

# Minimization principle for hemivariational-variational inequality driven by uniformly monotone operators with application to problems in contact mechanics

Filip Pietrusiak

Research performed in cooperation with Michał Beldziński under the supervision of Marek Galewski.

In this poster, we consider hemivariational-variational inequalities driven by uniformly monotone or  $d$ -monotone operators in Banach spaces. We establish related minimization principles leading to the existence and uniqueness of solutions to the inequality considered as well as we suggest the Ritz type numerical approximations. The theoretical results obtained are next applied to some problems inspired by models from contact mechanics. Poster content is a generalization of results from [4], where similar results were achieved for  $m$ -strongly monotone operators. The alternative approach is presented in [3], where under some suitable conditions leading to the usage of the Banach contraction principle, a similar problem is considered. Moreover, the presented results are a continuation of work started in [1], and are accepted for publication as [2].

## References

- [1] M. Beldziński, M. Galewski, F. Pietrusiak, *Minimax principles for mixed variational inequalities driven by uniformly monotone operators*, Discrete and Continuous Dynamical Systems - Series S, 16, 2964–2979 (2023),
- [2] M. Beldziński, M. Galewski, F. Pietrusiak, *Minimization principle for hemivariational-variational inequality driven by uniformly monotone operators with application to problems in contact mechanics*, Accepted for publication in: Nonlinear Analysis: Real World Applications (2024),
- [3] S. Migórski, A. Ochal, M. Sofonea, *A class of variational-hemivariational inequalities in reflexive Banach spaces*, Journal of Elasticity, 127, 151–178 (2017),
- [4] W. Han, *Minimization principles for elliptic hemivariational inequalities*, Nonlinear Analysis: Real World Applications, 54, 103-114 (2020).

**First Author:** Filip Pietrusiak

**Affiliation:** *Institute of Mathematics, Lodz University of Technology  
al. Politechniki 8, 93-590, Lodz, Poland*

**e-mail:** `filip.pietrusiak@dokt.p.lodz.pl`