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Characteristic Polynomials of p -adic Matrices

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Characteristic polynomial is one of the most fundamental tools in linear algebra. Its effective computation has been heavily studied, resulting in near-optimal fast algorithm. The computation of the characteristic polynomial of a p -adic matrix is used in Kedlaya's celebrated counting-point on hyperelliptic curves algorithm[2]. As p -adic numbers can only be processed on a computer at finite precision, this raises the issue of the behaviour of precision on the computation of characteristic polynomials over matrices with p -adic coefficients.

In this talk, we will introduce the method of differential precision to track p -adic precision, and apply it to the computation of characteristic polynomials.

It will lead to the computation of p -adic Hessenberg forms and unexpected factorization results on the adjunct of $XI_n - A$.

This work has been published in the proceedings of ISSAC 2017[1].

Keywords: Algorithms, p -adic precision, characteristic polynomial, eigenvalue

References

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