Sk Asif Iqbal

Kolkata, WB, India

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Education	**Indian Association for the Cultivation of Science,** Kolkata, India	*October 2020-Present*
	Integrated BS-MS	*Graduation : June 2025*
	Specialization : Computer Science	
	CGPA : 7.39/10.00	

Publications

Sk Asif Iqbal, Mir Md Sajid Sarwar, Rajarshi Roy. 2024. *Explaining Unsolvability of Planning Problems in Cyber-Physical Systems.* [Long Paper]. Under Review at the Innovations in Software Engineering Conference (ISEC 2025)

Madhusudan Ghosh, Payel Santra, **Sk Asif Iqbal**, Partha Basuchowdhuri. 2022 *Astro-mT5 : Entity Extraction from Astrophysics Literature using mT5 Language Model.* [Short Paper]. In Proceedings of the first Workshop on Information Extraction from Scientific Publications, pages 100 - 104, Online Association for Computational Linguistics.

Ongoing Work

Developing a framework for explaining the property violations in Hybrid Systems through causal analysis of system traces.

Presentations

Explaining Unsolvability of Planning Problems in Hybrid Systems. SAT+SMT School 2024, co-located with SAT 2024.
Automatic Benchmark Generation and Explanation by Relaxation. IACS Master's Research Evaluation May 2024.
Explaining Unsolvability of Planning Problems in Hybrid System using Component-wise Reachability Analysis. IACS Master's Research Evaluation Dec 2023.

Research Experience

IACS Verification Lab with Dr. Rajarshi Ray   *Sep 2023-Present*

Benchmark Generator and Relaxation

- Developed a C++ based benchmark generator for warehouse domains, capable of generating unsolvable instances by automatically assessing the dynamics and constraints of hybrid systems, including invariant and flow equations.
- Designed a relaxation process for constraints associated with transitions derived from component-wise reachability analysis. This process specifically relaxed the strict conditions imposed by the flow dynamics of the source location in these transitions.

Explaining Unsolvability by Component-analysis

- Analyzed unsolvable planning problems in systems modeled as Linear Hybrid Automata (LHA), where planning problems were formulated to intentionally lack a feasible solution, thereby representing scenarios that cannot occur over time.
- Developed a component-wise decomposition framework to analyze sequences of transitions (plans) within the LHA. Applied the bounded reachability checker (BACH tool) on these components to pinpoint states or transition where execution fails providing explanations for unsolvability.
- Evaluated the framework on hybrid systems in domains such as warehouse automation and water level monitoring. Applied heuristics to optimize the analysis process, ensuring the analysis time remains reasonable despite the problem's exponential complexity at greater plan depths.

IACS ML Lab for CS with Dr. Partha Basuchowdhuri   *April 2022-Feb 2023*

Document Classification

- Contributed to the development of a document classification model utilizing image texture features (24 attributes from GLCM) and spatial relations between text tokens, extracted via bounding box dimensions and Euclidean distances between token centroids.
- Preprocessed data for training by extracting text via OCR, tokenizing using BertTokenizerFast, and computing spatial features such as bounding box coordinates, then normalizing and transforming images with z-score normalization.

Astro-mT5
- Preprocessed astrophysical datasets by converting JSON formats into text files, and optimizing Python scripts for data cleaning, parsing, and tokenization, which improved data quality and reduced processing time.
- Conducted experiments with transformer-based models, including Longformer and RoBERTa, to find the best-performing model for the NER sequence labelling task. Contributed to research documentation and illustrations.

Grad Course Projects	**COM 5202 Compiler Construction** with Prof. Goutam Biswas *Spring 2024*

- Developed a recursive descent parser in C for an LL(1) grammar, using flex for lexical analysis and integrating syntax checks with computed First and Follow sets.
- Implemented a symbol table as a linked list for context analysis, handling variable declarations, type assignment, and initialization checks with error handling.
- Implemented robust error handling strategies to detect and report multiple syntax and semantic errors without halting the analysis.

COM 5103 Advanced ML with Dr. Debarshi Kumar Sanyal *Fall 2023*
- Implemented a deep learning classifier using PyTorch for hand sign recognition (digits 0-5), incorporating regularization techniques like L2-norm penalty, early stopping, data augmentation, and dropout, with three dense layers using ReLU activation.
- Experimented with optimization methods, including Gradient Descent, SGD, AdaGrad, Adam, and Batch Normalization, evaluating model performance through accuracy metrics and visualizing loss and validation accuracy per epoch.

Workshops and Schools	SAT+SMT School 2024	*August 2024*
	Recent Trends in Algorithms(RTA) 2024	*June 2024*

Community Involvement	Recent Trends in Algorithms(RTA) 2024, *Student Volunteer*	*June 2024*

Achievements	Secured Rank 1 in WIESP 2022 Shared Task for achieving highest F1 score with Astro-mT5	*2022*
	Achieved a Top 10 position in Datathon@IndoML	*2022*

References	**Dr. Rajarshi Ray**
	Associate Professor of Computer Science at the Indian Association for the Cultivation of Science,
	Email : rajarshi.ray@iacs.res.in