

# Samantha Pease (She/Her)

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## SUMMARY

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PhD-trained ML engineer building production-grade LLM + retrieval systems. Built RAG over 20K webpages (300K+ chunks) shrinking a 1.8GB embedding store to 28MB (IVFPQ, 384-d) and trimming per-answer context 25K→3K tokens (88%) via hierarchical summarization + manual hallucination review. Deployed FastAPI + LangChain/LangSmith service (token/latency/error tracing) and compared Anthropic vs OpenAI for cost/quality. Experience: graph ML (GNN link prediction AUC 0.935), Playwright scraping, 3D SfM + Gaussian Splatting, classical + deep ML, strong math foundations. 9 years teaching → clear specs & rapid iteration; excited to leave academia and apply these skills to passions like fostering autonomy and travel.

## SKILLS

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**LLM / Retrieval / Eng:** RAG (FAISS IVFPQ, MMR, hierarchical summarization), FastAPI (async), caching, latency/cost & prompt optimization, LangChain/LangSmith tracing, Anthropic & OpenAI eval  
**ML / Data / Graph:** Python, PyTorch + PyG, classical ML, NetworkX, SQL/SQLite, Playwright, Git

## EXPERIENCE

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**Machine Learning Engineer Intern** Summer 2024  
*Covar Durham, NC*  
• Built two production-candidate prototypes: (a) video→3D Gaussian Splatting pipeline (SfM + segmentation) over 2K–10K frame inputs; (b) object identification visualization module using Segmentation (SAM).  
• Adapted & stitched open-source SAM and Gaussian Splatting codebases for rapid comparative experiments.  
• Distilled 20+ papers into architecture tradeoffs; demoed to stakeholders & external client informing roadmap; produced clear specs under ambiguity.

**Math Instructor** 2017–Present  
*Duke University & Rutgers University–Newark Durham, NC & Newark, NJ*  
• Taught Applied Calculus & Calculus I and supported large (100+ student) Precalculus, College Algebra, Applied Calculus lectures; created syllabi, assessments, structured problem sessions.  
• Translated abstract math for 1000+ students into clear, stepwise explanations; praised for effective teaching.

## PROJECTS

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**Trans Advice Agent** Summer 2025  
• Built large-scale RAG over 20K webpages (300K+ chunks) using FAISS IVFPQ (shrunk raw store 1.8GB → 28MB) + MMR + query expansion + hierarchical summarization (25K→3K tokens).  
• Reduced answer latency & context cost via async batch summarization and caching; manual hallucination review + prompt tuning; evaluated Anthropic vs OpenAI for cost/quality.  
• Deployed FastAPI (POST /ask) service with LangSmith step-wise token/latency/error tracing & provenance UI (paginated sources) on Render.

**Instagram Network Analysis** Summer 2025  
• Scraped Instagram mutuals with Playwright (design limiting scope to mutuals) building directed graph (700 nodes / 23K edges); visualized communities (Louvain) via PyVis.  
• Trained PyTorch Geometric GNNs for link prediction (AUC 0.9352, AP 0.9349) and community classification; engineered structural features & optimized scraping throughput.

**Additional Projects**  
• Built an image classification neural net in pure NumPy; analyzed architectural tradeoffs (ML course project)  
• Applied persistent homology to LiDAR forest canopy data to differentiate forests (TDA research project)

## EDUCATION

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**Rutgers University–Newark - Ph.D. Mathematics** May 2026  
**Duke University - B.S. Mathematics & Computer Science, with Distinction** May 2020