

**PhD research topic proposal**  
**BME, Doctoral School of Mathematics and Computer Science**

**Name and degree of supervisor :**

Hegedüs Pál, PhD

**Are you willing to supervise Stipendium Hungaricum applicants?**

Yes.

**Title of the topic:**

**Constants of Algebraic Derivations**

**Short description:**

We deal with algebraic derivations of the  $n$ -variable polynomial algebra  $R=K[x_1, \dots, x_n]$ . A derivation  $D$  of  $R$  is a  $K$ -linear transformation of  $R$  that satisfies the Leibniz rule  $D(fg)=fD(g)+gD(f)$ . The polynomials where  $D$  vanish form a subalgebra  $S$ . The general question is: how do properties of  $S$  and properties of  $D$  reflect each other. In particular, for which  $D$  would  $S$  be empty? For which  $D$  would  $S$  be freely generated? The analogous questions for polynomial invariants of (finite) groups were successfully studied in the past century. However, for derivations there are only a handful of general results.

Clearly,  $D$  extends uniquely to the field of fractions of  $R$ . The rational functions where this extension vanishes form a field  $F$ , the field of *rational constants*. The analogous questions remain: how algebraic properties of  $F$  reflect the properties of  $D$  and vice versa? In particular, is it true that  $F$  is always purely transcendental? What is its transcendence degree?

**Requirements:**

Strong algebraic background is expected. Algorithmic and programming skills are welcome.

**Contact:**

E-mail:

hegpal@math.bme.hu

**Place of work:**

BME, Building H, Office 505