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*Nonlinear Schrödinger Equations:
Concentration on Weighted Geodesics in the Semi-Classical Limit*

Abstract: We consider the problem

$$\varepsilon^2 \Delta u - V(x) u + u^p = 0, \ u > 0, \quad u \in H^1(\mathbb{R}^2)\,,$$

where $p > 1$, $\varepsilon > 0$ is a small parameter and V is a uniformly positive, smooth potential. Let Γ be a closed curve, nondegenerate geodesic relative to the weighted arclength $\int_\Gamma V^\sigma$, where $\sigma = \frac{p+1}{p-1} - \frac{1}{2}$. We prove the existence of a solution u_ε concentrating along Γ, and exponentially small in ε at any positive distance from it, provided that ε is small and away from certain critical numbers. This proves a conjecture raised By Ambrosetti, Malchiodi and Ni.