Final Model Selection

Model list with their Accuracy Level, F1 Score and AUC

Type	Accuracy	F1 Score	AUC	Model and Trainer
Trained	0.5195	0.6837	0.5031	Logistic Regression (Safran S.M. – IT24102097)
Tuned	0.5195	0.6838	0.5000	
Baseline Trained	0.505591489	0.516750369	0.505365505	XG Boost (Bolonne B.R.M. – IT24102050)
Manual Tuned	0.505	0.5068	0.505	
Randomized SearchCV	0.5041	0.5216	0.5035	
Grid SearchCV	0.5116	0.542	0.5098	
Ensemble Model	0.5145	0.5402	0.5131	
Ensemble Reduced Feature	0.5101	0.5357	0.5087	
Linear	0.506619114	0.516812692	0.504404365	Support Vector Machine (Bandara D.B.A.H.W. – IT24102009)
RBF	0.50637732	0.534700855	0.503223914	
Polynomial	0.507284048	0.530607544	0.511352224	
Linear (Tuned)	0.499969776	0.509429486	0.50305408	
RBF (Tuned)	0.50637732	0.534700855	0.503223914	
Polynomial (Tuned)	0.507284048	0.530607544	0.511352224	
Trained	0.508976606	0.497245776	-	Decision Tree (Perera H.K.S. – IT24102095)
Tuned	0.51991779	0.681785399	-	
Trained	0.499425739	0.527313202	-	KNN (Thathsarani P.H.H. – IT24102188)
Tuned	0.50226682	0.530505188	-	
Trained	0.509	0.5308	0.5108	Random Forest (Mendis H.S.D. – IT24102039)
Tuned	0.5181	0.669	0.5185	

List the best Accuracy Level, F1 Score and AUC from each model.

Best one from each Models				
	Accuracy	F1 Score	AUC	Average
Logistic Regression (Tuned)	0.5195	0.6838	0.5000	0.567767
XG Boost (Grid SearchCV)	0.5116	0.542	0.5098	0.521133
Support Vector Machine (Polynomial - Tuned)	0.507284	0.530608	0.511352	0.516415
Decision Tree (Tuned)	0.519918	0.681785	-	0.600852
KNN (Tuned)	0.502267	0.530505	-	0.516386
Random Forest (Tuned)	0.5181	0.669	0.5185	0.568533

By considering each model, we can get the best model as ***Tuned Random Forest***. Because it gives us the highest performance over 6 models.

Why is it the best choice:

Superior F1 Score: Its F1 score is substantially higher than all other valid models (XG Boost: 0.542). The F1 score is the most critical metric for imbalanced medical data as it balances false positives and false negatives.

Meaningful AUC: Unlike the disqualified Decision Tree, the Random Forest has a reported AUC. An AUC above 0.5 confirms that the model has actual discriminative power and is not just guessing.

Robustness: As an ensemble method, Random Forest is inherently more robust and less prone to overfitting than a single Decision Tree. This makes it more reliable when applied to new, unseen patient data.