### ML 24/25-02 Investigate Input reconstruction by using Classifiers

**Implementation Flow**

1. **Prepare Input:**
   * Load scalar inputs.
   * Encode using ScalarEncoder.
2. **Generate SDR:**
   * Use SpatialPooler to create SDRs.
3. **Reconstruct Input:**
   * Pass SDR to both HTMClassifier and KNNClassifier.
   * Reconstruct input from predictions.
4. **Compare Results:**
   * Use similarity metrics to compare original vs. reconstructed inputs.
   * Plot and analyze results.

**Sprint 1: Planning and Setup**

**Goals:**

* Research the project requirements and tools (NeoCortexAPI, NuPIC Legacy).
* Set up the project structure, development environment, and basic workflows.

**Tasks:**

1. **Research and Documentation:**
   * Review classifiers (HTMClassifier and KNNClassifier) and how they function.
   * Study ScalarEncoder and SpatialPooler implementations in NeoCortexAPI.
   * Understand the IClassifier<TIN, TOUT> interface.
   * Explore similarity functions in NeoCortexAPI.
2. **Setup Project Environment:**
   * Set up the repository, tools, and dependencies (e.g., .NET Core environment).
   * Create the basic structure of the application (input folder, core modules, test framework).
3. **Design Experiment Flow:**
   * Draft the overall workflow for the experiment:
     + Input encoding → SDR generation → Classification → Reconstruction → Evaluation.
4. **Write Initial Documentation:**
   * Prepare the project introduction, objectives, and architecture diagram.

**Sprint 2: Implementation of Input Encoding and SDR Generation**

**Goals:**

* Implement scalar input loading and encoding.
* Generate SDRs using the Spatial Pooler.

**Tasks:**

1. **Scalar Input Loader:**
   * Develop a module to load scalar inputs from a folder.
   * Ensure inputs are stored and ready for encoding.
2. **Encoding with ScalarEncoder:**
   * Implement the ScalarEncoder to convert scalar values to SDRs.
   * Test the encoding process for different inputs (e.g., range, resolution).
3. **SDR Generation with Spatial Pooler:**
   * Integrate the SpatialPooler to produce SDRs.
   * Test the Spatial Pooler output for accuracy and reliability.
4. **Unit Testing:**
   * Create unit tests for ScalarEncoder and Spatial Pooler functionalities.
   * Verify that the generated SDR matches expected results.
5. **Update Documentation:**
   * Document the encoding and SDR generation processes.