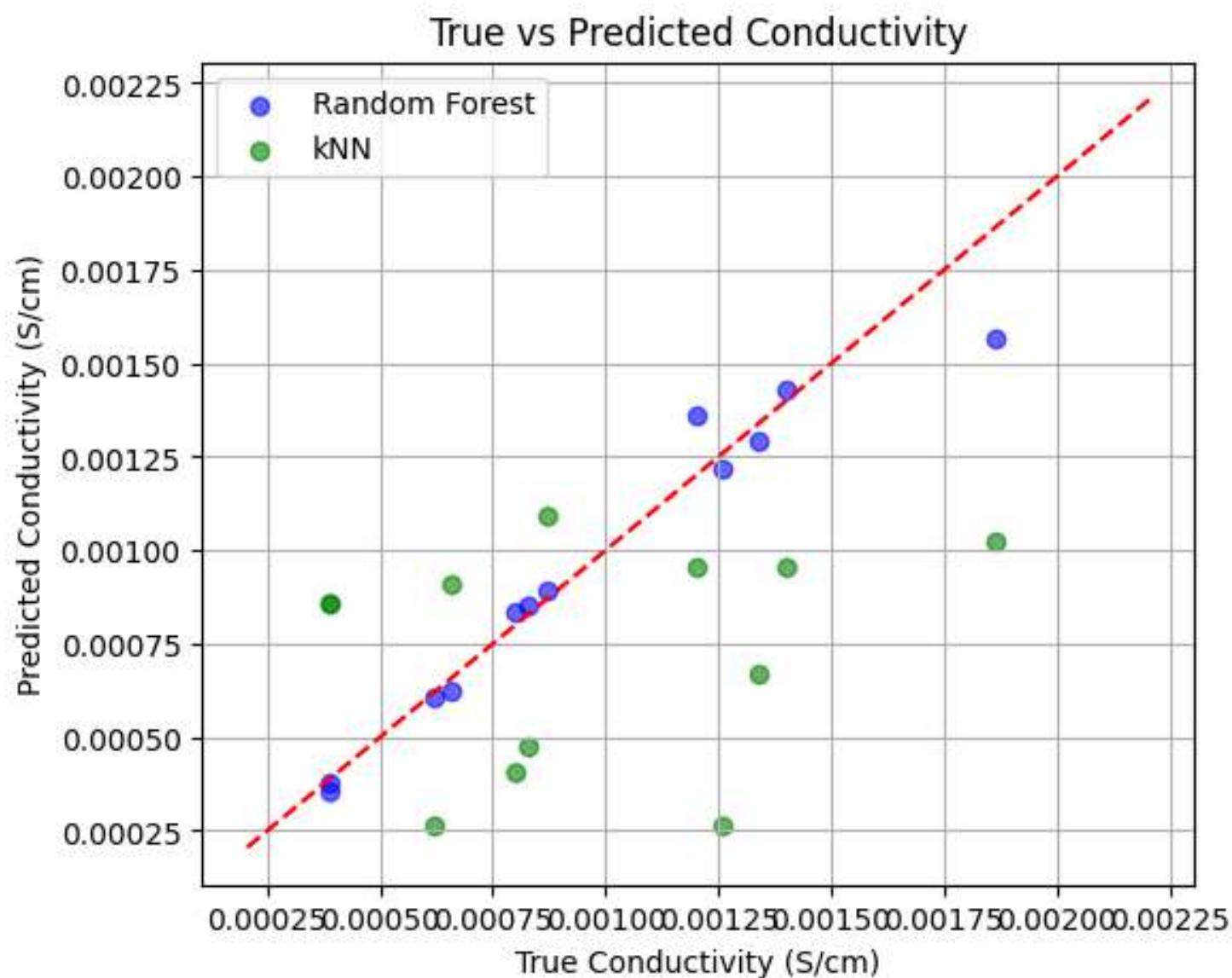


Random Forest Performance:

R<sup>2</sup>: 0.943, MSE: 1.04e-08, MAE: 6.25e-05

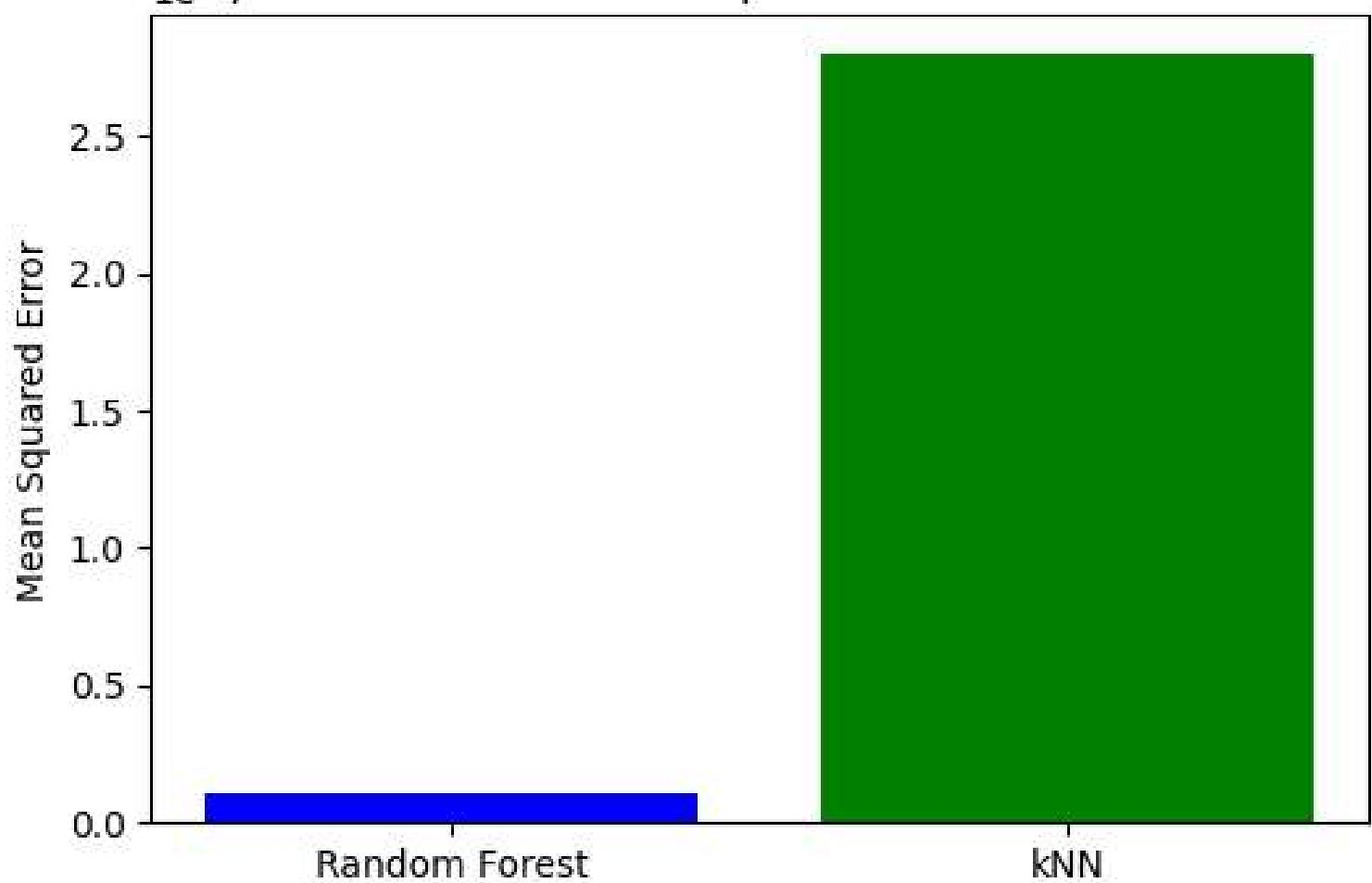
kNN Performance:

R<sup>2</sup>: -0.519, MSE: 2.80e-07, MAE: 4.75e-04

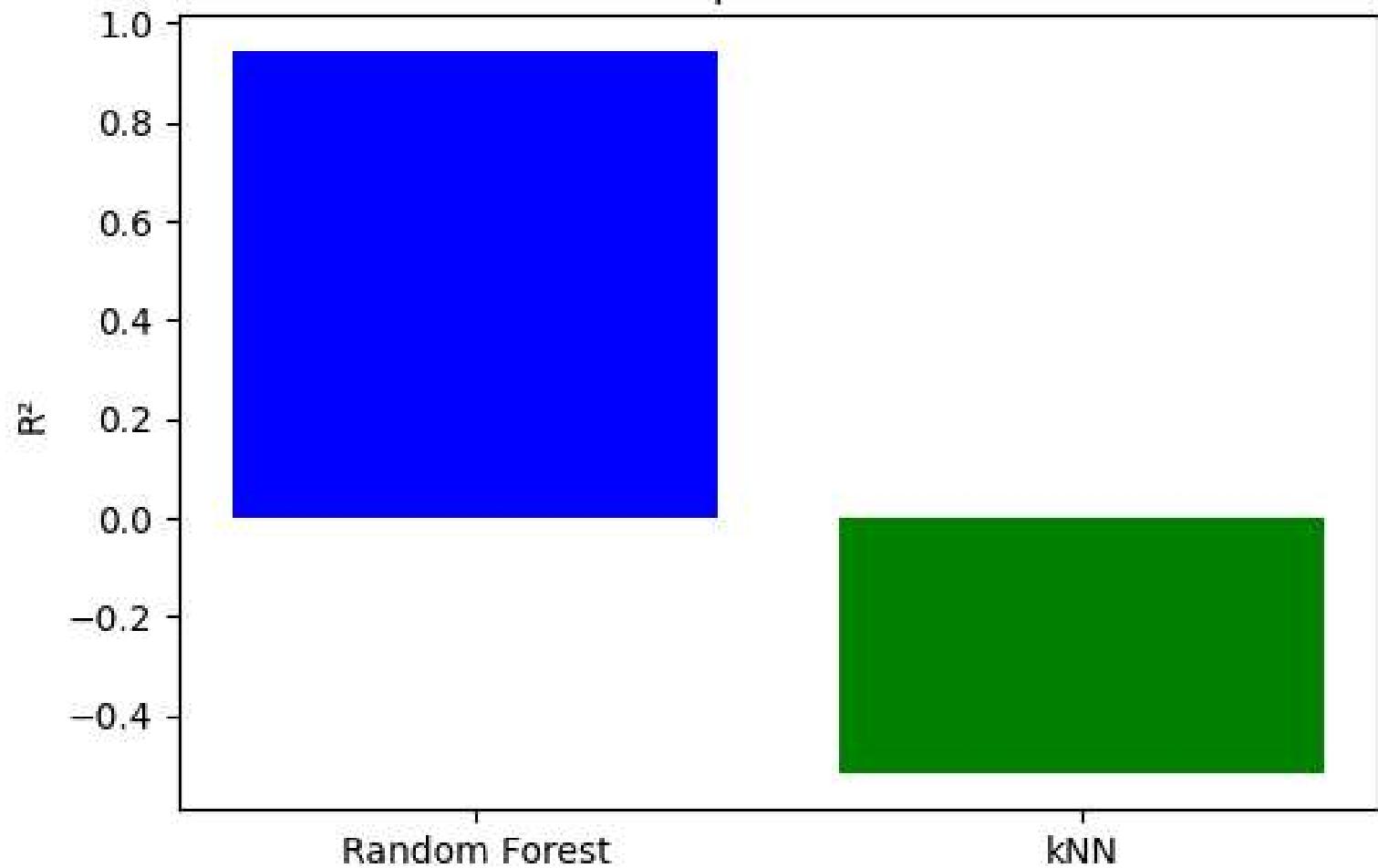


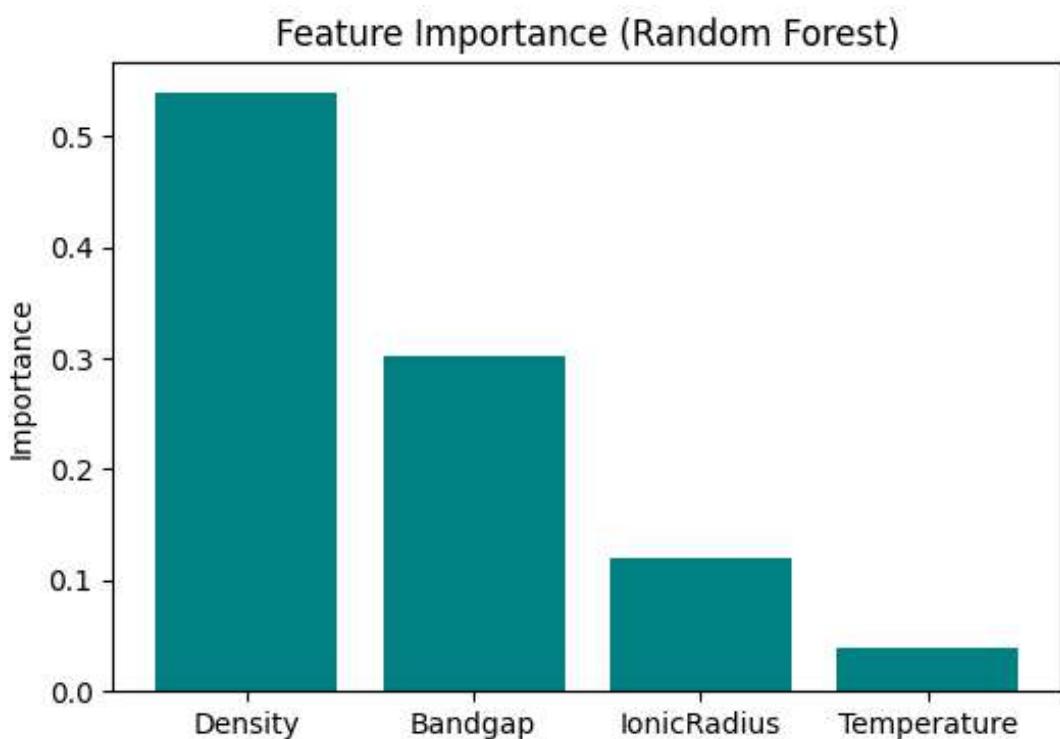
1e-7

### Model Comparison: MSE



### Model Comparison: R<sup>2</sup> Score





Random Forest CV R<sup>2</sup>: 0.951 +/- 0.013

Linear Regression CV R<sup>2</sup>: 0.641 +/- 0.193

#### Summary:

- Enhanced synthetic dataset with temperature, non-linear degradation, and sensor noise.
- Compared kNN (instance-based) vs Random Forest (model-based).
- Visualized predictions and error metrics.
- Feature importance shows Temperature and Bandgap are key drivers.
- Ready for visual storytelling and short video explanation.