

# Michael Andrzej Klaczynski

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Experienced AI Researcher with interests in Interpretability, Language Models, and Agentic Systems.

## Education

**University of Virginia**, Bachelor of Science – School of Engineering and Applied Science: Computer Science

Relevant Coursework: Machine Learning, Artificial Intelligence, Database Systems, Operating Systems, Information Retrieval, Cloud Computing, Data Analysis with Python, Computer Architecture, Algorithms, Statistics

## Skills

- Machine Learning
  - ✓ Can design, train, and run experiments with state-of-the-art AI models
  - ✓ Experienced with Computer Vision, Natural Language Processing, and Reinforcement Learning
  - ✓ Familiar with Transformers, Attention, CNN's, ViT, Diffusion, LoRA, sparse autoencoders, and RAG
  - ✓ Tools: PyTorch, TensorBoard, HuggingFace, CUDA, Pandas, OpenCV, Faiss, Docker, matplotlib
- Technical Writing
  - ✓ Can write proposals for government funding as well as customer technical reports
  - ✓ Authored a paper accepted to an IEEE applied computer vision conference
  - ✓ Proficient in *LATEX*
- Software Development
  - ✓ Experienced in Agile software development cycles
  - ✓ Familiar with Git and version control
  - ✓ Primary Programming Languages: Python, C, C++, Java, Javascript

## Publications

**ArcGeo: Localizing Limited Field-of-View Images using Cross-view Matching** (WACV 2024)

Contributions include:

- ✓ Significant top-1 recall improvements on standard cross-view matching datasets
- ✓ ArcGeo, a novel loss function which outperforms ArcFace and batch-all triplet loss
- ✓ Field-of-view augmentation to improve robustness across different types of data

## Security Clearance: Top Secret (SCI) w/Poly

## Research Experience

**BlueHalo, Rockville, MD**

**October 2021 – present**

*Research Engineer II*

- Image Geolocalization
  - ✓ **Unsupervised Object Class Discovery for Interpretable Geopositioning** – Created a novel unsupervised learning system that discovered regional object classes useful for inferring geographic position. Used SAM and CLIP to generate object embeddings which were passed to a dual-memory categorization system. Samples were clustered in working memory across both embedding space and geographic space, then used to generate LDA classifiers.
  - ✓ **Cross-view matching** – Trained image encoders to process ground-level and satellite images into a common embedding space for comparison. Experimented to incorporate other modalities such as terrain elevation and semantic maps. Authored a WACV paper on the custom training process and loss function used for this kind of matching.
  - ✓ **Cross-view synthesis** – Designed and trained pipelines for generating ground-level imagery based on satellite imagery and a desired camera pose, adapting diffusion models such as Stable Diffusion and Flux.
- Proposal Writing
  - ✓ Collaborated with several university professors to propose novel methods to detect and reduce LLM hallucinations.
  - ✓ Other proposal topics: geospatial foundation models, 3D city modeling based on sparse imagery, OSINT anomaly detection
  - ✓ Participated in many other proposal reviews and recommended changes
- Designed and implemented several novel but classified computer vision systems amid severe security restraints.
- Managed a small team of researchers for an internal competition, using reinforcement learning to direct swarms of drones.
- Created a synthetic data generation system for training trajectory prediction models based on probabilistic principles.
- Developed a return-augmented generation system for automated report writing, to assist in radar classification research

**TerraPixel, Bethesda, MD**

**May 2020 – March 2021**

**Data Scientist**

- GPS-Denied Visual Drone Navigation
  - ✓ Designed and trained a neural network model to match keypoints in high-altitude drone footage to keypoints in satellite imagery for the purpose of navigating in GPS-denied environments
  - ✓ Constructed a database system to efficiently retrieve the most likely location from across state-sized areas
  - ✓ Developed a cloud computing solution for large-scale encoding and indexing NAIP aerial imagery covering the entire contiguous United States using AWS.

## **Other Work Experience**

**Simventions, Fredricksburg, VA**

**February 2018 – May 2020**

**Software Developer**

- Documentation Graph Pruning – Used a combination of NLP and graph neural network approaches to find and eliminate frivolous, redundant, and incorrect connections autogenerated between documentation and its code.

**Office of Naval Research, Dahlgren, VA**

**May 2017 – July 2017**

**Intern**

- Updated and ported legacy code for hardware-in-the-loop testing of Tomahawk missiles.

**Naval Research Laboratory, Washington, DC**

**May 2015 – July 2015**

**Intern**

- Implemented a code analysis system for mathematically proving adherence to security criteria.

## **Other Projects**

**W2 Interpretation**

- A number of experiments searching for semantic feature representations within the FFN's of transformer modules.
- Theorized that feature vectors found by sparse autoencoders may align with simple linear combinations of FFN weights.
- Processed several million tokens from the Pile through a small llama-3.2 model to track the activations of neurons in the FFN of each transformer module, noting samples that maximize activations of each weight alongside other statistics.
- Used LLM Chain of Thought to summarize similarities across activation groups.

**Priority Weave**

- A system to emulate Multiple-Instruction-Multiple-Data processing on a CUDA GPU
- Purpose: asynchronous neural network propagation and massive multi-agent pathfinding
- Implemented priority queue algorithms in CUDA for on-device thread and memory management

**Neural Search**

- An undergraduate capstone project for isolating common functions across different neural networks
- Converted many open source computer vision models to standardized ONNX format
- Parsed neural networks into a Neo4j graph database for pattern mining