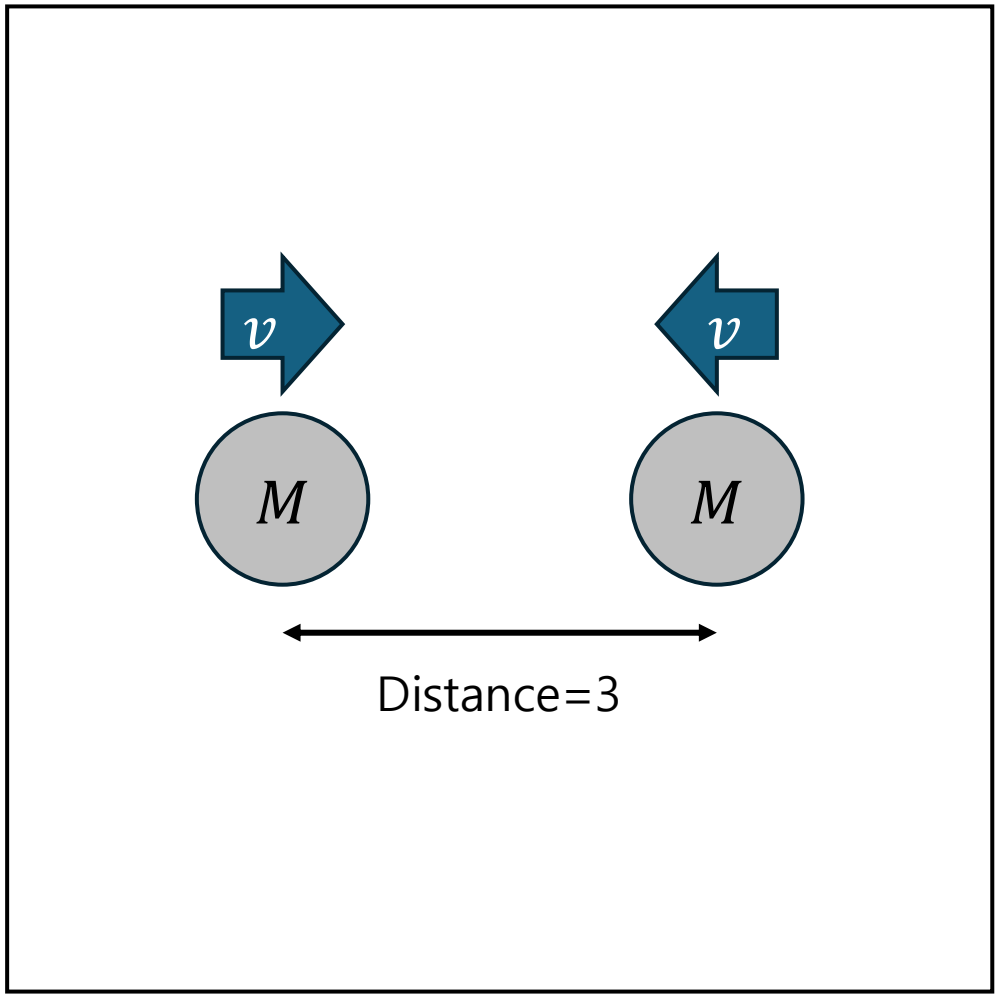
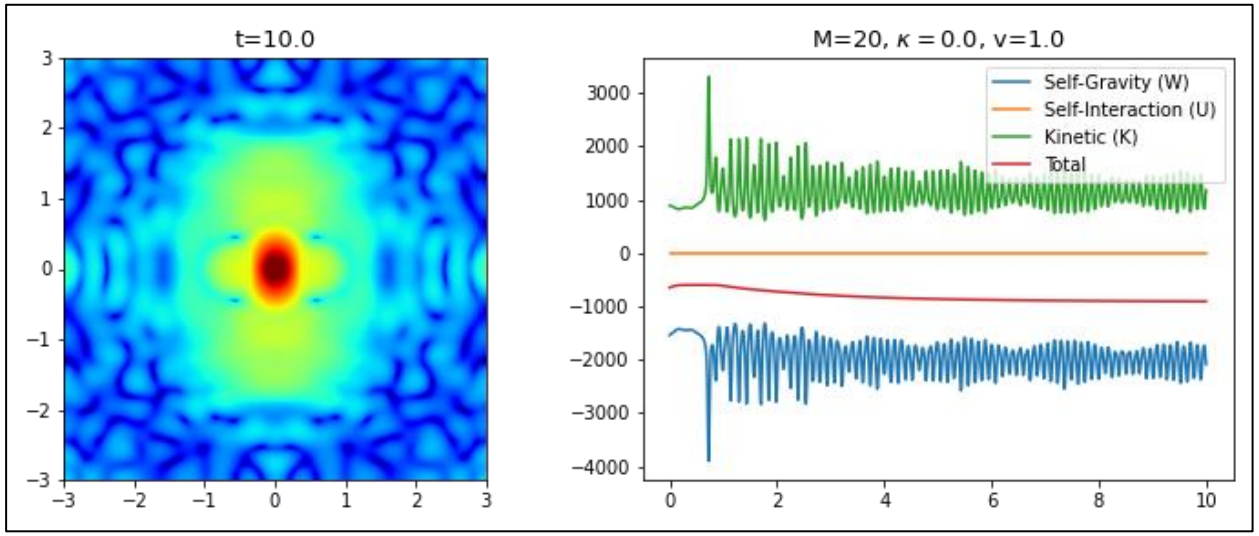
