product, I will first explore random processes, and then move onto the diffusion equation.

Some ideas to begin with, involving simple random problems:

* Generate pseudo-random numbers
* Test characteristics of pseudo-random numbers
* Simulate radioactive decay by random sampling
* Explain the basic Monte Carlo method
* Simulate random walks in 1D and 2D (maybe 3D?)
* Self-avoiding random walks (never intersects itself; occurs on lattices e.g. coiling of links in polymer chains)
* Explain the power scaling of travel distance
* Describe the forces acting at small and large time scales in Brownian motion
* Model the stochastic components in Brownian motion simulations
* Identify different power laws for travel distance in the limiting cases of small and large times