Γ-convergence: An Application

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We give a short introduction to Γ-convergence on topological spaces and consider an easy example to illustrate this concept. We then move to a numerical setting, where we present approximating functionals which can be interpreted as weighted and stabilized Poisson equations. They Γ-converge to the functional

$$\mathcal{J}(v) := \tfrac{1}{p} \int_\Omega |\nabla v|^p \, dx - f(v)$$

which has Euler-Lagrange equation

$$\begin{aligned} -\Delta_p v := -\operatorname{div}(|\nabla v|^{p-2}\nabla v) &= f \text{ on } \Omega \\ \text{and } v|_{\partial\Omega} &= 0. \end{aligned}$$

The notation of Γ-convergence provides us with many usefull tools in the context of minimization problems. In particular, we will use this concept to prove that the minimizers of the approximating functional converge weakly to the solution of the p-Poisson equation.