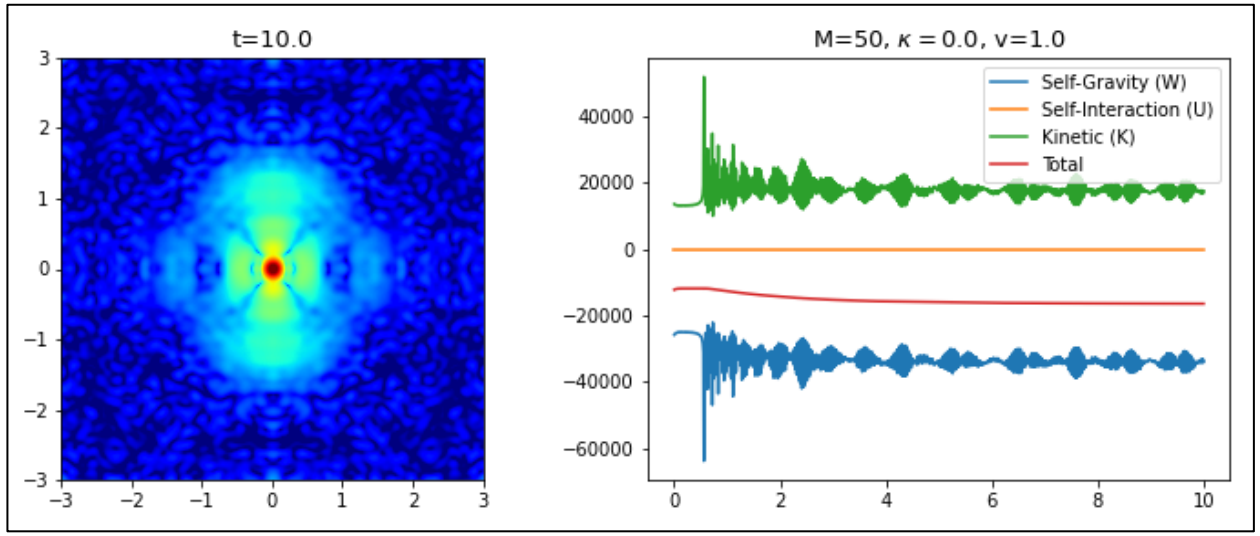


