Non occurrence of Lavrentiev Phenomenon for functionals with non standard growth

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Abstract

We will give examples of Lavrentiev Phenomenon and we will discuss about hyphotesis that avoid its occurrence. In particular, considering the following non-autonomous functional

$$\mathcal{F}(u) := \int_\Omega f(x, Du(x)) \ dx$$

we will show the absence of Lavrentiev in the setting proposed in [2]: the density $f(x, z)$ is α-Hölder continuous with respect to $x \in \Omega \subset \mathbb{R}^n$, it satisfies the (p, q)-growth conditions

$$|z|^p \leqslant f(x, z) \leqslant L(1 + |z|^q),$$

where $1 < p < q < p\left(\frac{n+\alpha}{n}\right)$, and it can be approximated from below by suitable densities f_k. In particular, we will investigate the absence of the Lavrentiev Phenomenon for the model density

$$f(x, z) := |z|^p + a(x)|z|^q,$$

with the weight a belonging to a new class Z^k, see [1].

References

[1] M. Borowski, I. Chlebicka, F. De Filippis, B. Miasojedow: Absence and presence of Lavrentiev's phenomenon for double phase functionals upon every choice of exponents, arXiv:2303.05877

[2] F. De Filippis, F. Leonetti: No Lavrentiev gap for some double phase integrals, *Adv. Calc. Var.* (2022) https://doi.org/10.1515/acv-2021-0109