USN NUMBER: 1RVU22CSE071
NAME: Joselyn Riana Manoj

Ex No: 8 Date: 25/09/2024	RNN Name Generation

Objective:

To build a character-level language model using a Recurrent Neural Network (RNN) that generates dinosaur names. The model will learn the patterns of existing dinosaur names and generate new plausible names.

Descriptions:

This lab involves developing a character-level language model to generate new dinosaur names using a Recurrent Neural Network (RNN). The goal is to train the RNN on a dataset of existing dinosaur names, allowing it to learn the patterns and structure of the names. Once trained, the model can generate new names character-by-character, which can potentially be used in real-life scenarios where new dinosaur breeds need unique names.

The lab involves:

- Loading and preprocessing a dataset of dinosaur names.
- Implementing gradient clipping to avoid exploding gradients during training.
- Sampling characters from the RNN's predictions to generate new names.
- Training the RNN using stochastic gradient descent to learn the name patterns

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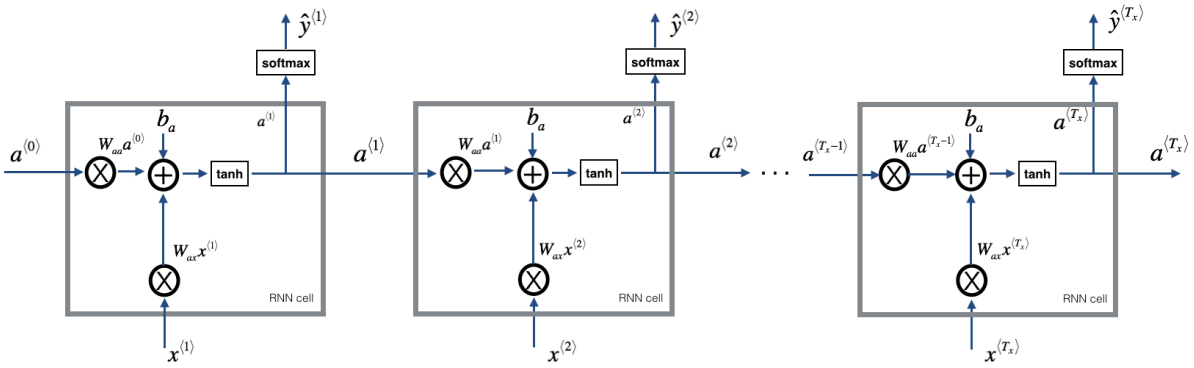
Model:



Building Parts of the Algorithm:

1. **Dataset and Preprocessing:**
   - The dataset consists of existing dinosaur names compiled into a text file. Each name is treated as a sequence of characters, and special characters like newline (`\n`) are used to indicate the end of a name.
   - The model uses dictionaries (`char_to_ix` and `ix_to_char`) to map characters to indices and vice versa, which is crucial for encoding inputs and decoding outputs during training.

2. **Model Overview:**

   The RNN is designed to predict the next character in a sequence based on previous characters.

   The model performs the following steps:

   a. Initialize parameters for the RNN.
   b. Optimize the parameters using forward and backward propagation.
   c. Use gradient clipping to prevent exploding gradients.
   d. Update parameters using gradient descent.

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3. **Building Blocks of the Model:**

   Gradient Clipping: To avoid exploding gradients, which can destabilize training, gradient values are clipped within a specified range (e.g., [-10, 10]). This ensures that the learning process remains stable.

   Sampling: Once the model is trained, it generates new names by sampling characters based on the probability distribution output by the softmax layer at each time step. This is done by:

   a. Initializing a dummy input.
   b. Forward propagating through the RNN.
   c. Sampling the next character index based on probabilities.
   d. Repeating the process until a newline character is generated.

4. **Gradient Descent Optimization:**

   The optimization loop performs one step of stochastic gradient descent:

   a. Forward propagate through the RNN to compute the loss.
   b. Backward propagate to compute gradients of the loss.
   c. Clip gradients to handle exploding gradients.
   d. Update parameters using the computed gradients.

5. **Training the Model:**
   - The model is trained on dinosaur names in a shuffled order to improve learning through stochastic gradient descent.
   - Every few iterations, the model generates and prints new names to evaluate its learning progress.

GITHUB LINK :
https://github.com/joselynrianaaa/DeepLearning_Labs/tree/main/RNN%20Name%20generation%20DISTRI