**Data and Code Explanation**

Introduction: This document provides an overview of the data and code used in this study titled “**Characterizing the multidimensional competitive relationships of maize-weed communities with airborne hyperspectral**”.

In this study, we initially calculated the individual time variability (ITV) for three years and three replicates separately. Due to the computational efficiency requirements, all data underwent calculation in a dimension-reduced PC1-PC3 trait space. The results were exported as an RData file and subsequently utilized for generating figures and tables.

**Data Description:**

**1. Computed Results Data:**

The data consists of ITV calculations for ten traits of three maize varieties after dimensionality reduction in the experiment.

a) ITV\_2022\_Repeat1: The data consists of ITV calculations for the first replicate of the 2022 experiment.

b) ITV\_2022\_Repeat2: Similar data as above, but for the second replicate of the 2022 experimental site.

c) ITV\_2022\_Repeat3: Similar data as above, but for the third replicate of the 2022 experimental site.

d) ITV\_2023\_Repeat1: Similar data as above, but for the first replicate of the 2023 experimental site.

e) ITV\_2023\_Repeat2: Similar data as above, but for the second replicate of the 2023 experimental site.

f) ITV\_2023\_Repeat3: Similar data as above, but for the third replicate of the 2023 experimental site.

g) ITV\_2024\_Repeat1: Similar data as above, but for the first replicate of the 2024 experimental site.

g) ITV\_2024\_Repeat2: Similar data as above, but for the second replicate of the 2024 experimental site.

g) ITV\_2024\_Repeat3: Similar data as above, but for the third replicate of the 2024 experimental site.

**2. Code Files:**

a) ITVCode.R: R file for computing ITV in experiments.

b) VIPScoreCode.py: Python file to calculate the VIP scores for each hyperspectral band.

c) TransformerCode.py: Multidimensional competition relationship prediction model based on hyperspectral data.