

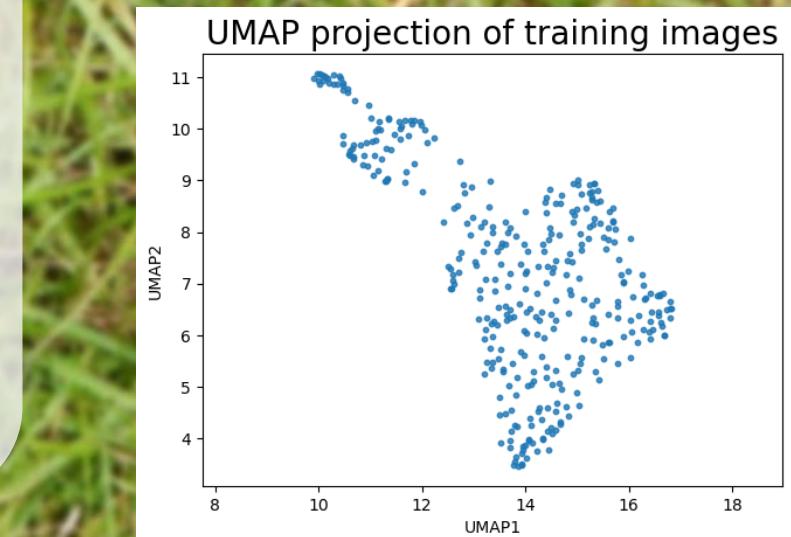
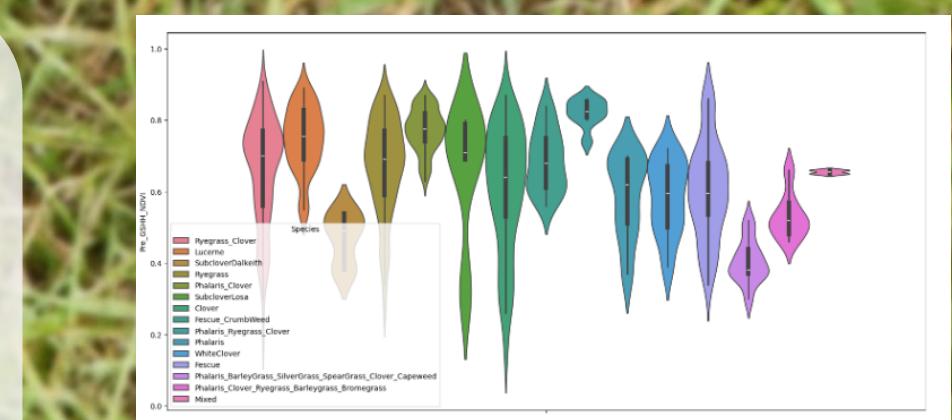
Image to Biomass Prediction

- Task Background
 - Predict **biomass** [g] from pasture images for Farmers
 - Regression Task with 5 different target variables
 - Dataset: **357 Training Images** each with 5 measured biomass values
- Our Approach
 - Use **DINOv2** for **feature extraction**
 - Build **Multi-Layer-Perceptron (MLP)** for multi-output **regression**
- Objective
 - Identify how accurately **biomass** [g] can be **predicted** using images
 - Evaluate how a **simple MLP performs** in this task

```
1 sample_id,image_path,Sampling_Date,State,Species,Pre_GSHH_NDVI,Height_Ave_cm,target_name,target
2 ID1011485656_Dry_Clover_g,train/ID1011485656.jpg,2015/9/4,Tas,Ryegrass_Clover,0.62,4.6667,Dry_Clover_g,0.0
3 ID1011485656_Dry_Dead_g,train/ID1011485656.jpg,2015/9/4,Tas,Ryegrass_Clover,0.62,4.6667,Dry_Dead_g,31.9984
4 ID1011485656_Dry_Green_g,train/ID1011485656.jpg,2015/9/4,Tas,Ryegrass_Clover,0.62,4.6667,Dry_Green_g,16.2751
5 ID1011485656_Dry_Total_g,train/ID1011485656.jpg,2015/9/4,Tas,Ryegrass_Clover,0.62,4.6667,Dry_Total_g,48.2735
6 ID1011485656_GDM_g,train/ID1011485656.jpg,2015/9/4,Tas,Ryegrass_Clover,0.62,4.6667,GDM_g,16.275
```

