**MODEL ARCHITECTURE & TRAINING SUMMARY**

**Model:** U-Net with an EfficientNet-B3 encoder backbone, pre-trained on ImageNet.

**Input Data:** The given training test and validation time-series satellite chips (3 timesteps × 6 bands = 18 features/channels) were used to engineer 4 vegetation indices per timestep (NDVI, NDWI, EVI, NBR) per timestep, expanding inputs to 30 channels. Thie enriched the spectral information and improved the model performance

**Data Splitting:** A **random split** was employed instead of a geographical/temporal split. This ensures the model learns from a well-mixed distribution of features across the entire dataset but may overestimate real-world generalization performance.

**Training:** The model was trained for 15 epochs, with performance tracked using R², RMSE, and MSE.

**Results:** The training process showed strong and consistent convergence. The error metrics decreased sharply and began to plateau around epoch **15**, achieving a robust **R² score of ~0.81**. This indicates the model explains a very high proportion of the variance in the target variable and has learned the training distribution effectively.

**Key Takeaways:**

* The combination of a powerful U-Net architecture with a pre-trained EfficientNet backbone proved highly effective.
* The custom vegetation indices were successfully integrated and contributed to the model's strong performance.
* The rapid convergence and high R² score suggest the model is well-fit to the data.

**Next Steps:**

* Evaluate on a held-out test set with a **geographical or temporal split** to better assess real-world generalization.
* Experiment with learning rate schedules or slight architectural tweaks to potentially push performance beyond the plateau.
* Perform error analysis to understand what types of samples the model still struggles with.