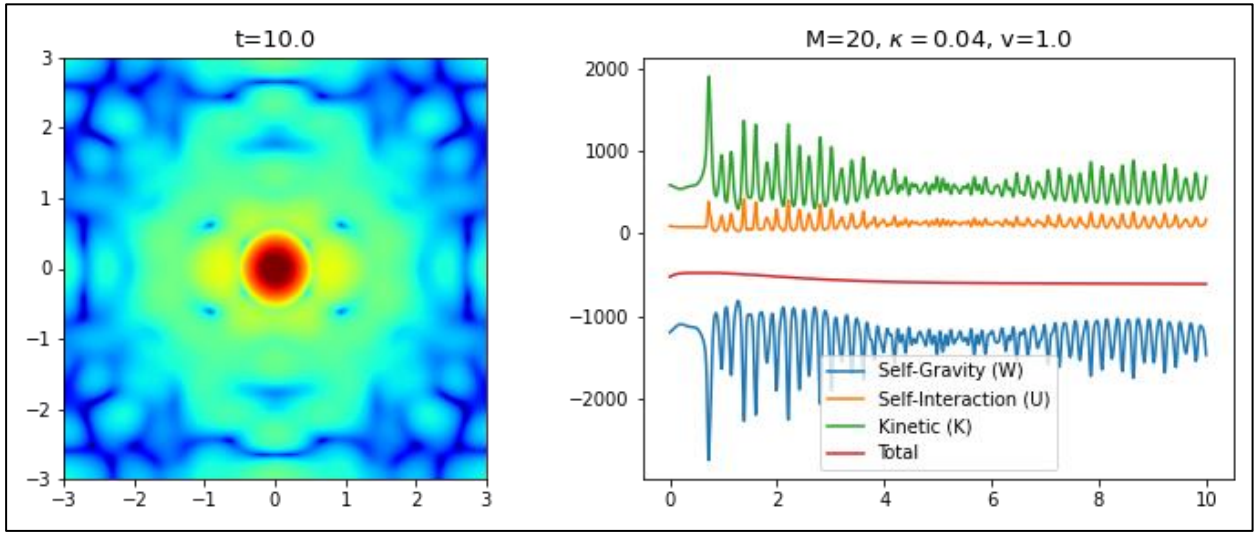
$L = 6$

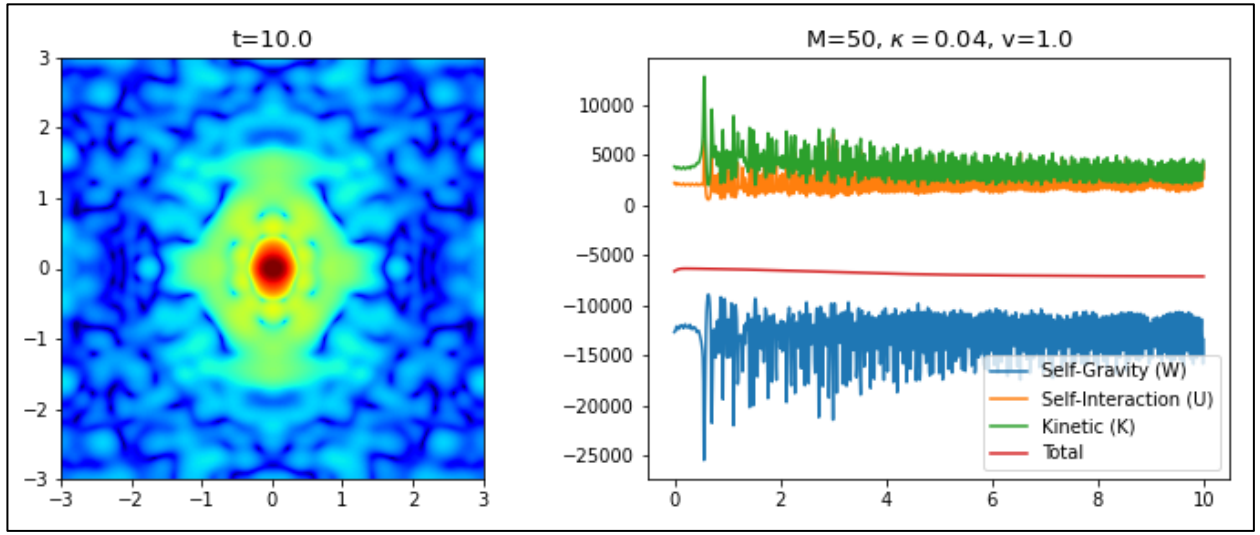
- Soliton Mass $M = 20{\sim}50$
- Colliding velocity $v = 1, 2$
- Time duration $T = 10$
- # of snapshots $N_t = 1000$
- Box size $L = 6$
- Resolution : $L/\Delta x = 256$
- Self-Interaction $\kappa = 0{\sim}0.04$
- Absorption BC is applied

- FDM particle mass $m_\phi = 10^{-22}\mathrm{eV}$
- $M_c = 2.23 \times 10^6 M_\odot$
- $v_c = 0.5\mathrm{km/s}$
- $t_c = 75.1\mathrm{Gyr}$
- $l_c = 38.4\mathrm{kpc}$

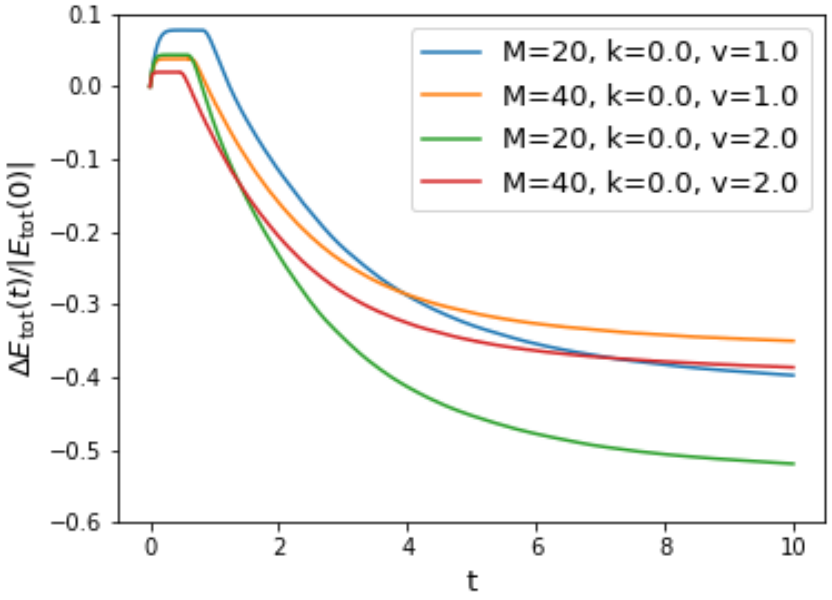

t=10.0
M=20, $\kappa = 0.0$, v=1.0
Self-Gravity (W)
Self-Interaction (U)
Kinetic (K)
Total

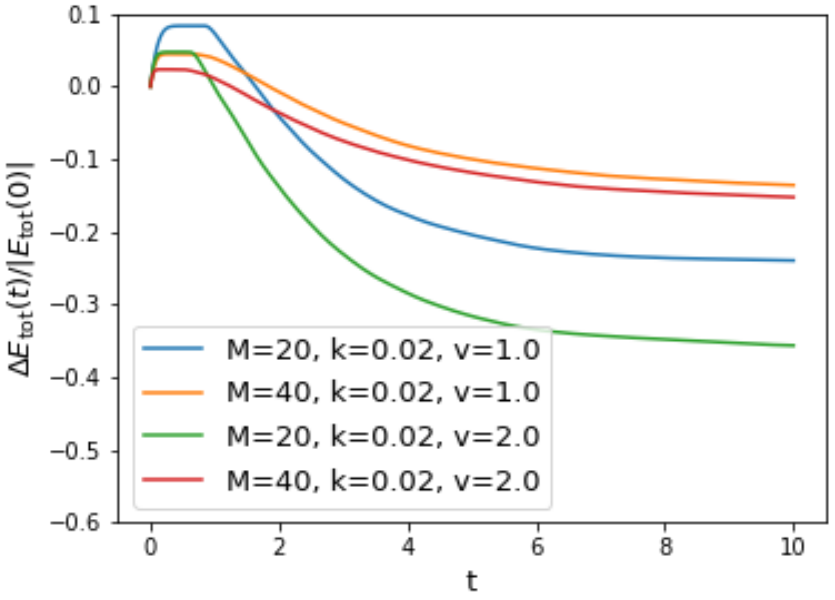

t=10.0
M=50, $\kappa = 0.0$, v=1.0
Self-Gravity (W)
Self-Interaction (U)
Kinetic (K)
Total

