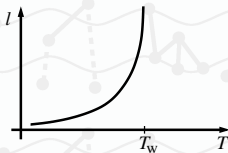
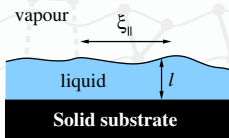


Wetting Transitions: A New Look at an Old Problem



$$l \sim (T - T_w)^{-\beta}$$
$$\xi_{\parallel} \sim (T - T_w)^{-\nu_{\parallel}}$$
$$d^* = 3$$

- ▶ Theory based on interfacial model.
- ▶ RG results depend on wetting parameter $\omega = \frac{k_B T \kappa^2}{4\pi\Sigma}$.
- ▶ For the Ising model $\omega \approx 0.8$ and $\nu_{\parallel} \approx 4$.
- ▶ Ising Model simulations consistent with $\omega \approx 0.3$ and $\nu_{\parallel} \approx 1.3$ (Mean Field: $\nu_{\parallel}^{\text{MF}} = 1$)!
- ▶ Interfacial model also fails for **non-planar** substrates and does not satisfy **exact sum-rules**.
- ▶ Missing lengthscale.

The Nonlocal Model


Interfacial Model

$$H_I = \int d\mathbf{x} \left[\frac{\Sigma}{2} (\nabla \ell)^2 + a e^{-\kappa \ell} + b e^{-2\kappa \ell} + \dots \right]$$

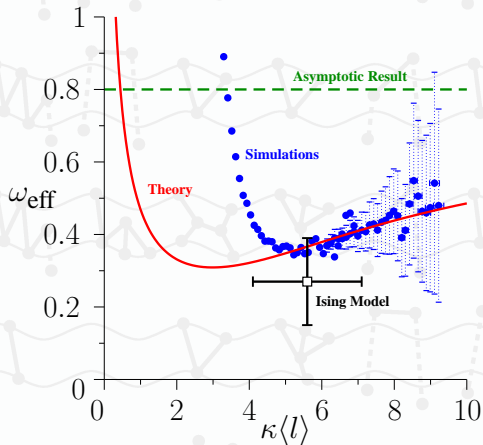
Nonlocal Model

$$H_{NL} = \Sigma \cdot \text{Area} + a \text{ (diagram)} + b \text{ (diagram)} + \dots$$


with

$$\text{(diagram)} \equiv \int d\mathbf{s}_\psi \left[\int d\mathbf{s}_\ell \frac{\kappa e^{-\kappa |\mathbf{r}_\psi - \mathbf{r}_\ell|}}{2\pi |\mathbf{r}_\psi - \mathbf{r}_\ell|} \right]^2$$


Successes of the Nonlocal Model



- ▶ New lengthscale present.
- ▶ Due to new lengthscale the sum-rule is now satisfied.
- ▶ Perturbation theory:



- ▶ Surface potential:



- ▶ Wetting on non-planar substrates:

