PATTERN ADAPTIVE TIME SERIES PREDICTION WITH PARALLELED PROCESSING USING CUDA

**ABSTRACT: Leveraging GPU Acceleration for Advanced Time Series Forecasting**

Time series forecasting plays a crucial role in various domains, from finance and weather prediction to demand forecasting in supply chain management. As datasets grow larger and computational demands increase, traditional forecasting methods face scalability challenges. This project focuses on harnessing the power of CUDA-enabled GPUs to accelerate time series forecasting algorithms and address these scalability issues.

Utilizing CUDA, a parallel computing platform and programming model developed by NVIDIA, we optimize forecasting algorithms to leverage the massive parallel processing capabilities of modern GPUs. This enables us to achieve significant speedups in computation compared to traditional CPU-based implementations.

Our project explores CUDA-accelerated implementations of popular time series forecasting techniques such as ARIMA, LSTM, and Prophet. We demonstrate the effectiveness of GPU acceleration in reducing forecasting computation times, enabling real-time or near-real-time forecasting even on large-scale datasets.

Key features of our project include:

1. Implementation of CUDA kernels for parallelizing time series forecasting algorithms.
2. Optimization techniques to leverage GPU memory hierarchy and achieve efficient data processing.
3. Comparative analysis of CPU-based and GPU-accelerated implementations in terms of speed and accuracy.
4. Scalability testing to evaluate performance on increasingly larger time series datasets.
5. Integration of CUDA-accelerated forecasting models into existing analytics pipelines for seamless deployment.

**Through this project, we aim to showcase the potential of GPU acceleration in revolutionizing time series forecasting tasks, unlocking new possibilities for real-time decision-making and predictive analytics across various industries.**