Academic and industrial interest in supercapacitance has been steadily growing since the first patent introducing the technology was awarded in 1966 to a General Electric scientist. As the world develops new technologies to harness renewable energies, new technologies for storing said energy are emerging as well. My interest in the subject comes from a desire for the theoretical knowledge that is necessary to understand the technology, as well as a desire to be fluent in a very practical area of applied physics.

Supercapacitors main advantage over very widely used Li-ion batteries is their high power density. Though electrolytic batteries offer a much higher energy density, they cannot produce the kind of power and cycle efficiency as superconductors, which makes superconductors the leading energy storage technology for high power output machines (CEI). The cycle stability of S.C. is much higher than Li-ion batteries as well. Some SC have reached cycle stability of 94-96% retention after 200,000 cycles (Thai). Most Li-ion batteries are efficient to 80% after 1000 cycles.

These are some initial things that I found that set supercapacitors apart from regular parallel plate capacitors. SC use an electrolyte solution as a dielectric as opposed to a solid one. Once a voltage is applied, charge builds up on the plates like a normal capacitor, and then the ions in the dielectric solution are attracted to their respective oppositely charged plates, in which they almost balance the charge. Electrical energy is stored between the barrier which separates the ions in the solution, and the charges on the plate. This process is called the “double-layer effect” and it is more effective than a traditional capacitor at storing energy for higher power outputs.