# Extrapolation methods and their applications in image reconstruction and restoration

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## Abstract

In numerical analysis and in applied mathematics one has often to deal with sequences which converge slowly to their limit. Extrapolation methods can be used to accelerate the convergence of a slow converging sequence or even to sum up divergent series.

In the first part of the presentation, we will revise Wynn's $\varepsilon$-algorithm and the particular rules for treating isolated singularities, i.e. when two or more consecutive elements are equal or almost equal, and the more general particular rules proposed by Cordellier for treating non-isolated singularities, i.e. when more than two elements are equal. A new implementation of the generalized particular rules covering all the cases, namely singularities caused by two or more elements that are equal or almost equal, makes the algorithm more efficient.

The second part of the presentation will be devoted to applications of vector extrapolation in imaging problems. In particular, we will use the simplified topological $\varepsilon$-algorithm, introduced by Brezinski and Redivo-Zaglia, in order to extrapolate a sequence generated by some iterative regularization methods, commonly used for solving linear inverse problems, and we study the gain of applying extrapolation on these methods in image reconstruction and restoration problems. The numerical results illustrate the good performance of the accelerated methods compared to their unaccelerated versions and other methods.

# References

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