Vortices in Bose-Einstein condensates: simulations and identification of vortex lines

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Vortices in Bose-Einstein condensates are topological defects with quantized circulation.
This property is a signature of the superfluid (zero-viscosity) nature of these systems.
We describe a method to extract vortex lines from numerical simulations based on the Gross-Pitaevskii model.
We also discuss the algorithm implementation in FreeFem++ for 2D and 3D configurations.
This is joint work with G. Sadaka, I. Danaila and F. Hecht.