## Minimality of level sets in phase transitions

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## Abstract

In this talk we study the level sets of solutions of the Allen-Cahn equation and we prove local minimality of the zero level set with respect to certain perimeter functional with density. This provides a direct relationship between phase transition type problems and minimal surfaces with some weight. In particular, we establish that if u is a solution to the Allen-Cahn equation that satisfy  $u_{x_n} > 0$  and  $\lim_{x_n \to \pm \infty} u(x', x_n) = \pm 1$ , then the zero level set of ulocally minimizes a perimeter type functional. As an application, we establish the De Giorgi conjecture, proved by O. Savin, by reducing it to a Bernstein type result for anisotropic perimeter functionals obtained by L. Simon, thus directly linking it to the geometric problem.