Corrections to the extended-SIAM project
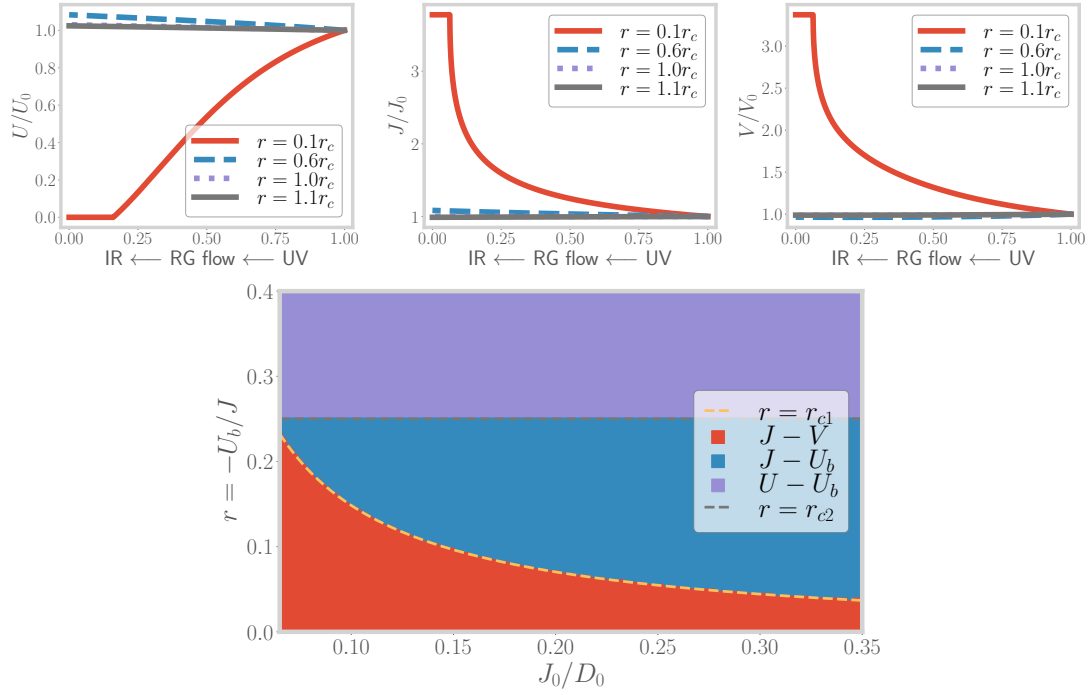
RG equations

$$\Delta U = \rho(D_0)\Delta D \left[4V^2 \left(\frac{1}{d_1} - \frac{1}{d_0} \right) - \frac{J^2}{d_2} \right], \quad \Delta V = -\rho(D_0)\Delta D \frac{3VJ}{8} \left(\frac{1}{d_2} + \frac{1}{d_1} \right), \quad \Delta J = -\rho(D_0)\Delta D \frac{J\left(J + 4U_b \right)}{d_2},$$

