Minimisers of a fractional seminorm and nonlocal minimal surfaces

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The recent literature has intensively studied two classes of nonlocal variational problems, namely the ones related to the minimisation of energy functionals that act on functions in suitable Sobolev-Gagliardo spaces, and the ones related to the minimisation of fractional perimeters that act on measurable sets of the Euclidean space. In this talk, we relate these two types of variational problems. In particular, we investigate the connection between the nonlocal minimal surfaces and the minimisers of a Gagliardo seminorm, showing that a function is a minimiser for the fractional seminorm if and only if its level sets are minimisers for the fractional perimeter, and that the characteristic function of a nonlocal minimal surface is a minimiser for the fractional seminorm. We also discuss an existence result for minimisers of the fractional seminorm, an explicit non-uniqueness example for nonlocal minimal surfaces, and a Yin-Yang result describing the full and void patterns of nonlocal minimal surfaces. This is a joint work with Claudia Bucur, Luca Lombardini and Enrico Valdinoci.