# Ananya Gupta

EPFL | Google - SDE III | IIT BHU | USC Viterbi
LinkedIn: https://linkedin.com/in/ananya94

+41-783338825
ananya99gupta@gmail.com
Lausanne, Switzerland

## Education

- **EPFL, Lausanne, Switzerland**
  *MS in Computer Science* — *Sept. 2024 - Ongoing*

  Coursework: Machine learning, Mathematics of Data, Reinforcement learning, Visual Intelligence, Distributed Algorithms, Concurrent Computing

- **Indian Institute of Technology, BHU, Varanasi, India** — GPA: 9.58/10.0
  *Bachelor of technology in Electrical Engineering; Transcript* — *Jul. 2016 - May. 2020*

## Interests and Skills

- **Areas of Interest:** Machine learning, Deep Learning, Diffusion models, Optimization, Distributed Systems
- **Languages & tools:** C++, Java, Python, Pytorch, numpy, Git, Cuda

## Work Experience

- **AI Engineer Intern** — Lausanne
  *AI Team, Nexthink* — *Aug. - Jan 2025*

  My Project aims to **Enhance Retrieval in RAG systems** using Hybrid and Knowledge Graph powered approaches

  - Built an automated data pipeline to collect real user queries, augment and annotate them using LLMs, and generate a high-quality baseline evaluation dataset.
  - Developed a comprehensive evaluation framework supporting multiple retrieval methods and benchmarking them using diverse metrics.
  - Implemented hybrid retrieval that integrates keyword and semantic search, outperforming naïve semantic-only baselines.
  - Constructed large-scale knowledge graphs from heterogeneous data sources and designed graph-based search strategies to identify missing but relevant entity links and improve retrieval coverage.

- **Teaching Assistant** — EPFL
  *VITA Lab* — *Feb. - Jul. 2025*
  - Teaching Assistant for EPFL Master's level course Deep Learning for Autonomous Vehicles

- **Software Engineer III** — Bangalore, India
  *Google Search, Google* — *Aug. 2020 - Aug. 2024*
  - **Learning & Exposure:** Gained deep insights into maintaining and modernizing large-scale, complex systems like Google Search. Worked with Java, C++, internal rendering frameworks, and microservices-based architecture while leveraging cutting-edge technologies like Generative AI.
  - **Key Contributions:**
    * Migrated first set of Search features to the new micro-services based architecture resulting in improvement of development **build time by 50%, edit-refresh time by 75% and page reload time by 68%**.
    * Built an automated dashboard pipeline to analyze the prerequisites and track the progress of feature migration, **cutting manual effort from days to minutes.**
    * Contributed to the design and implementation of an **LLM-driven agentic workflow** to automate code generation, modification, building, and testing for large-scale migrations in Google Search and beyond. Co-developed evaluation strategies and integrated continuous feedback loops to enhance model learning and performance.
    * **Google Research(AI for Social Good Associate):** Mentored and co-led the development of an ***AI-based Smart Assistant for Child Deliveries in Low Resource Areas*** to assist nurses in documenting the observations during labor(Partograph monitoring) and in identifying anomalies and taking appropriate action. Built Automatic Speech Recognition(ASR) models using Kaldi toolkit and integrated with an android app. The prototype underwent a successful pilot in rural maternity care centre, located in Patna, Bihar.

## Research Experience

- **Extending LUNA(Tissue Reassembly with Generative AI) to cell morphologies** EPFL
  *Semester Project supervised by Prof. Maria Brbić* *March 2025 - Ongoing*
  - LUNA is a generative AI model that reconstructs tissue structures from gene expressions of cells by learning spatial priors over existing spatially resolved datasets.
  - Extended the existing LUNA generative diffusion model by integrating cell morphology images and global tissue images to improve spatial reconstruction of tissues from gene expression data.
  - Currently working on a novel framework to condition coordinate generation on global tissue images, constraining predicted cell distributions to match realistic tissue shapes and anatomical structures.

- **3D Steady-State SplinePINNs for solving Navier-Stokes** EPFL
  *Course Project* *Oct 2024 - Jan. 2025*
  - Developed SteadyStateSplinePINNs, a novel Physics-Informed Neural Network (PINN) architecture integrating **U-Net CNNs with Hermite splines** to solve steady-state Navier-Stokes and heat equations in 3D domains.
  - Formulated a physics-informed loss function, incorporating boundary condition constraints and supervised learning using CFD simulation data to improve model convergence.
  - Achieved significant improvements in solution accuracy, with lower RMSE compared to traditional PINNs, demonstrating effectiveness in fluid dynamics and heat transfer modeling.

- **Biomimetic Neuromorphic Circuits** USC, Viterbi School of Engineering, LA, USA
  *Summer Research Scholar, Supervised by Prof. Alice Parker, Report* *May 2019 - Jul. 2019*
  - Gained in-depth knowledge of neuromorphic circuit design, including neuron and synapse modeling in both theory and hardware. Worked on spiking neural networks (SNNs) and designed analog neuromorphic circuits using CMOS and memristors in Cadence.
  - Constructed a switching neural network consisting of excitatory and inhibitory synapses to **model inhibition and signal routing** in the human nervous system. This model illustrated how the brain selects and routes information to its destination.
  - Incorporated basic Synaptic Time-Dependent Plasticity to demonstrate its **application in reinforcement learning**. The model was later deployed in an autonomous tendon driven robotic limb to make it learn walking.

- **Parkinson Tremor Reduction using Self-tunable Vibration Absorber** IIT BHU, India
  *Undergraduate Project, Supervised by Prof. Shyam Kamal, Report* *Jul. 2019 - Apr. 2020*
  - Developed a mathematical model integrating control systems to mitigate Parkinson's tremors.
  - Conducted FFT analysis and explored various frequency absorbers through simulations in MATLAB and Python.
  - Achieved a 95–98% reduction in tremor amplitude by coupling a sophisticated human arm model with a vibration absorber.

## Honours and Awards

- Won **2nd prize Women in Tech Hackathon** focused on the theme "Empowering women through technology" by Presenting an enhanced Search privacy feature to empower people(specially women) to have a better control over their online privacy.
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- Awarded by **Director's Gold Medal** for excellent academic and co-curricular performance in B.Tech batch of 2020, comprising 1000+ students in IIT BHU
- **MIT India Initiative**(Design, Technology & Social Innovation workshop 2020): Presented an prototype to tackle the issue of medical non-compliance by an AI-based voice-call reminder system.
- Received **Special Mention** (Gymkhana Awards) 2018-19 for outstanding and significant contribution to the Science and Technology Council as the secretary of Robotics club.

## Extracurricular

- **Joint secretary of Robotics Club**(2018-19): Organized robotics events and workshops, and led the college robotics team in competitions.
- **Joint secretary** and volunteer of Social Service Club, **Kashi Utkarsh**(2016-2020): Contributed to educating underprivileged children, organized educational activities, and conducted medical camps for health awareness.