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# DryAnatolia-Diff Project Report

## 1. Abstract

DryAnatolia-Diff is an AI-powered drought scenario generation project focusing on the Southeastern Anatolia Region of Turkey. It uses climate data and a conditional Latent Diffusion Model to generate realistic future drought severity maps (DSI) between 2030 and 2050.

## 2. Introduction

Climate change and increasing water stress are affecting semi-arid regions significantly. Southeastern Anatolia faces growing risk due to agricultural demands and reduced groundwater levels.

## 3. Objectives

- To generate drought scenarios between 2030 and 2050
- To assist in regional water resource planning
- To utilize climate data grids in generative modeling

## 4. Methodology

Latent Diffusion Models (LDMs) are used to conditionally generate synthetic drought index grids based on variables such as month, temperature anomaly, and emission scenario. The model is trained on historical data (2000-2020) and applied to future periods.

## 5. Data Sources

- ERA5: historical climate reanalysis
- CMIP6: climate scenario projections (SSPs)
- Turkish Meteorology (MGM): station-level data
- DSI: groundwater and reservoir levels
- MODIS: NDVI and land surface temperature

## 6. Turkey-Specific Relevance

Southeastern Anatolia is one of Turkey's driest regions, with high evaporation rates and critical water levels. This project addresses local drought vulnerability and supports data-driven decision making.

## 7. Results and Outputs

The system produces monthly NetCDF or GeoTIFF drought grids. Example maps for July 2023 are generated. These outputs support visualization, planning, and policy recommendations.

## 8. Conclusion

DryAnatolia-Diff is one of the first generative climate simulation projects tailored to Turkey. It provides valuable insights for agriculture, water resource management, and climate resilience strategies.

## 9. References

- ERA5 Climate Data

- IPCC CMIP6 Scenarios

- Turkish State Meteorological Service

- State Hydraulic Works (DSI)

- MODIS Satellite Data