4. Scaling analysis

One way to analyze experimental data (or simulations at big lattices) is to plot $m/|t|^a$ versus $h/|t|^c$. Start from $m \sim \partial f/\partial h$ and

$$f(t,h) = b^{-d} f(tb^{y_t}, hb^{y_h}), \tag{1}$$

and express a and c in terms of d, y_t, and y_h.

Solution: We first need the scaling expression for the magnetization:

$$m(t,h) \sim \frac{\partial f}{\partial h} \sim b^{y_h - d} f_h(tb^{y_t}, hb^{y_h}). \tag{2}$$

Put the first argument equal to unity, i.e. demand that $tb^{y_t} = \pm 1$. This gives $b = |t|^{-1/y_t}$ which we put back into Eq. (2):

$$m(t,h) = |t|^{(d-y_h)/y_t} f_h(\pm 1, h|t|^{-y_h/y_h}), \tag{3}$$

which can be rewritten

$$m(t,h)/|t|^{(d-y_h)/y_t} = f_\pm(h/|t|^{y_h/y_h}). \tag{4}$$