## Abstract

Let $\mathcal{A} = \{H_1, \ldots, H_l\}$ be a hyperplane arrangement in $\mathbb{C}^n$ and $M$ be the complement of the union of hyperplanes in $\mathcal{A}$, i.e., $M = \mathbb{C}^n \setminus \cup_{i=1}^{l} H_i$. The cohomology algebra $H^*(M, \mathbb{C})$ has a complete combinatorial description. Let $\mathcal{L}$ be a local system on $M$ and $H^*(M, \mathcal{L})$ be the cohomology algebra with local coefficients. For $[\omega] \in H^1(M, \mathbb{C})$, there is a chain complex:

$$0 \to H^0(M, \mathbb{C}) \stackrel{\mu_\omega}{\to} H^1(M, \mathbb{C}) \stackrel{\mu_\omega}{\to} \cdots \stackrel{\mu_\omega}{\to} H^n(M, \mathbb{C}) \to 0.$$

The characteristic varieties of $M$ are the jumping loci of the cohomology groups $H^*(M, \mathcal{L})$. The resonance varieties of $M$ are the jumping loci of the cohomology groups of the above complex. The aim of this thesis is to study some properties of these varieties.