Alexander Martin

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EDUCATION

University of Rochester ***Rochester, New York***

Bachelor of Science in Computer Science; Honors in Research; Major GPA: 3.73 *May 2024*

RESEARCH

Formal And Computational Semantics (FACTS) Lab ***University of Rochester***

Advised by Dr. Aaron Steven White *May 2022 – Present*

Frames Across Multiple Sources (https://arxiv.org/abs/2311.05601**):**

- Created a corpus for document level information extraction and cross document argument linking.
- Designed annotator qualification tasks for document level argument annotation.
- Formulated inter-annotator agreement metrics creating customized F1 and agreement scores.

MegaWika (https://arxiv.org/abs/2307.07049**):**

- Created a corpus to help LLMs cite sources with report-source pairs in 50 different languages.
- Devised annotator task for verifying whether events existing in a passage existed in their citation.

Multi-Document Role Recovery:

- Created a corpus for extracting arguments across multiple documents that discuss the same event.
- Designed annotation tasks for validating and correcting machine predictions for the corpus.
- Developed a computational model for consolidating event extractions from each document into a single most informative template representation.

Event Individuation through Subevent Annotation:

- Investigated the problems of individuation at the document level through subevent annotation.
- Formulated a new metric for the "range" of events unique event counts for a document.

Connotate (https://connotate.netlify.app/**):**

- Created an open-source annotation tool for entity, event and argument, and coreference annotation.
- Generated documents for pilot tasks using event and entity trigger extraction models for FrameNet.
- Optimized pilot document quality using modified optimal matching algorithms based on gold dataset annotations from RED and machine predicted triggers for FrameNet frames.

Visual Intelligence & Social Multimedia Analytics (VIStA) Lab ***University of Rochester***

Advised by Dr. Jiebo Luo *August 2022 – Present*

Jurassic World Remake (https://arxiv.org/abs/2308.07316)**:**

- Created a new dataset consisting of skulls and their corresponding living animals.
- Proposed a new methodology for diffusion models to translate in good faith between domains.
- Wrote a first-author publication and delivered oral presentation to ACM Multimedia conference.

Background Audio and Music Generation:

- Developed a method for contrastive video-music pretraining (CVMP).
- Developed an unsupervised method for generating background music and background audio.

Closed Loop Corrections for Text-to-Image Generation:

- Designed a pipeline for correcting the generations of text-to-image models using a text-only LLM and visual foundation models.
- Built a pipeline for both LMMs and LLM+visual model corrections.
- Formulated reward metrics for the refinement process by weighing various scores about layout, subjects, and aesthetics.

Multimodal Report Generation on Events in Social Media:

- Designed a framework for extracting real time event information from tweets with text and video.
- Formulated evaluation of information factuality and causal links between events in tweets.

Rochester Human Computer Interaction (ROC-HCI) Lab ***University of Rochester***
Advised by Dr. Ehsan Hoque *November 2022 – Present*

Hi5: Hand Pose Estimation with Zero Human Annotation:

- Created a synthetic dataset for hand pose estimation generating diverse images with game engines.
- Trained computer vision models on the dataset to prove the successes and failures.
- Received the Dean's Award in Engineering and Mathematics for my presentation of this work.

Environmental Protection Agency ***Remote***
Advised by Dr. Andrea Kirk and Dr. Clyde Martin *May 2022 – October 2022*

Quantifying the Impacts of PFAS Exposure (https://www.mdpi.com/1660-4601/20/5/4539)**:**

- Developed algorithms for relative importance analysis for large datasets to measure the effects of PFAS exposure on humans and their health including cancer risk and bone mineral density.

Independent Research ***Remote***
Advised by Dr. Clyde Martin

Probabilities Associated with a Dynamic Game

- Realized a close association between best rational number approximation of an irrational number and continued fraction approximations in a dynamic game using decreasing fractions (1/1,…,1/N)
- Utilized GPUs to perform efficient matrix computation for large probabilities up to N=10,000

PAPERS, PUBLICATIONS, & TALKS

Accepted and Under Review Papers:

