Georgios Peikos

Applied AI Engineer | Retrieval Augmented Generation (RAG) | LLM Systems | Semantic Search

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Applied AI Engineer with a background in Electrical and Computer Engineering, specializing in **Large Language Models**, **Retrieval Augmented Generation**, and **Information Retrieval**. Designs and deploys end-to-end AI systems covering data pipelines, semantic retrieval, reranking, model training, inference, and evaluation. Experienced in training and adapting **small and mid-scale language models (1B–7B parameters)** using **PyTorch DDP** on **Slurm-managed HPC** infrastructure. Develops scalable and evidence-grounded AI systems for healthcare and other high-reliability domains, with experience spanning research, system implementation, and technical leadership.

Skills

Programming Languages	Python | SQL | C++
ML & NLP Frameworks	PyTorch | Hugging Face Transformers | SentenceTransformers | vLLM | LangChain | scikit-learn | Pandas | NumPy | Streamlit
Retrieval, Ranking & Evaluation	Semantic search | Elasticsearch | BM25 | Dense retrieval | Ranking aggregation (Metasearch) | Error analysis | Statistical significance testing
LLM Training & Infrastructure	Pre-training | Fine-tuning | Distributed training | PyTorch DDP | Slurm | HPC | Multi GPU training | Experiment tracking | Efficient inference
Engineering & Systems	Docker | REST APIs | Data pipelines | Git | CI/CD | UNIX/Linux
Soft Skills	Technical leadership | System architecture design | Cross-disciplinary collaboration | Stakeholder communication | Training and Mentoring | Project coordination
Languages	English (C2) | Italian (B1) | Greek (native)

Professional Experience

Research Scientist (RTDA) — Search and NLP 2024 – Present
University of Milano-Bicocca, Milano, Italy *ANTHEM: Advanced Technologies for Human-Centred Medicine*

Scope: Semantic search | RAG | LLM training on HPC infrastructure | Evaluation frameworks | **AI Implementation**

Impact: Research and development of 2 open-source trustworthy AI search systems for clinical information access.

- Pre-trained multiple domain-specific **small language models (1B–7B parameters)** from scratch for autoregressive language modelling using PyTorch DDP on Slurm-managed HPC infrastructure.
- Developed and deployed **ASPIRE**, an open-source visual analytics platform for search system evaluation, used for research and teaching in Information Retrieval.
- Built **12 benchmarking datasets and evaluation pipelines** for phenotype-centric information extraction and RAG, enabling systematic comparison of retrieval architectures and LLM pipelines.
- Architected **RAG pipelines** combining semantic search with evidence-grounded verification.
- Implemented retrieval and ranking pipelines integrating **LLMs and knowledge graphs** for trustworthy medical information access.
- Lecturer in Information Retrieval (IR) and Recommender Systems (RS) at the University of Milano-Bicocca, covering theory and practical IR system development.
- **Mentored and supervised 11** MSc and BSc students through research training and thesis development.

Marie Skłodowska-Curie Early Stage Researcher 2020 – 2024
University of Milano-Bicocca, Milano, Italy *EU Horizon 2020 ITN DoSSIER*

Scope: Domain-specific search systems | Biomedical IR | **IR Innovation**

Impact: PhD research on professional search systems for healthcare and legal domains within the EU Horizon 2020 DoSSIER.

- Developed **DtMRF**, a novel decision-theoretic ranking framework for task-specific aggregation of ranking signals, that produces interpretable rankings while improving retrieval effectiveness with minimal latency overhead.
- Designed and implemented **domain-specific search pipelines** for healthcare and legal information access using lexical and neural retrieval models.
- Conducted large-scale experimental evaluation of retrieval architectures across benchmark datasets using ranking metrics and statistical significance testing.
- Collaborated with **international research and industry partners** including Spinque, TU Wien, and Leiden University on retrieval modelling and evaluation methodologies.
- Delivered multiple research presentations, tutorials, and invited talks at international workshops, conferences, and academic training schools.