where the denominators d_i are given by
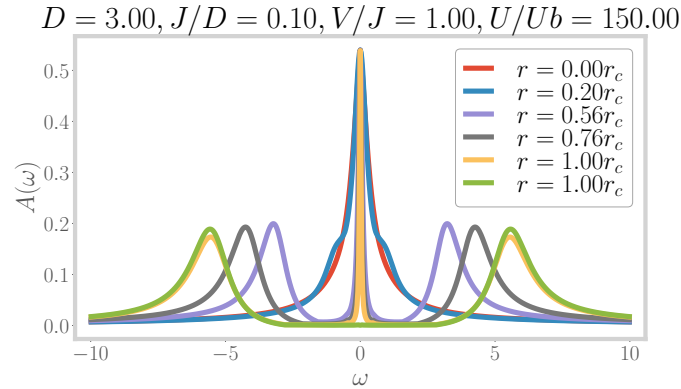
$$d_0 = \omega - \frac{D}{2} + \frac{U_b}{2} - \frac{U}{2}, \ d_1 = \omega - \frac{D}{2} + \frac{U_b}{2} + \frac{U}{2} + \frac{J}{4}, d_2 = \omega - \frac{D}{2} + \frac{U_b}{2} + \frac{J}{4}.$$
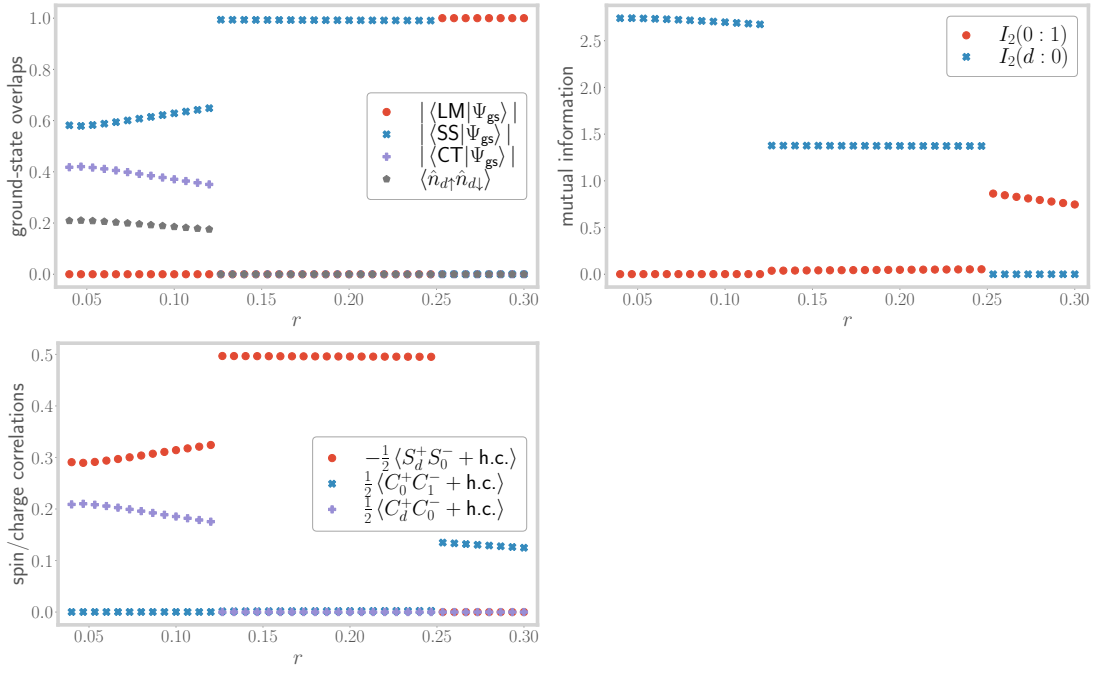
RG flows and phase diagram

