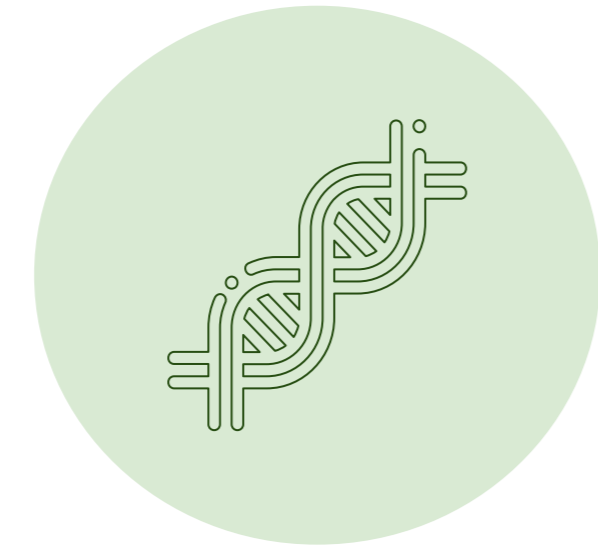
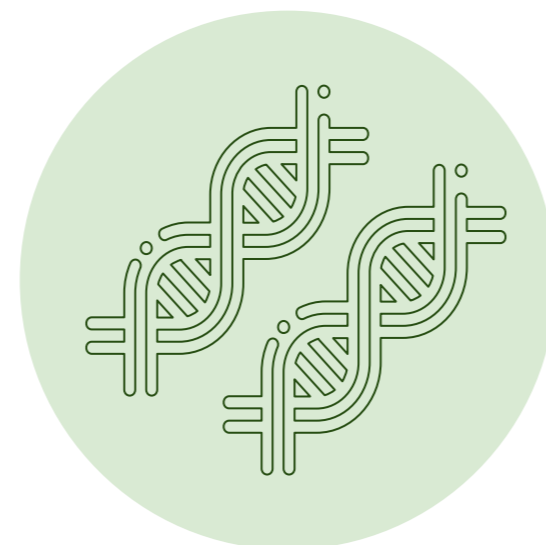