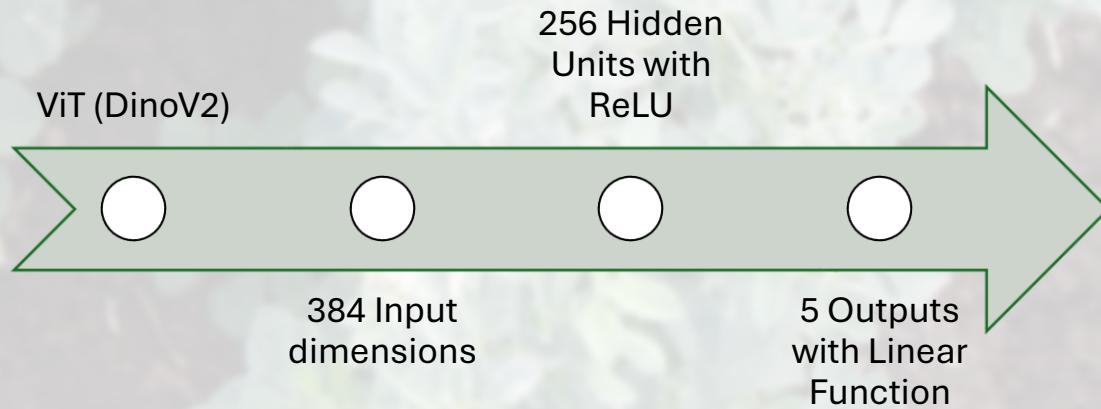
Data Overview & Feature Extraction

- Data
 - CSIRO Pasture Biomass Images
 - Samples: 357 RGB Training Images
 - Further Informative Columns with both categorical and continuous data -> Not used for model
 - 5 Continuous target Biomass-values (g) for each image
- Feature Extraction
 - Method: Pre-trained and fully frozen DINOv2 model
 - Each image to 384 features