$$U_0 \sim 100U_b - 130U_b, \quad \omega = -U_0/4, \quad \rho(D_0) = 1/D_0$$
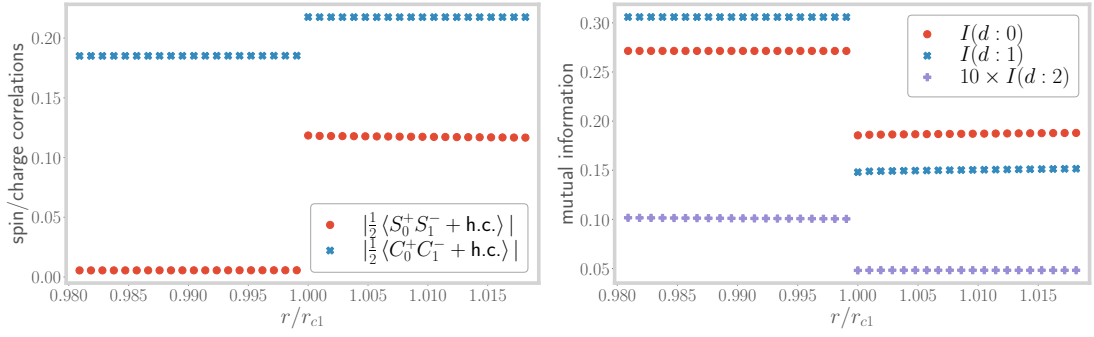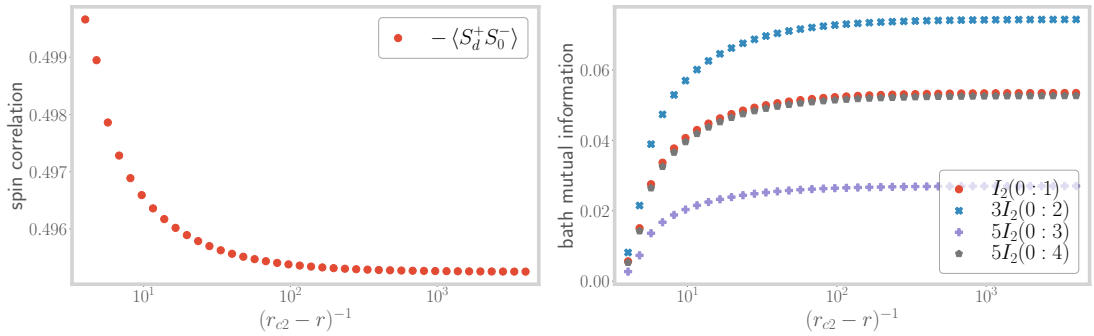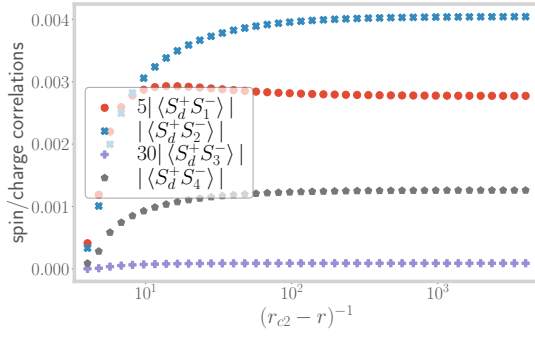

Spectral function

Correlations across full range
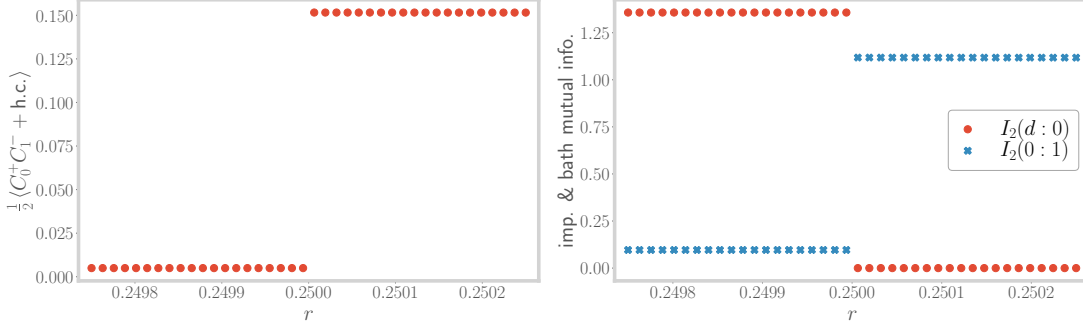

Correlations near r_{c1}

Correlations near r_{c2}

Correlations about r_{c2}

Analytical expression for r_{c1}

For small values of the bare J (compared to the bandwidth), the irrelevance of V occurs because of the change in the sign of the denominator d_1. This allows us to obtain an analytical expression for the curve $r = r_{c1}(J_0/D_0)$. The zero of the denominator d_1 occurs at

$$\omega - \frac{D_0}{2} + \frac{U_b}{2} + \frac{U_0}{2} + \frac{J_0}{4} = 0 \ .$$

Defining $f_U = U_0/|U_b|$ and $f_J = J_0/D_0$ and using the choice $\omega = -U_0/4 = -f_U|U_b|/4$ allows us to simplify the equation into

$$-f_U|U_b|/4 - \frac{J_0}{2f_J} - \frac{|U_b|}{2} + \frac{f_U|U_b|}{2} + \frac{J_0}{4} = 0 \implies \frac{|U_b|}{J_0} \equiv r_{c1} = \frac{2/f_J - 1}{f_U - 2} \ .$$