A new Newton-type method and connections to Schroder theorem, Voronoi's diagrams, Newton's flows and the Riemann hypothesis

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The speaker has designed, very recently [4], a new Newton-type's method for root finding and optimization, which can be applied in any dimensions. The method is named Backtracking New Q-Newton's method (BNQN).

This talk concerns the application of this method to finding roots of a meromorphic function in 1 complex variable. I will present:

- The convergence guarantee theorem when applying BNQN to finding roots of meromorphic functions, from [5].

- The experiments from [4], which shows that usually the basins of attraction of BNQN are much more smooth than that of Newton's method. This is rather unexpected, given that BNQN depends on many seemingly random factors.

- The theorem from [2] which proves rigorously that the dynamics of BNQN, for finding roots of a polynomial of degree 2, is the same as the classical Schr̈oder's theorem for dynamics of Newton's method (except that BNQN is not chaotic on the boundary line).

- Experiments from [1] which reveal some surprising connections between BNQN and Voronoi's diagrams and Newton's flows.

- New results from [3] which connects the dynamics of BNQN and the Riemann hypothesis.

References

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[4] T. T. Truong, Backtracking New Q-Newton's method: a good algorithm for optimization and solving systems of equations, arXiv:2209.05378.

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