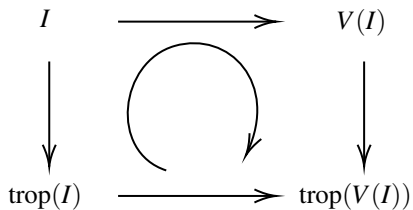# Motivation

A motivating goal of tropical algebra is to develop a tropical geometry tool-kit for studying matroid theory.

# Tropical Algebra



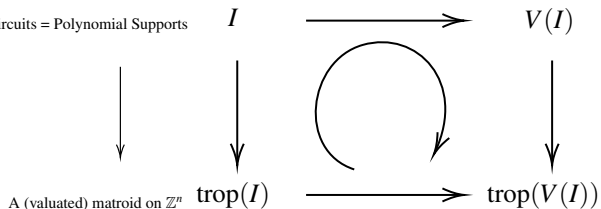Algebraic Geometry

$$I \longrightarrow V(I)$$

$$\mathrm{trop}(I) \longrightarrow \mathrm{trop}(V(I))$$

Tropical Geometry

# Tropical Algebra



Algebraic Geometry

Ground Set = All monomials ($\mathbb{Z}^n$)

Circuits = Polynomial Supports $\quad I \longrightarrow V(I)$

A (valued) matroid on $\mathbb{Z}^n$ $\quad \mathrm{trop}(I) \longrightarrow \mathrm{trop}(V(I))$

Tropical Geometry

# Tropical Algebra

Algebraic Geometry

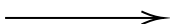Ground Set = All monomials ($\mathbb{Z}^n$)

Circuits = Polynomial Supports

$I \longrightarrow V(I)$

$\text{trop}(I) \longrightarrow \text{trop}(V(I))$

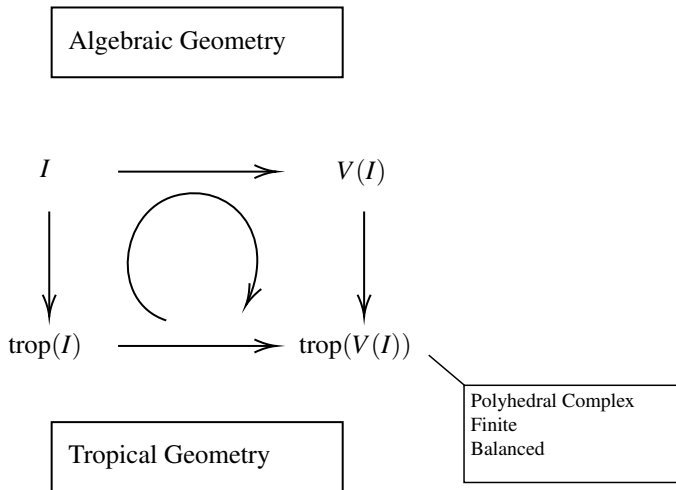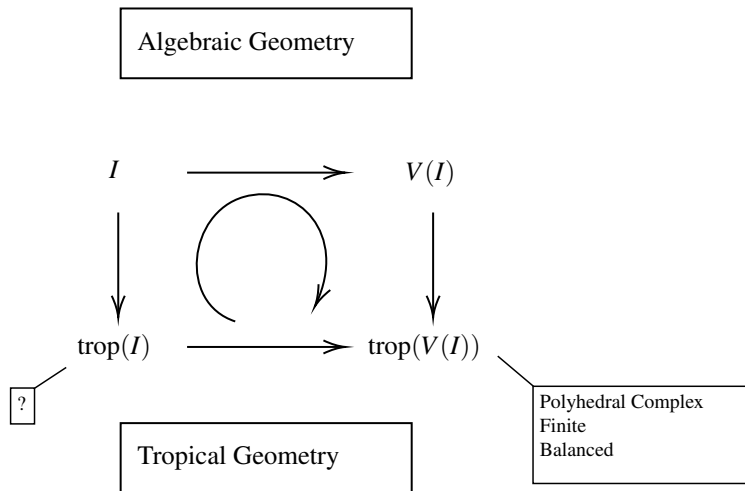A (valuated) matroid on $\mathbb{Z}^n$

