# Computer Science GTA Project

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**Section 2 – *Project Information***

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| **Project Title** | Scalable and Robust Graph Neural Network-Based Recommender Systems | |
| **Project Highlights:** | 1. | We plan to propose a graph compression framework to reduce memory usage and speed up GNN computations. |
| 2. | We plan to develop incremental learning methods to support real-time updates on evolving user-item graphs. |
| 3. | We plan to design denoising strategies to defend against malicious interactions and improve recommendation reliability. |
| **Project Summary (300 words maximum)** | | |
| Recommender systems, such as those used by Amazon and eBay, have become ubiquitous in modern life, helping users alleviate the problem of information overload. In these systems, user-item interactions are typically modelled as bipartite graphs to predict potentially relevant items for each user. Among various approaches to recommender systems, Graph Neural Network (GNN)-based models have emerged as a mainstream solution due to their ability to capture complex structural dependencies. While many studies focus on improving the accuracy of GNN-based methods, addressing their efficiency is equally critical, given the growing scale of users and items. Simplified architectures, such as LightGCN, have gained traction due to their practical effectiveness and scalability. ***However, building a truly scalable and robust GNN-based recommender system remains a significant challenge.*** Specifically: (1) Existing work often assumes that the entire GNN computation can be executed in-memory, which is infeasible for large-scale commercial graphs. (2) Most GNN models are designed for static graphs, making them ill-suited for dynamic environments where user behaviours evolve over time. (3) Current methods generally assume benign user interactions, neglecting the potential impact of malicious behaviours on recommendation outcomes.  To address these challenges, ***this project aims to advance current research from three perspectives:*** (1) We plan to propose a graph compression framework that identifies and preserves the most informative substructures in graphs for GNN computation, thereby reducing memory usage and computational cost. (2) We plan to develop incremental learning techniques that enable continuous model updates as the user-item graph evolves, eliminating the need for full retraining. (3) We plan to explore denoising strategies to mitigate the influence of malicious users, thereby improving the trustworthiness of recommendation results.  In summary, this project aims to develop a practical, scalable, and robust GNN-based recommender system suitable for real-world deployment. For more information, please visit my homepage at https://wentaoli-92.github.io/. | | |