Kazi Tasnim Zinat

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Education

University of Maryland, College Park — College Park, MD
Ph.D. Candidate in Computer Science (Advisor: Leo Zhicheng Liu) — *Aug 2019 – Present*

- Focus: VLM Evaluation, Interpretable Machine Learning, Event Sequence Data Modeling & Visual Analytics
- Thesis: Beyond Domain Boundaries: Enhancing Generalizability of Event Sequence Visual Analytics Research

University of Maryland, College Park — College Park, MD
Master of Science in Computer Science; — *Aug 2019 – 2024*

Experience

Applied Science Research Intern - Machine Learning — Summer 2022, 2023
Amazon Web Services (AWS) - Bedrock Generative AI & ML Solutions Lab — *Santa Clara, CA*

- Developed novel out-of-domain intervention augmented causal framework extending Rubin's model to temporal point processes, achieving 88% RMSE reduction (3501.14 to 419.38) in predictive maintenance
- Engineered hybrid Transformer-CNN architecture with multi-headed self-attention to capture long-range dependencies and local patterns, achieving 50% lower negative log-likelihood in simulation studies
- Derived theoretical proofs and implemented counterfactual treatment effect estimator with propensity score matching for detecting causal relation shifts under interventions
- Validated framework on healthcare and industrial maintenance logs, confirming findings against medical literature

Graduate Research Assistant - Event Sequence Visual Analytics — Spring 2021 – Present
University of Maryland Human-Data Interaction Lab — *College Park, MD*

- Created ProcVQA benchmark evaluating 19 state-of-the-art VLMs (GPT-4, Claude-3.7, Gemini-2.5, Llama-4) across 118 visualizations with 2,583 ground truth annotations and 144 expert-authored questions
- Identified systematic VLM failure modes: 30% performance drop from single to multi-hop reasoning, edge-value fabrication and node fusion hallucinations in high-complexity scenarios (¿20 nodes)
- Developing Multi-Agent Event Sequence Analysis System using Autogen framework, benchmarking foundation models (Claude 3.7, GPT-4o, Gemini) on zero-shot/few-shot analysis objective extraction
- Built tool-augmented LLM pipelines enabling agents to leverage visualization and data mining libraries through function calling to implement analysis plans
- Designed comprehensive domain-agnostic task framework through analysis of 58 visualization systems, establishing theoretical foundation for next-generation intelligent assistance tools

Graduate Research Assistant - Bioinformatics — Fall 2019 – Summer 2020
University of Maryland HCBravo Lab — *College Park, MD*

- Co-authored scTreeViz BioConductor package for interactive single-cell RNA-seq analysis with hierarchical annotations
- Implemented clustering methodology and PCA-based dimensionality reduction for genomic data visualization

Key Research Projects

Vision-Language Models for Event Sequence Analysis | *PyTorch, Transformers, HuggingFace* — 2025

- Designed comprehensive evaluation framework assessing VLMs' effectiveness on 108 unique visual summaries
- Engineered systematic protocols measuring quantitative information extraction and visual QA performance
- Discovered Gemini-2.0-Flash produced 6x fewer hallucinations (44) than Gemini-2.5-Flash (276)

Multi-Level Task Framework for Event Sequence Analysis | *Python* — 2023

- Developed comprehensive domain-agnostic framework through systematic analysis of 58 visualization systems across 16 venues, creating four-level hierarchical taxonomy (6 objectives, 5 intents, 15+ strategies)
- Formalized techniques using action-input-output-criteria quartets for precise characterization across domains
- Established theoretical foundation for next-generation intelligent assistance tools and executable benchmarks
- Validated framework expressiveness through comparative analysis with existing taxonomies across healthcare and sports

Interactive Behavioral Analysis Tool (COALA) | *TypeScript, D3.js, React* — 2024

- Applied event sequence analysis to develop visual analytics tool for 162 writing sessions from 27 teams
- Modified Sequence Synopsis algorithm for behavioral pattern analysis with LLM-generated cluster summaries

Visual Summarization Benchmarking | *Python, JavaScript, D3.js* 2022

- Conducted controlled experiment comparing techniques using 108 visual summaries, 180 participants, 1,620 observations
- Reimplemented three visualization techniques with standardized encoding to isolate algorithmic performance

Selected Publications

Conference Papers

ProcVQA: Benchmarking VLM Performance on Mined Process Visualizations (2025). **K.T. Zinat**, S.M. Abrar, S. Saha, S. Duppala, S.N. Sakhamuri, Z. Liu. EMNLP Findings.

Uncovering Causal Relation Shifts in Event Sequences under Out-of-Domain Interventions (2025). **K.T. Zinat**, Y. Zhou, X. Lyu, Y. Wang, P. Xu. ICANN.

A Multi-Level Task Framework for Event Sequence Analysis (2024). **K.T. Zinat**, S.N. Sakhamuri, A.S. Chen, Z. Liu. IEEE VIS (TVCG).

A Comparative Evaluation of Visual Summarization Techniques for Event Sequences (2023). **K.T. Zinat**, J. Yang, A. Gandhi, N. Mitra, Z. Liu. EuroVis (Computer Graphics Forum).

Comparing Native and Non-native English Speakers' Behaviors in Collaborative Writing (2025). Y. Chen, Y. Xiao, **K.T. Zinat**, N. Yamashita, G. Gao, Z. Liu. ACM CHI.

Workshop Papers

Evaluating VLMs as Accessibility Bridges for Process Visualizations (2025). **K.T. Zinat**, S.M. Abrar, S. Duppala, S.N. Sakhamuri, Z. Liu. CVPR VizWiz Grand Challenge Workshop.

Comparing Native and Non-native English Speakers' Behaviors (2025). Y. Chen, Y. Xiao, **K.T. Zinat**, N. Yamashita, G. Gao, Z. Liu. NAACL Workshop on Intelligent Writing Assistants (In2Writing).

Technical Skills

Machine Learning: PyTorch, Transformers, Causal Inference, Model Evaluation, Neural Networks, LLMs, Autogen
Interactive Systems: React, D3.js, JavaScript, HTML5/CSS3, Web Development, Data Visualization
Languages: Python, JavaScript, Java, R, C++
Tools & Frameworks: HuggingFace, scikit-learn, Git, AWS, Docker, Tableau, Linux, PostgreSQL

Selected Achievements & Service

Conference Reviewer: IEEE VIS (2023, 2025), EuroVis (2025), ACM CHI (2025), PacificVis (2025) - "Highly Useful" recognition

Grants: AWS Cloud Credit for Research $5000 (2023), Jacob K. Goldhaber Travel Grant (2023)

Teaching: 7 courses including Programming Languages (CMSC 430), Bioinformatics (CMSC 423), Web Development (CMSC 335)