Algebraic
Stuff

Combinatorial
Stuff

Tropical Geometry

# Tropical Algebra

# Tropical Algebra

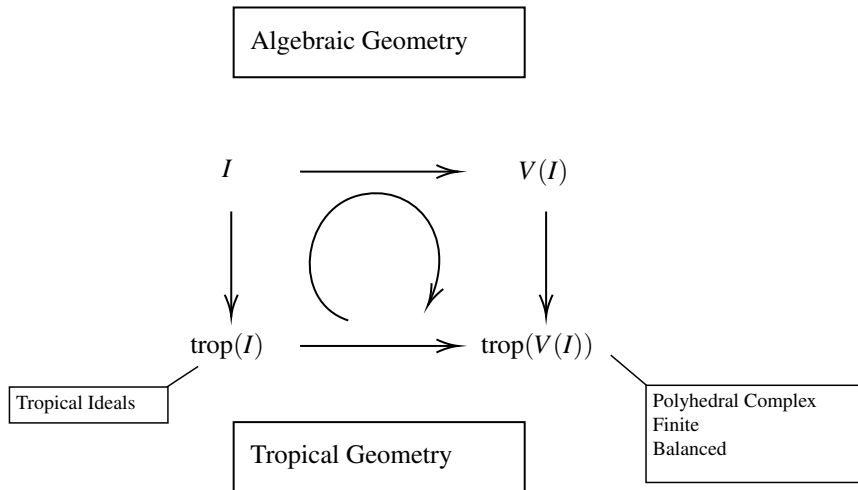# Tropical Algebra

# Tropical Algebra

Algebraic Geometry

$$I \longrightarrow V(I)$$

$$\text{trop}(I) \longrightarrow \text{trop}(V(I))$$

Tropical Ideals

Tropical Geometry

Polyhedral Complex
Finite
Balanced
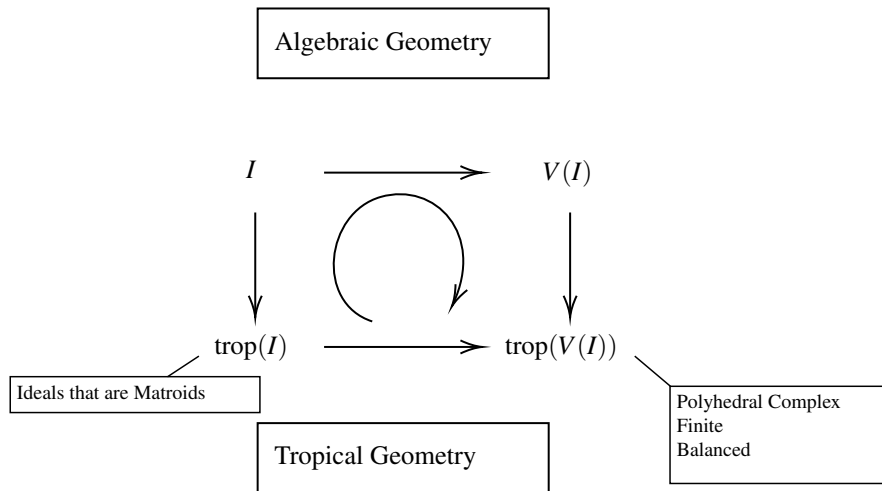
# A (very) Open Problem

- A tropical ideal is a (valuated) (finitary) matroid on $\mathbb{Z}^n$ whose automorphism group contains $\mathbb{Z}^n$ itself.
- this structure gives us robust geometry compatible with tropical scheme theory.
- **Question:** Can we consider "matroids on $G$" with automorphism group containing $G$? When $G = \mathbb{Z}^n$ we arrive at tropical ideals, and there are considerable geometric consequences.