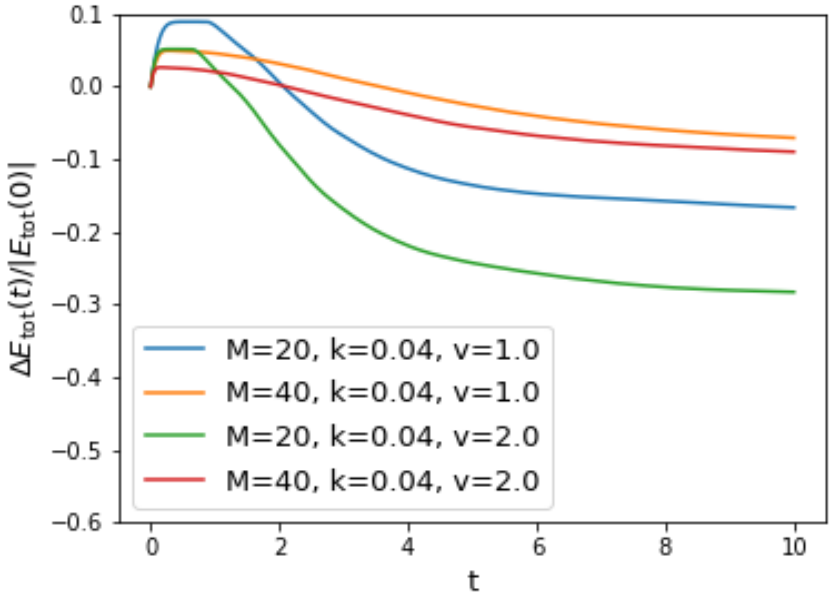

t=10.0
M=20, $\kappa = 0.04$, v=1.0
Self-Gravity (W)
Self-Interaction (U)
Kinetic (K)
Total


t=10.0
M=50, $\kappa = 0.04$, v=1.0
Self-Gravity (W)
Self-Interaction (U)
Kinetic (K)
Total

- Absorption BC… How much ULDM escaped from the box?

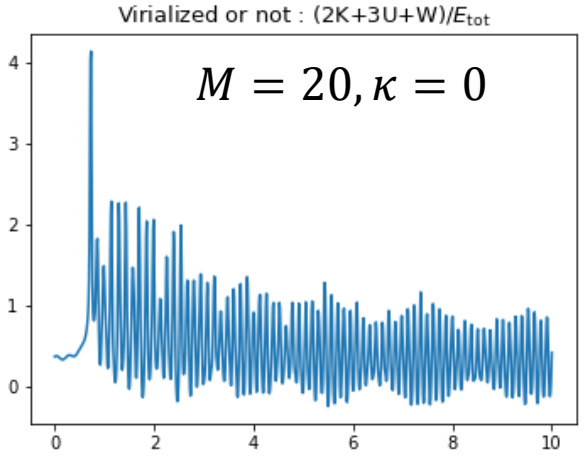


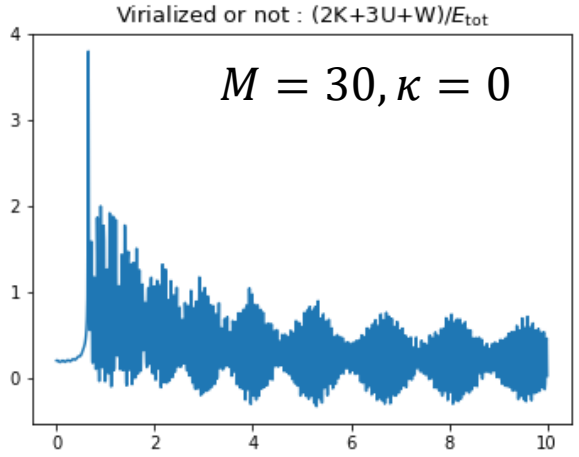


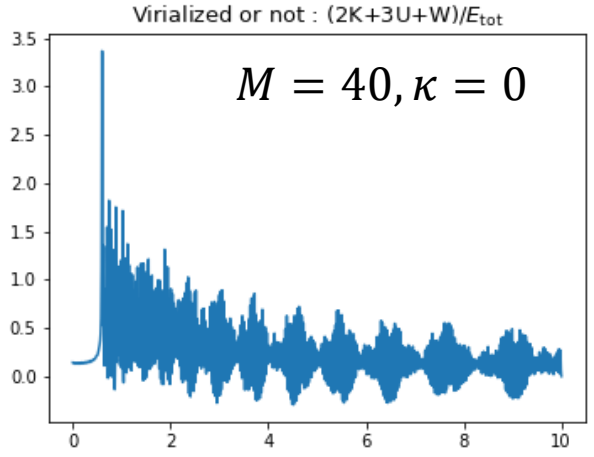


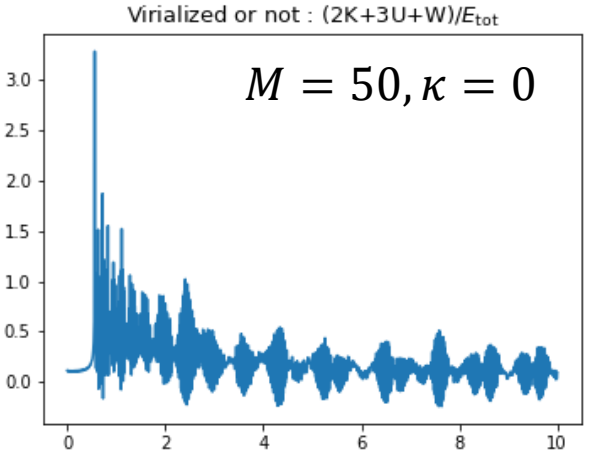
- Higher soliton mass, higher self-interaction strength, high encounter speed → Lower energy loss
- Fits well with fitting function $\sim A\left(1+\frac{t}{t_{\mathrm{relax}}}\right)^{-1}$ … Estimate precisely later!

