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Editorial

Special issue "Variational and topological analysis: methods and applications"

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The special issue *Variational and topological analysis: methods and applications* provides new existence and non-existence results for mathematical models via different equations, inequalities and inclusions driven by suitable principal operators. The classical variational and non-variational methods, as well as several consolidated numerical techniques, are adopted and adapted to increase the knowledge of the behavior and intrinsic properties of such mathematical models and their corresponding physical systems. In general, the problems collected in the special issue are studied imposing specific boundary conditions, and mild assumptions on the data and setting. The arguments used in the proofs and experiments pay attention to the difficulties originated by the nonlocal nature and the lack of regularity for the main operator and solution space, this makes the approach very specialized but effective. The fifteen contributions collected in the special issue reach results concerning existence, multiplicity and asymptotic behavior of solutions, as well as convergence statements, relevant in the context of optimization and control. We like to emphasize the investigations concerning the Schrödinger equation (**Ziqing Yuan and Jing Zhao:** Trudinger-Moser inequality, variational methods and Morse theory are used in obtaining the existence and multiplicity of solutions, **Yong-Chao Zhang:** variational methods are used in proving the existence of least energy solutions), hence different Kirchhoff-type equations (**Wei Ma and Qiongfen Zhang:** variational methods and critical point theory are used in establishing the existence of nontrivial solutions, **Zhenluo Lou and Jian Zhang:** variational methods, truncation techniques and steep potential well are used in proving the existence and concentration behavior of solutions), the cable equation (**Mohamed Jleli and Bessem Samet:** nonlinear capacity estimates are used in establishing sufficient conditions for the non-existence of weak solutions), the Choquard equation (**Liyan Wang, Baocheng Zhang, Zhihui Lv, Kun Chi and Bin Ge:** variational methods and inequalities are used in ensuring the mountain pass geometry, hence to show the existence of solutions), Fredholm integral equations (**Abdurrahman Büyükkaya, Mudasir Younis, Dilek Kesik and Mahpeyker Öztürk:** fixed-point arguments and contractive mappings in abstract spaces are used in proving existence and uniqueness of solutions), and the polyharmonic wave inequalities (**Mohamed Jleli and Bessem Samet:** nonlinear capacity estimates are used in concluding a sharp criterium for nonexistence of weak solutions). Furthermore, we underline the contributions on the properties of dynamical systems (**Jie Zhou, Tianxiu Lu and Jiazheng Zhao:** evaluation of expansivity, sensitivity and topological conjugacy of set-valued discrete models, **Doaa Filali, Mohammad Dilshad, Mohammad Akram:** exploration of common solution of a generalized variational inclusion via fixed-point iterative procedures), and elliptic equations (**Jihahm Yoo and Haesung Lee:** physics-informed neural networks are used in approximating solutions to one-dimensional boundary value problems and in proving robust error estimates, **Jinghong Liu and Qiyong Li:** interpolation operators of projection type are used in constructing several weak estimates and superconvergence results, **Pengfei Zhu and Kai Liu:** a modified stable generalized finite element method is used in evaluating a second-order interface problem). Finally, we note the analysis of variational inequalities (**Haoran Tang and Weiqiang Gong:** improved extrapolated gradient algorithms are used in approximating solutions to pseudo-monotonic variational inequalities, **Nagendra Singh, Sunil Kumar Sharma, Akhlad Iqbal and Shahid Ali:** convexificators on the Hadamard manifold are used in proving the mean value theorem to discuss the solution of several vector type problems).

We would like to express our thanks to all the authors for contributing to this special issue, sharing the above investigations with readers. We also are grateful to reviewers for assessing the quality of submissions. We are also very grateful to the Editor-in-Chief of AIMS Mathematics Alain Miranville, the Managing Editor Qing Miao and the Assistant Editor Jingjing Xu for their support and advice in publishing this special issue.

We hope that this Special Issue will represent a basis to stimulate new ideas and future investigations both from a theoretical and practical perspective.

Guest Editors

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Conflict of interest

The Guest Editors declare no conflicts of interest.