Hackathon 1

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Problem Statement

Context: E-k (energy v/s wavevector also called as the dispersion) relationship that relates the variation of the energy and wave-vector of an electron. From this relationship we can extract many important properties like bandgap, effective mass, density of states etc. This makes these relationship very useful in analysing a semiconductor.

Effective mass (m^*) is an important performance metric for a semiconductor as it directly affects the mobility of the carriers and density of states. It is related to the curvature (2nd derivative) of the E-k relationship around the minima and it is given by

$$m^* = \hbar^2 / d^2E/d|k|^2 \tag{1}$$

where hbar is the reduced Planck's constant An experimentalist has measured the dispersion data around the minima of the E-k of the silicon and it is given in the Starting Code. Calculate the effective mass of the data. Please assume that the data is noisy. Below is the figure illustrating the E-k diagram.