A Kaleidoscopic View of Genomes: The *Cannabis sativa* Pangenome

Gokce Alp, Anmol Singh, Mike Wu, and Dr. Ido Hatam



DNA
The molecule that carries genetic information



Genome
The complete set of genetic information in an individual



Genotype
The genetic makeup of an individual within a population

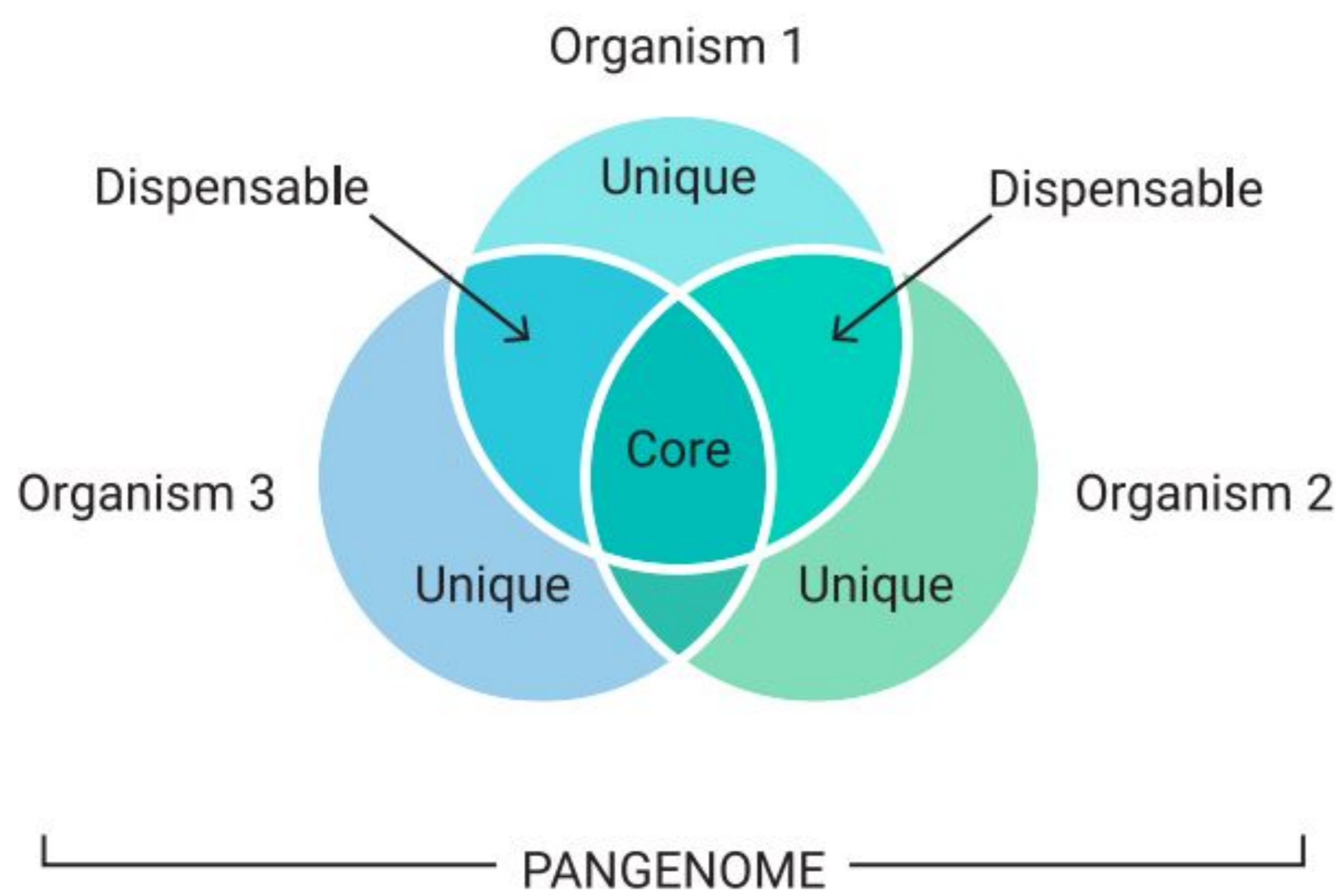


Phenotype
The observable traits in an organism determined by genotype and environmental factors

Differences in Genomes

- Most genes are shared between individuals of the same species
- Differences can arise due to mutations
 - Structural variants
 - Polymorphisms

Pangenome
A compilation of multiple reference genomes that fully represents species/population wide genetic diversity



Purpose of a Pangenome

- Provides access to genetic diversity for multiple genomes
 - Accounts for more variants
 - Connects genotype to complex phenotype
- Typically visualized in a graph format

Purpose of Connecting Genotype to Phenotype

- Associate genetic loci (location) with traits

Constructing the Cannabis pangenome



Connect genotype to phenotype

The Purpose of Constructing the *Cannabis sativa* Pangenome

Strategy

Phase 2: Unassembled Genomes
Add 23 unassembled Cannabis genomes to assembled pangenome



