**HW2Chapter 4: Sequence Modeling Assignment**

**Introduction:**

This assignment consists of two parts designed to deepen your understanding of sequence modeling. The first part focuses on classifying heartbeat signals using RNN, LSTM, and GRU. The second part is based on a step-by-step RNN implementation adapted from Module 5 of Andrew Ng's Deep Learning course.

**Part 1: Heartbeat Classification**

**Overview:**

You will work with heartbeat signals from the MIT-BIH Arrhythmia Dataset. Each row in the dataset represents a time series with 187 time steps and one feature per time step. The last column is the label, indicating one of five classes:

* **'N' (Normal): 0**
* **'S' (Supraventricular premature beat): 1**
* **'V' (Premature ventricular contraction): 2**
* **'F' (Fusion of ventricular and normal beat): 3**
* **'Q' (Unclassifiable beat): 4**

**Tasks:**

1. **Environment Setup:**
   * Create a new environment using conda.
   * conda create -n sequence\_modeling python=3.9 -y

conda activate sequence\_modeling

* + Install the required dependencies:

pip install -r requirements.txt

1. **Follow Instructions:**
   * Open the provided Jupyter Notebook.
   * Implement the required functions for:
     + Data exploration
     + Model building (RNN, LSTM, GRU)
     + Training and evaluation
     + Visualization of results
2. **Deliverables:**
   * Submit the completed Jupyter Notebook.
   * Include all required plots and a brief discussion of your findings.

**Part 2: Building an RNN Step-by-Step**

**Overview:**

This part of the assignment is adapted from Module 5 of Andrew Ng's Deep Learning course. You will:

1. Build an RNN step-by-step to better understand the internal workings of sequence models.
2. Complete **required sections** in the notebook. Some **optional parts** are included for further exploration but are not graded.

**Deliverables:**

* Submit the completed notebook with the required sections implemented.

**Submission:**

* Submit both Jupyter Notebooks (Part 1 and Part 2) as part of your assignment.
* Ensure all required tasks are completed and all code is functional.

**Notes:**

* Use the course forum or reach out to the instructor and TAs for any questions.
* Ensure your code is well-documented and readable.