## Licentiate Seminar

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# Title: On Bernstein-Sato Ideals and Decomposition of D-modules over Hyperplane Arrangements

## Abstract

The focus of this work lies on the relation between Bernstein-Sato ideals and the decomposition of the $D_2$- module

$$M_\alpha^\beta = \mathbb{C}\langle x, y, \alpha^{-1}\rangle \alpha^\beta,$$

where $\alpha^\beta = \alpha_1^{\beta_1} \cdot \alpha_2^{\beta_2} \cdot \ldots \cdot \alpha_m^{\beta_m}$, $\beta_i \in \mathbb{C}$ and each $\alpha_i, (1 \leq i \leq m)$, are linear forms on $\mathbb{C}^2$. Our main new result is the description of different types of Bernstein-Sato ideals of

$$\alpha = xy \prod_{i=3}^{m} (a_i x + y),\ 0 \neq a_i \in \mathbb{C}, a_i \neq a_j \text{ for } i \neq j.$$

The thesis starts by summarizing the definition, properties and the results on the number of decomposition factors of $M_\alpha^\beta$. Then it continues with the definition and basic properties of univariate Bernstein-Sato polynomials, and collects what is known of Bernstein-Sato polynomials for hyperplane arrangements. A variation of the ideas are the multivariate Bernstein-Sato ideals. We also give several computational examples, calculated using Singular.