# Global Optimizations of Covariant Energy Density Functionals: Challenges, Solutions and Global Calculation Errors

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The nucleus is described as a system of fermions interacting via the exchange of different mesons in covariant density functional theory (CDFT). It is very successful in the description of many nuclear phenomena [1]. However, at present the absolute majority of covariant energy density functionals (CEDFs) are fitted to only spherical nuclei. This does not allow to improve the global description of nuclear phenomena (for example, nuclear masses) and creates theoretical uncertainties.

Our group is working on the global improvement of covariant energy density functionals (CEDFs) towards more accurate description of binding energies, charge radii, deformations etc. across the nuclear chart. Some important steps in that directions will be discussed in this presentation. To overcome numerical problems connected with global fit of energy density functionals (EDFs), a new anchor-based optimization method has been proposed by us in [2]. It leads to a substantial improvement in the global description of binding energies for several classes of covariant EDFs at moderate computational cost [2–4]]. This allows for the first time to take into account infinite basis corrections to binding energies in the fermonic and mesonic (bosonic) sectors of CDFT [4]. In addition, the total electron binding energies [5] are used in conversion of experimental atomic binding energies presented in Atomic Mass Evaluations into nuclear ones. Their neglect and the calculations in truncated bases lead to substantial global calculation errors. The remaining issues and in progress results will be discussed.

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### References

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