

# Postgraduate Seminar Series

*Venue: Graduate Seminar Room*

*Date & Time: February 28, 2026 at 2:30 PM*

## Speaker Information

Md. Ferdouse Ahmed Foysal (Std No. 0419052083) is a part time M.Sc. student in the department of CSE, BUET. He completed his undergraduate studies from Daffodil International University in 2019. His research interest lies in the fields of Deep Learning and Reinforcement Learning. He is currently doing his postgraduate thesis under the supervision of Dr. Tanzima Hashem. He will be speaking about his ongoing research in this talk.



## A Policy Gradient Based Deep Reinforcement Learning Approach for Automated Neural Architecture Search in Crime Prediction

Prediction of crime is critical for enhancing urban safety, enabling proactive surveillance, and supporting strategic resource allocation. In this thesis, the crime prediction task refers to forecasting the count of crimes of a specific category within a geographic area over a future time period. Recent deep learning technologies, notably spatio-temporal network architectures such as the Attentionbased Interpretable Spatial-Temporal (AIST) model, have shown potential to capture the complex nonlinear structure of historical crime data. However, predictive performance is highly sensitive to architectural hyperparameters, which are typically determined through manual, iterative trial-and-error, relying heavily on domain expertise. This approach is computationally expensive and time-consuming. To overcome the limitation, we present an automatic Neural Architecture Search (NAS) framework for crime prediction based on a Policy gradient-based Deep Reinforcement Learning method. The policy network is implemented using a lightweight gated-residual architecture, which efficiently models the search policy by allowing strong transformations for some hyperparameters while passing others with minimal adjustment, maintaining computational efficiency. We adopt the AIST architecture as the backbone model due to its superior performance compared to existing crime prediction methods. There are several parameters that the framework attempts to optimize, such as output feature dimensions and attention module sizes of Graph Attention Networks, hidden state dimensions and attention module sizes, network layer count for SAB-LSTMs, and the number of recent time steps. To guide the search, we design a weight-sharing strategy combined with reward shaping based on improvements in Mean Squared Error (MSE) and Mean Absolute Error (MAE). The reward is incorporated into a policy loss function using a standard logprobability objective with an entropy bonus to balance exploration and exploitation. Monte Carlo dropout is integrated for uncertainty estimation, enhancing robustness. We conduct extensive experiments on real-world datasets. Compared to humandesigned architectures, the proposed NAS-AIST model automatically discovers optimal architectures, achieving high-quality predictive performance for crime prevention.