Group	Test / Model	When to Use	Medical Example
Correlation Tests	**Pearson correlation**	Correlation between two continuous, normal variables	Correlate age and blood pressure
	Spearman correlation	Rank-based correlation, non-normal/ordinal data	Correlate disease stage (ordinal) with symptom severity
	Kendall's Tau	Correlation for small samples or many tied ranks	Small sample: correlate pain score and functional score
	Point-Biserial correlation	Correlation: one binary, one continuous variable	Correlate gender (M/F) with hemoglobin
	Phi coefficient	Correlation between two binary variables	Correlate presence of diabetes with hypertension
	Tetrachoric correlation	Binary variables assumed to be underlying continuous	Smoking status and disease status, both coded as yes/no
Regression/ Prediction Tests	**Simple linear regression**	Predict a continuous outcome from one predictor	Predict cholesterol from BMI
	Multiple linear regression	Predict continuous outcome from multiple predictors	Predict BP from age, BMI, and physical activity
	Logistic regression	Predict binary outcome	Predict presence of diabetes (yes/no) from age, BMI
	Multinomial logistic regression	Predict categorical outcome with ≥3 unordered levels	Predict diagnosis category (diabetes, HTN, cancer) from lab data
	Ordinal logistic regression	Predict ordered categorical outcome	Predict severity (mild/moderate/severe) from vitals
	Poisson regression	Predict count data	Number of ER visits per year from comorbidities
	Negative binomial regression	Count data with overdispersion	Hospitalizations per year with variable frequency
	Zero-inflated models	Count data with many zeros	Predict number of asthma attacks (many patients have 0)
	Cox regression (proportional hazards)	Time-to-event prediction	Time to cancer recurrence post-treatment
	Linear mixed-effects regression	Repeated measures or hierarchical data	Track glucose levels across time within patients
	Quantile regression	Predict median or percentiles of outcome	Predict median hospital stay length by age, comorbidities
	Ridge/Lasso regression	High-dimensional data, feature selection	Predict gene expression outcome using many SNPs
	Decision Tree	Easy-to-interpret model for classification/regression	Predict diabetes from BMI, age, family history
	Random Forest	Ensemble method for better prediction	Predict mortality risk from clinical parameters
	Gradient Boosting (e.g., XGBoost)	High-accuracy prediction for tabular data	Predict cancer risk using clinical + genetic features
	Support Vector Machine (SVM)	Classification with complex boundaries	Classify tumor as benign/malignant
	K-Nearest Neighbors (KNN)	Prediction based on similarity	Predict disease based on symptom similarity
	Naive Bayes	Fast probabilistic classifier, especially for text	Classify radiology report as abnormal/normal
	Neural Networks / Deep Learning	Complex, nonlinear prediction with large datasets	Predict diabetic retinopathy from retinal images
	Time Series (ARIMA/Prophet/LSTM)	Forecast future values from past trends	Forecast hospital admissions or COVID cases over time
	Ensemble models (Bagging/Stacking)	Combine multiple models to improve performance	Predict sepsis using combined models of vitals, labs, and notes