

# Chapter 1

## Chow Rings

It is time now to delve into the world of algebra, developing the notion of a Chow ring of a matroid. This section that will be more challenging to parse without at least some background in abstract algebra.

Much of this section will be presenting results of Adiprasito-Huh-Katz that establish the link between the Chow ring and the characteristic polynomial, forming a necessary bridge

### 1.1 Defining a Chow Ring

We will, for example, be taking the notion of a ring entirely for granted. Really though, even for those with some background, we don't expect Chow rings to be are somewhat specialized. a development of intersection theory in algebraic geometry. Not something everyone has seen for sure. Luckily, we can exploit the structure of matroids to define a Chow ring without having to go the long way through intersection theory.

A Chow ring is “a generalization of cohomology for alegbraic geometry” **1.Introduce the Chow Ring of a matroid. From lattice of flats to quotient ring 2.Use our example matroid and construct its Chow Ring**

#### 1.1.1 Properties of Chow Rings

**3.Use words like *homogeneous polynomial*, *graded ring*, etc...**

#### 1.1.2 The Degree Map

**4.How do I explain this? I guess I can at least say it's linear and sends terms of full degree to 1. Maybe I'll understand it this time around**

### 1.2 Relationship with the Characteristic Polynomial

**5.Come up with a nice way of relating the reduced characteristic polynomial with our ring (and therefore fan)**

**6.Define  $\alpha$  and  $\beta$ . Here or in a subsection? Or should it be up when we introduce the ring itself?**