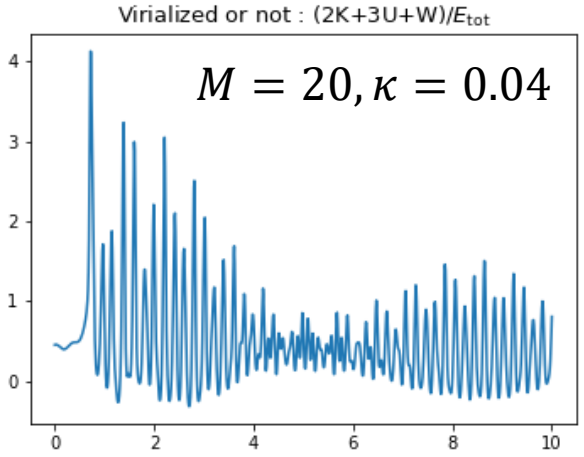
- Virialization condition of ULDM soliton with self-interaction: $3U + 2K + W = 0$

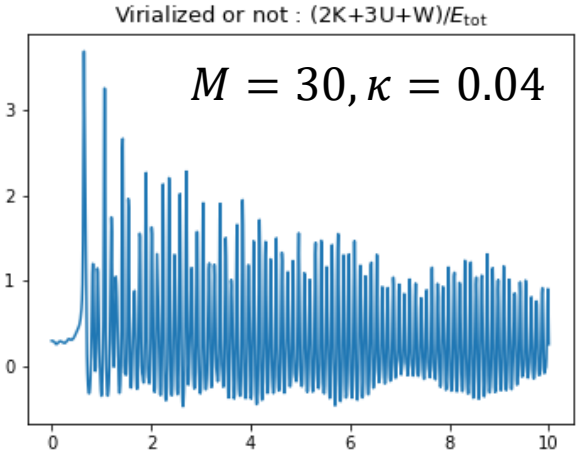


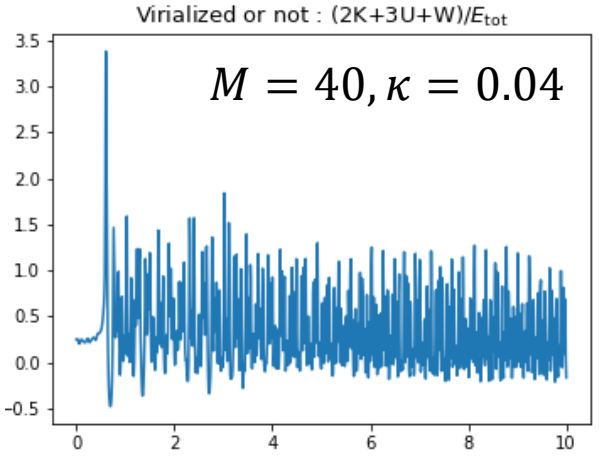


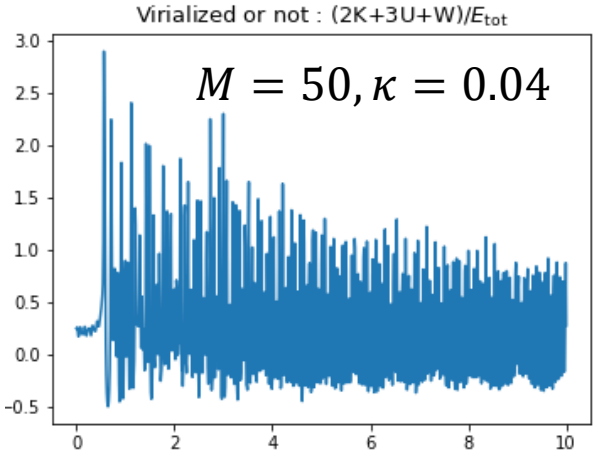












- Fourier Transform → Maybe obtain the oscillation?