- **A. Martin**, H. Zheng, J. An, J. Luo "Jurassic World Remake: Bringing Ancient Fossils Back to Life via Zero-Shot Long Image-to-Image Translation" (**Accepted,** ACM MM)
- S. Vashishtha, **A. Martin**, W. Gantt, B. Van Durme, A.S. White "FAMuS: Frames Across Multiple Sources" (**Completed,** Intended NAACL, **Preprint,** ArXiv, Hugging Face)
- S. Barham, O. Weller, et al. (incl. **A. Martin**) "MegaWika: Millions of reports and their sources across 50 diverse languages" (**Submitted,** ACL ARR; **Preprint,** ArXiv, Hugging Face)
- A. Kirk, A. DeStafano, **A. Martin**, K. Kirk, C. Martin "A New Interpretation of Relative Importance on An Analysis of Per and Polyfluorinated Alkyl Substances (PFAS) Exposures on Bone Mineral Density" (**Published**, IJERPH)
- **A. Martin**, C. Martin "Probabilities Associated with a Dynamic Game" (**Under Revision**, Communications in Information Systems)
- C. Martin, **A. Martin**, A. Kirk "Regression on subspaces: A tool for mixtures with applications to the effects of per-and polyfluoroalkyl substances on risk of major osteoporotic fracture" (**Under Revision**, Journal of Agricultural Biological and Environment Statistics)

Invited Talks:

- ACM Multimedia 2023, *Jurassic World Remake* (October 2023)
- University of Rochester Data Set Grant Presentations: *Document Level Event Information and Relations* (September 2023)
- University of Rochester Research Symposium: *Hi5: Hand Pose Estimation with Zero Human Annotation* (April 2023)

In work (In order of completion expectation):

- **A. Martin,** A.S. White "Context Minimization for Cross-Document Argument Extraction" (Intended NAACL 2024)

- W. Gantt, **A. Martin**, A.S. White "On Event Individuation through Subevent Annotation" (Intended NAACL 2024)
- M. Hasan, C. Ozel, **A. Martin**, S. Potter, T. Adnan, E. Hoque "Hi5: Hand Pose Estimation with Zero Human Annotation" (Intended FAaccT 2024)
- **A. Martin***, J. An*, J. Luo "Closed-Loop Corrections for Text-to-Image Generation" (Intended ECCV/ICLR 2024)
- A. Imtiaz, C. Nair, O. Hai, **A. Martin**, A.S. White "Connotate: A Concrete Annotator Tool" (Intended ACL Short 2024)
- **A. Martin**, H. Lyu, J. Lin, H. Hua, A.S. White, J. Luo "Real Time Multimodal Report Generation on Events in Social Media" (MM 2024)
- **A. Martin***, Y. Zang*, D. Zhang, G. Zhu, Y. Zhang, Z. Duan, J. Luo "Unsupervised Rhythm and Emotion Aware Background Music Generation" (2024)
- **A. Martin**, J. Huang, J. Lin, A.S. White, J. Luo "Learning Eventuality Structure From Videos" (2024)
- **A. Martin** "Beyond Document Level Information Extraction" (Senior Thesis 2024)

HONORS, AWARDS, & GRANTS

Office of Undergraduate Research Presentation Grant: *Jurassic World Remake* ($1300) Fall 2023
RCL Data Set Grant: *Document-Level Event Extraction and Report Generation* ($850) Spring 2023
Make It Happen Grant: *Re-Vision Home Inspection* ($500) Spring 2022
University of Rochester Undergrad Research, *Deans' Award: Engineering and Mathematics* 2023
University of Rochester, *Residential Life Best Program of the Year* 2023

PROJECTS

ReVision Home Inspection

- Engineered a platform to automate visual home inspections to identify problems during inspections.
- Built vision models for automating home inspections and creating price estimates.
- Make it Happen Grant from the University of Rochester; Finalist Cornell Tech's Start Up Awards.

TEACHING, LEADERSHIP, & VOLUNTEERING

Computer Science Department ***Rochester, New York***
Teaching Assistant - Intro to Artificial Intelligence (CSC 242) *Spring 2023*
Teaching Assistant - Data Structures and Algorithms (CSC 172) *Spring 2022, Fall 2022*
Teaching Assistant - Intro to Computer Science (CSC 171) *Fall 2021*
Computer Science Undergraduate Tutor *Fall 2021—Present*
Computer Science Undergrad Council: Comm Chair *Jan 2021—May 2022*
Residential Life:
Resident Advisor *Aug 2022 – Present*
D'Lion *Aug 2021—May 2022*
STEM Initiative: *Mentor* *2021 – Present*

SKILLS

Programming Languages: Python, Java, C++, MATLAB **Familiar:** C, SQL, JavaScript, R
Tools/Frameworks: PyTorch, Amazon Mechanical Turk, Docker, AWS, LaTeX, Git, Overleaf
Soft Skills: Small group instruction, conflict resolution, engaging presentations