Education

PhD in Computer Science (Marie Skłodowska-Curie Fellow) 2020 – 2024
University of Milano-Bicocca, Milano, Italy *Marie Skłodowska-Curie ESR (DoSSIER Project)*

Focus: Developed domain-specific search models designed to improve retrieval effectiveness in complex professional search scenarios.
Key outcomes: WIREs: Data Mining and Knowledge Discovery | Journal of Information Technology & Decision Making

MSc in Advanced Electrical & Computer Engineering 2018 – 2020
Democritus University of Thrace, Xanthi, Greece *Specialization: Information Retrieval*

Focus: Designed and validated core retrieval strategies that empirically improved search effectiveness in ranking systems.
Outcomes published in: Information Retrieval Journal

Integrated Master's in Electrical & Computer Engineering 2013 – 2018
Democritus University of Thrace, Xanthi, Greece *Specialization: Data Mining & Social Media Analytics*

Focus: Developed a real-time social media analytics dashboard to monitor consumer intentions and support decision-making.
Outcomes published in: Operational Research Journal

Selected Research Contributions

24 Publications and research outputs | 161 citations | h-index 9 | Google Scholar

Focus: Information retrieval | RAG systems | LLMs for IR | LLMs in healthcare | Evaluation frameworks

Retrieval Models and Ranking — Ranking optimization, query representation, dense retrieval modelling, and decision theoretic IR models for professional search systems. Publications: **Peikos G.**, Pasi G. ***WIREs DMKD Journal 2024*** | **Peikos G.**, Pasi G. ***IJITDM 2025*** | **Peikos G.**, Alexander D., et al. ***ECIR 2023*** | Sokli E., Kasela P., **Peikos G.**, Pasi G. ***WI-IAT 2025 (Best Paper)***

LLM Augmented Retrieval Systems — Retrieval and verification pipelines combining large language models with structured knowledge sources for trustworthy medical information access. Publications: **Peikos G.**, Kasela P., Pasi G. ***WI-IAT 2024*** | Milanese G., **Peikos G.**, et al. ***ECIR 2025*** | Sokli E., **Peikos G.**, et al. ***EMNLP 2025***

Evaluation and Benchmarking — Evaluation methodologies, shared-task systems, and tools for analyzing retrieval system performance in professional domains. Publications: Kusa W., **Peikos G.**, et al. ***ACM ICTIR 2024*** | **Peikos G.**, Kusa W., et al. ***ECIR 2025 (ASPIRE)*** | Kusa W., **Peikos G.**, et al. ***BioNLP 2022***

Honors, Awards & Professional Development

Marie Curie Fellowship	Selected for a prestigious European Commission Horizon 2020 doctoral fellowship to conduct PhD research within the DoSSIER Innovative Training Network.
Best Paper Award	IEEE/WIC WI-IAT 2025 award for research on mixture-of-experts architectures for dense retrieval systems.
CINECA ISCRA HPC	Awarded access to CINECA high-performance computing resources for large-scale LLM training and retrieval system research.
Startup Competition Winner	Member of the winning team at the Clean Tech Academy - EIT Deep Tech Talent Initiative for developing an AI-powered circular network supporting electronic device repair and reuse.
Postgraduate Certificate	Postgraduate Certificate in Researcher Professional Development, recognizing advanced researcher competencies across research practice, impact, and professional development.
Grant Proposal School	Training school on transforming research ideas into structured grant proposals for European research funding.

Academic Service

Academic Reviewing	Reviewer and Program Committee member for 22 international conferences and journals in Information Retrieval, NLP, and AI systems. Reviewer for national and international research grant proposals.
Community & Training	Organizer of workshops and hackathons; delivered tutorials and invited talks at international conferences and training schools.

Additional Experience

Military Service 2019 – 2020
Hellenic Army, Greece *Mandatory service*

- Developed internal software tools and maintained operational databases for equipment tracking and reporting.
- Supported personnel coordination, scheduling, and daily operational activities in a structured team environment.