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JOHANN · RADON · INSTITUTE
FOR COMPUTATIONAL AND APPLIED MATHEMATICS

ÖAW
AUSTRIAN ACADEMY OF SCIENCES

Johann Radon Institute for Computational and Applied Mathematics
der Österreichischen Akademie der Wissenschaften

Habilitation colloquium

Symbolic Computation Group

Wednesday, July 7, 2021, 16:00

via **Zoom**

https://jku.zoom.us/j/97910967630?pwd=VER6bTBXTUltM3YyeHJnY005Y21rQT09

Oliver Roche-Newton

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Sums, products and growth

Sum-product theory revolves around the fundamental idea that additive and multiplicative structures cannot coexists in sets of numbers. The most famous manifestation of this principle is the Erdős-Szemerédi sum-product conjecture, which says that any set of integers must determine very many distinct sums or products. This is a very important problem in additive number theory which remains wide open.

There are many other problems which have the same idea of additive/multiplicative disharmony at their core. These include

- item transferring the Erdős-Szemerédi conjecture to other fields
- focusing on extreme cases where one of the sets is particularly small,
- proving that sets defined by a combination of additive and multiplicative operations are always large,
- various beautiful geometric problems which turn out to be secretly about sums and products.

In this Habilitation defense, I will give a survey of this area of research and focus on some of what I consider to be my favourite contributions to the field.