

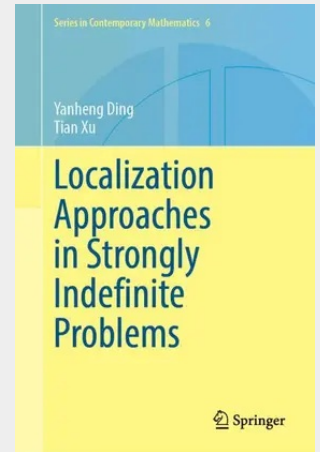
Localization Approaches in Strongly Indefinite Problems

Several important problems arising in Physics, Differential Geometry and other topics lead to consider semilinear variational equations of strongly indefinite type and a great deal of work has been devoted to their study. From the mathematical point of view, the main interest relies on the fact that the tools of Nonlinear Functional Analysis, based on compactness arguments and non-degenerate structure, in general cannot be used, at least in a straightforward way, and some new techniques have to be developed.

This book discusses some new abstract methods together with their applications to several localization problems, whose common feature is to involve semilinear partial differential equations with a strongly indefinite structure. This book deals with a variety of partial differential equations, including nonlinear Dirac equation from quantum physics (which is of first order), coupled system of multi-component incongruent diffusion and spinorial Yamabe type equations on spin manifolds. The unified framework in this book covers not only the existence of solutions to these PDEs problems, but also asymptotic behaviors of these solutions. In particular, the results for the nonlinear Dirac equations show several concentration behaviors of semiclassical standing waves under the effect of external potentials and the results for the spinorial Yamabe type equations show the existence of conformal embeddings of the 2-sphere into Euclidean 3-space with prescribed mean curvature.

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160,49 €

149,99 € (zzgl. MwSt.)

Lieferfrist: bis zu 10 Tage

Artikelnummer: 9789819795383

Medium: Buch

ISBN: 978-981-97-9538-3

Verlag: Springer

Erscheinungstermin: 06.02.2025

Sprache(n): Englisch

Auflage: 2025

Serie: Series in Contemporary Mathematics

Produktform: Gebunden

Gewicht: 610 g

Seiten: 281

Format (B x H): 160 x 241 mm

