# Muntabir Hasan Choudhury

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## Education

**Old Dominion University, VA, USA** — **December 2024**
*Ph.D. in Computer Science* — *GPA: 3.84/4.0*

**Elizabethtown College, PA, USA** — **May 2018**
*B.Sc. in Computer Engineering* — *GPA: 3.36/4.0*

## Professional Experience

**U.S. Food & Drug Administration** — **May 2024 – Present**
*ORISE – Research Fellow, Full-time* — *Silver Spring, MD*

- Enhancing algorithms for regulatory projects by integrating *Generative AI* (e.g., *prompt-tuning*, *fine-tuning*, and *RAG*).
- Accelerated data processing (e.g., **GPU-optimized parallelization**), reducing computation time on large datasets.
- Implemented a deep learning model using **transfer learning**, achieving **98% F1-score** in classifying regulatory data.

**Old Dominion University** — **August 2019 – December 2024**
*Graduate Research Assistant, Full-time* — *Norfolk, VA*

- Built *ETDSuite*, comprising of four AI frameworks to improve *discoverability*, *accessibility*, and *readability* of scholarly documents.
- Implemented ML and LLM-based frameworks to extract, parse, and segment scholarly documents to improve knowledge discovery.
- Published research in top-tier CS venues and mentored students in AI-focused research projects.

**Bihrle Applied Research Inc** — **June 2021 – August 2021**
*Machine Learning Intern* — *Hampton, VA*

- Developed ML algorithms for *Rail-Inspector*, detecting trains in aerial imagery to enhance railroad track monitoring.
- Optimized a **Fully Convolutional Network (FCN)**, achieving **96% accuracy** in train segmentation.
- Addressed overfitting and fine-tuned model hyperparameters to improve detection precision.

**Los Alamos National Laboratory** — **June 2020 – August 2020**
*Research Intern* — *Los Alamos, NM*

- Developed a DL framework for *Handwritten Mathematical Expression Recognition*, improving classification accuracy.
- Applied *OpenCV* techniques (segmentation, blurring, thresholding) to enhance model input quality.
- Implemented a **LeNet5-CNN** model, achieving **89% accuracy** in recognizing handwritten equations.

## Technical Skills

**Programming Languages**: Python, PHP, C, SQL, HTML, CSS
**Frameworks & Technologies** : Django, Bootstrap, Elasticsearch, AWS S3
**AI & Machine Learning**: Keras, TensorFlow, PyTorch, OpenCV, scikit-learn, spaCy, NLTK
**Development Tools**: Anaconda, Jupyter Notebook, Google Colab, Databricks, Visual Studio, SVN, Git, Docker, AWS

## Projects

**LMParsCit** | *Generative AI, Prompt Engineering, LLM fine-tuning, Git, Python GitHub*

- Developed LLM-based parser by *fine-tuning* **Llama3-8b-instruct** while incorporating *prompt-engineering with few-shot learning* for extracting key metadata fields (title, author, venue, year) from citations across 1500+ bibliography styles, achieving state-of-the-art (**99% F1**) performance on CORA-ref and ETDCite.

**ETDPC** | *Python, Git, AWS Textract, S3, TensorFlow, PyTorch, scikit-learn GitHub*

- Developed a two-stream multimodal AI with cross-attention network that uses a vision encoder (**ResNet50v2**) and a text encoder (**BERT**) to classify book-length document pages, achieving **84%–96% F1** on ETDPC-ETD500.

**MetaEnhance** | *Python, Git, Tesseract-OCR, RegEx, Hugging Face GitHub*

- Designed an AI-driven metadata correction framework, heavily relied on several AI methods (e.g., **CRF, NER, Sentence BERT**) that detects, fills missing values, and standardizes metadata fields, achieving **85%–100% F1** on MetaEnhance-ETDQual500.

**AutoMeta** | *Python, Git, NLP toolkit, Tesseract-OCR, scikit-learn GitHub*

- Developed a metadata extraction tool using **Conditional Random Field (CRF)** while incorporating visual and text features to extract metadata fields from the cover pages of scanned book-length documents, achieving **83%–96% F1** on AutoMeta-ETD500.

**TechDrawFinder** | *Django, Bootstrap, CLIP by OpenAI, FAISS by Meta, GitHub*

- Built a multimodal vector search engine (supported by Meta's **FAISS** vector database) for searching **67,516** design patent drawings, enabling text-to-figure and figure-to-figure search using the joint embeddings generated by OpenAI's **CLIP** model.

## Publications

**IAAI 2024**: ETDPC : A Multimodality Framework for Classifying Pages in Electronic Theses and Dissertations. | Link
**JCDL 2023**: MetaEnhance: Metadata Quality Improvement for ETDs of University Libraries. | Link **(Best Paper Award)**
**ICDAR 2023**: A Study on Reproducibility and Replicability of Table Structure Recognition Methods. | Link
**Sci-K 2022**: A Study of Computational Reproducibility using URLs Linking to Open Access Datasets and Software. | Link
**SDU@AAAI 2022**: Segmenting Technical Drawing Figures in US Patents. | Link
**JCDL 2021**: Automatic Metadata Extraction Incorporating Visual Features from Scanned ETDs. | Link
**JCDL 2020**: A Heuristic Baseline Method for Metadata Extraction from Scanned ETDs. | Link **(Best Poster Award)**
**IJDL**: Building Datasets to Support Information Extraction and Structure Parsing from ETDs | Link.