



## Mathematisches Kolloquium

Am Freitag, dem 20. Mai 2022, spricht um 14 Uhr c.t. im Hörsaal IV der Fachrichtung Mathematik, Gebäude E2.4,

**Prof. Dr. Karl Bringmann**  
**Universität des Saarlandes,**

über das Thema:

### **Algorithms for Multiplying Sparse Nonnegative Polynomials**

*Abstract:*

Polynomial multiplication lies at the heart of computer algebra systems. It is typically implemented using Fast Fourier Transform, multiplying two degree- $n$  polynomials in time  $\mathcal{O}(n \log(n))$  (or more precisely in  $\mathcal{O}(n \log(n))$  arithmetic operations). This is near-optimal for dense polynomials.

For sparse polynomials, let  $k$  be the total number of non-zero coefficients of the two input polynomials and of their product. A simple algorithm multiplies two sparse polynomials in time  $\mathcal{O}(k^2 \log(k))$ , demonstrating that for sparse polynomials the running time of  $\mathcal{O}(n \log(n))$  can be far from optimal, if  $k \ll n$ . This raises the question: Can we multiply two sparse polynomials in time  $\mathcal{O}(k \log(k))$ ? Or, a bit more modest, in time  $\mathcal{O}(k \log^c(n))$  for some constant  $c$ ?

In this talk, we report on progress on this active research question for the special case where  $P$  and  $Q$  have nonnegative integer coefficients. We present a deterministic algorithm running in time  $\mathcal{O}(k \log^6(n))$ , and a zero-error randomized algorithm running in expected time  $\mathcal{O}(k \log^2(k))$ .

Based on joint work with Nick Fischer and Vasileios Nakos.

Alle Interessenten und Interessentinnen sind zum Vortrag herzlich eingeladen. Der Vortrag findet im **hybriden Format** statt.

**Die Dozenten der Mathematik**