Flood Susceptibility Mapping Process Flowchart

The following flowchart outlines the process of flood susceptibility mapping using a combination of morphometric analysis and machine learning (ML) techniques. This process integrates geospatial data, morphometric indices, and machine learning models to evaluate flood risks across various catchments.

# Process Flow:

1. \*\*Data Collection:\*\*  
 - Gather high-resolution Shuttle Radar Topography Mission (SRTM) DEM data (30-meter resolution) from the USGS.  
 - Collect flood-prone labels from historical flood records.  
  
2. \*\*Preprocessing:\*\*  
 - Preprocess the data by reprojecting DEM into a consistent coordinate system (UTM Zone 32N).  
 - Apply sink-filling and hydrological correction tools to ensure accurate flow modeling.  
  
3. \*\*Morphometric Parameter Derivation:\*\*  
 - Use ArcGIS and Arc Hydro tools to calculate morphometric parameters such as Drainage Density (Dd), Stream Frequency (Fs), Relief Ratio (Rh), Bifurcation Ratio (Rbm), and Infiltration Number (If).  
  
4. \*\*Feature Selection:\*\*  
 - Perform feature selection using Recursive Feature Elimination (RFE) to identify the most important predictors for flood susceptibility.  
  
5. \*\*Model Training:\*\*  
 - Train supervised machine learning models (Random Forest, SVM, XGBoost) using morphometric parameters.  
 - Optimize hyperparameters using grid search and cross-validation.  
  
6. \*\*Model Evaluation:\*\*  
 - Evaluate models based on metrics like Accuracy, F1-Score, Precision, Recall, and ROC-AUC.  
  
7. \*\*Flood Susceptibility Mapping:\*\*  
 - Generate flood susceptibility maps based on the ML model outputs, with pixel-level classifications (low, moderate, high).  
  
8. \*\*Results Interpretation:\*\*  
 - Analyze the flood susceptibility map to identify high-risk zones for flood management and mitigation strategies.