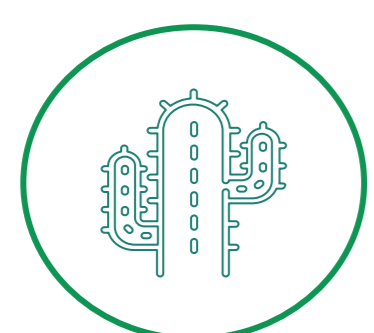
Phase 1: Assembled Genomes

Align assembled 14 Cannabis genomes with cactus-minigraph

Phase 3: Genome Wide Association Study

Use chemical properties to link genotype to phenotype

Computational Resources



Cactus-Minigraph

Software that creates pangenomes from whole genome alignment



Compute Canada

Provides access to cloud computing for increased computing power



Optimized Dynamic Genome Implementation

Pangenome graph visualization and assessment

Progress

50 hours

Minigraph Construction

Construction of minigraph from a set of FASTA files

25 hours

Minigraph Mapping

Map each genome to the pangenome graph

20 hours

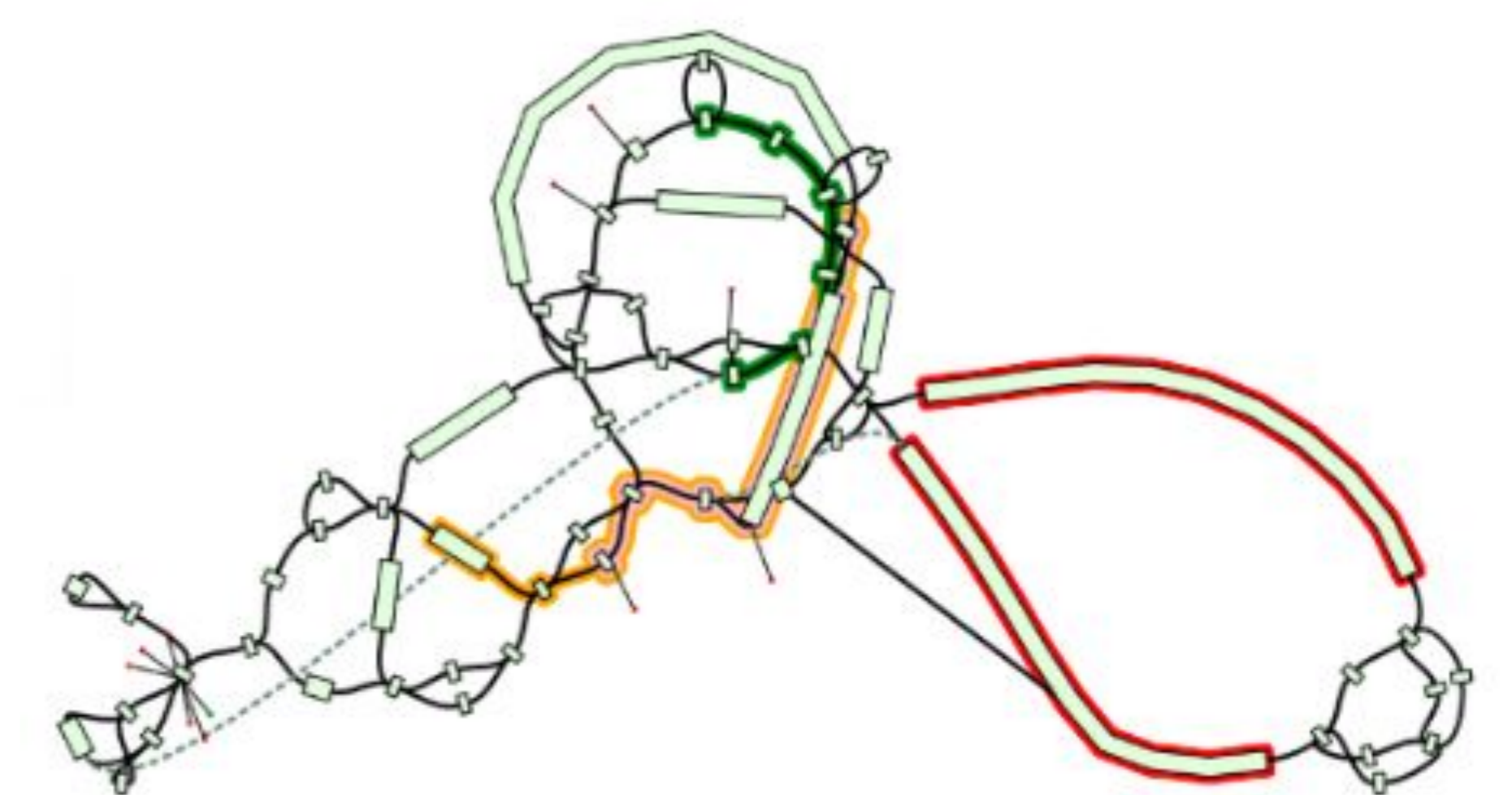
Cactus Alignment

Perform a multiple genome alignment and output "first draft" of pangenome

We are here

Indexes and Clipping

Indexing occurs and output of final pangenome is produced



Visualization of the Cannabis pangenome

Visualizing the Pangenome