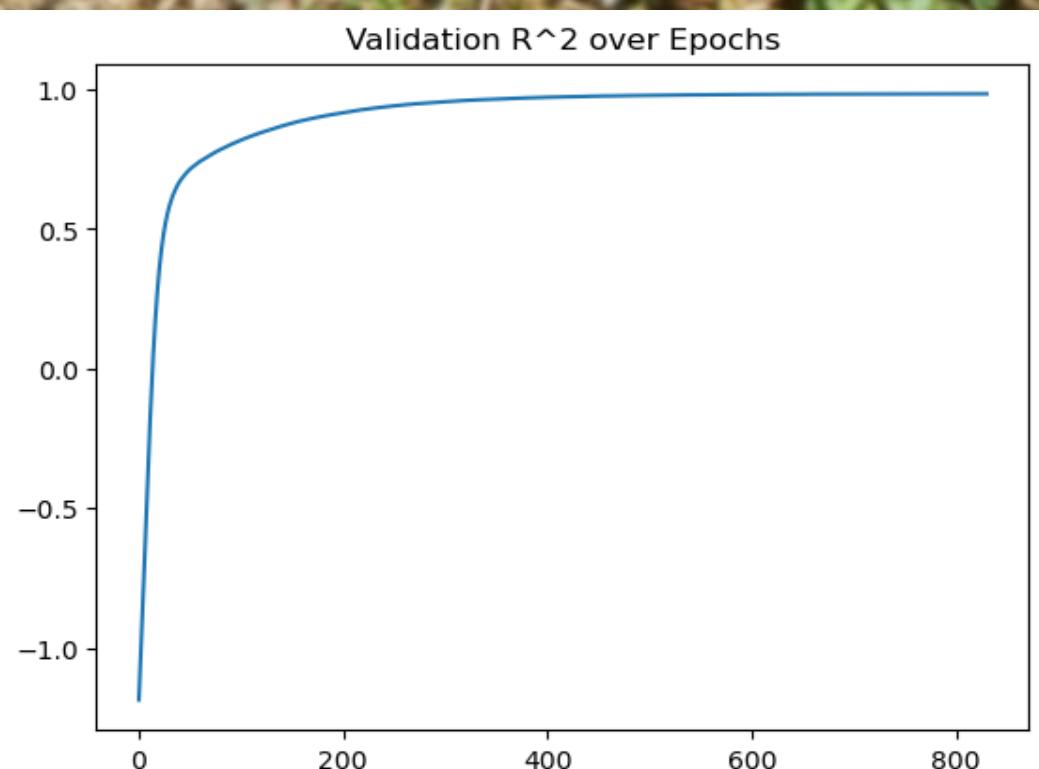
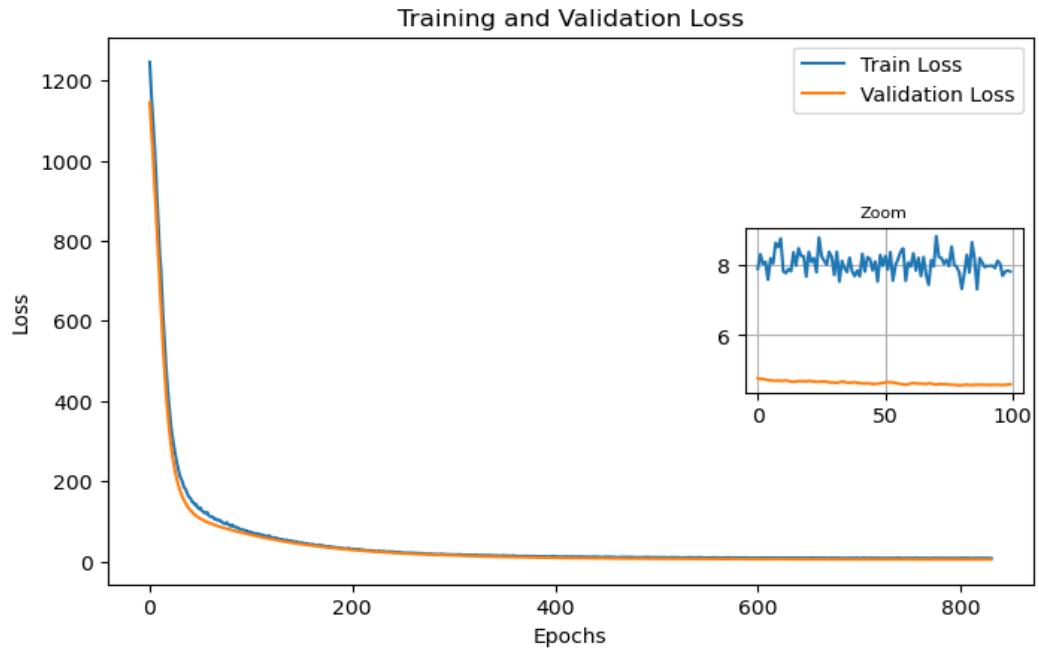
Multi-Layer-Perceptron (MLP) Build

- Dimensions
 - Input: 384
 - Hidden: 256
 - Output: 5
- Dropout of 0.2
- ReLU Activation function and Linear function for Regression output
- AdamW for Optimisation
- Cosine Annealing as Learning Rate Scheduler



Training

- 1000 Epochs planned
- Early stopping using MSE value with patience of 20 Epochs at 842
- Final R^2 of 98% with RMSE of 2.04
- Kaggle Results: -2.6 (unknown Metric)







A dense green bush of trifoliate leaves, likely clover or a similar legume, occupies the entire background of the image. The leaves are bright green and have a slightly serrated edge. Some dry, brownish twigs are visible among the foliage.

Thank you 😊