ANUSHKA SHARMA

AI Researcher | Open-Ended Evolution & AGI Safety | Evolutionary Computation

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Research Profile

Undergraduate AI researcher specializing in open-ended evolution and AGI safety through constraint-driven systems. I design evolutionary frameworks that sustain novelty generation without explicit fitness functions, addressing reward hacking in artificial general intelligence. My work explores principles fundamental to nature-inspired AI and biological evolution, bridging evolutionary computation, intrinsic motivation, and cognitive architectures for safe, open-ended learning systems.

Currently seeking summer 2026 research opportunities to advance open-ended learning systems and evolutionary AI.

Core Research Interests: Evolutionary Computation, Open-Ended Evolution, AGI Safety, Intrinsic Motivation, Constraint-Based Learning, Cognitive Architectures, Human-AI Collaboration, Embedded Intelligence

Project Links:
Genesis: Emergence
Genesis: Evolution Sandbox

Education

2023 – 2027: B.Tech in Electronics & Communication Engineering

Banasthali Vidyapith, Rajasthan, India
CGPA: 8.89/10.00 (3.56/4.00 equivalent)
Relevant Coursework: Machine Learning, Data Structures & Algorithms, Probability & Statistics, Linear Algebra, Optimization, Signal Processing, Embedded Systems, Computer Architecture

2022: Class XII (CBSE)

Dewan Public School, Meerut, Uttar Pradesh
Score: 90% – Physics, Chemistry, Mathematics, Computer Science

Research & Publications

Sustained Evolutionary Activity Without Fitness Functions

Anushka Sharma. *GECCO 2026 (Under Review)*
Genesis Engine: Investigated reward hacking in AGI by designing a constraint-driven evolutionary system that sustains open-ended novelty without explicit fitness functions.

- **Result:** Achieved **58.3% sustained activity rate** over **10,000 generations** across **12 independent runs**
- **Statistical Significance:** $p < 0.01$, Cohen's $d = 1.47$ (large effect size)
- **Novel Contributions:** Developed two new metrics for measuring evolutionary viability:
  - CARP (Cumulative Activity Rate Preservation) - measures sustained novelty generation
  - PNCT (Phenotypic Novelty Continuity Threshold) - quantifies phenotypic diversity maintenance
- **Implementation:** Custom evolutionary framework with **constraint-based selection**, **genealogical tracking**, and **phenotypic distance metrics**
- **Impact:** Demonstrates AGI-relevant open-ended learning that addresses reward hacking through intrinsic motivation
- **Tech Stack:** Python 3.9+, NumPy, Matplotlib, SciPy (statistical analysis), Custom evolutionary operators

Artificial Intelligence: What it Means to Us

Anushka Sharma. *Aegis India, 2023*
International publication simplifying AI for non-technical audiences. Covered ethical implications, societal impact, and consciousness in AI. Published at age 17.

Research Projects & Competitions

VisionIRL: Offline AI Navigation | Qualcomm Edge AI Hackathon Finalist

June 2025, Bengaluru

- **Achievement:** Selected from **650+ teams** across India, recognized as **youngest and most appreciated team**
- **System Design:** Built offline-first AI navigation system for visually impaired using real-time object detection with **zero cloud dependency**
- **Performance Optimization:** Achieved **>20 FPS** inference on Snapdragon NPU with **<50ms end-to-end latency**
- **Model Architecture:** Deployed quantized YOLOv5s (INT8) optimized for mobile edge inference
- **Edge Deployment:** Implemented **TensorFlow Lite** pipeline with **Snapdragon Neural Processing SDK**
- **Impact:** 100% reduction in cloud dependency, enabling navigation in areas with poor connectivity
- **Tech Stack:** Python 3.9, OpenCV 4.5, TensorFlow Lite 2.12, Qualcomm Snapdragon Neural Processing SDK, Android NDK
- **Hardware:** Snapdragon development board, Raspberry Pi 4B (prototyping), USB camera module

ApnoBot: Context-Aware AI Chatbot

May – June 2025

- **System Design:** Built AI-powered Telegram bot with **adaptive response generation** based on user mood, language preferences, and conversation context
- **Context Memory:** Implemented **sliding window context system** (last 10 messages) with **JSON-based state persistence**
- **Sentiment Analysis:** Integrated **real-time tone detection** using OpenAI GPT-3.5-turbo with custom prompt engineering
- **Role-Based Responses:** Designed **multi-persona system** with role-switching based on user emotional state
- **Architecture:** Flask backend with **asynchronous message handling** via Python-Telegram-Bot library
- **Tech Stack:** Python 3.9, Flask 2.3, Telegram Bot API, OpenAI API (GPT-3.5-turbo), JSON, python-telegram-bot 20.x
- **Skills:** Natural Language Processing, API Integration, Conversational AI, Prompt Engineering, Asynchronous Programming

SynthPredict: ML for RTL Synthesis | Google Girl Hackathon – Round 3

February 2025

- **Achievement:** Advanced to **Round 3 nationally** among thousands of participants
- **Model Performance:** Developed ML model achieving **98% prediction accuracy** for RTL combinational depth estimation
- **Feature Engineering:** Extracted domain-specific features: **Fan-In**, **Fan-Out**, **Gate Count**, **Critical Path Length**
- **Model Architecture:** Ensemble approach combining **MLP (Multi-Layer Perceptron)** and **XGBoost** for robust predictions
- **Interpretability:** Applied **SHAP (SHapley Additive exPlanations)** for feature importance analysis and model transparency
- **Impact:** Eliminates hours of waiting for full synthesis, providing **instant depth predictions** during design iteration
- **Tech Stack:** Python 3.9, scikit-learn 1.2, XGBoost 1.7, SHAP 0.41, Pandas, NumPy, Matplotlib
- **Dataset:** Trained on **custom RTL design corpus** with labeled synthesis results

Autonomous Drone Mapping | IIT Bombay E-Yantra – Round 2

October 2023 – January 2024

- **Achievement:** Advanced to **Round 2** in national robotics competition
- **Team Leadership:** Led team of **4 members** developing live drone mapping system for disaster management scenarios
- **Autonomous Navigation:** Implemented **waypoint-based path planning** with **obstacle avoidance algorithms**
- **SLAM Implementation:** Developed **real-time mapping** using **ROS (Robot Operating System)** with **sensor fusion**
- **Tech Stack:** Python, ROS Melodic/Noetic, OpenCV, PX4 autopilot firmware
- **Hardware:** Pixhawk flight controller, GPS module, camera module
- **Skills Gained:** Drone flight operations, ROS ecosystem, sensor fusion, embedded systems integration, team coordination

Current Projects

Wireless Drone Charging System

January 2026 – Present (Expected: May 2026)

- **System Design:** Developing **AprilTag-based precision landing** with **inductive charging** for autonomous drone operations
- **Vision System:** Implementing **real-time marker detection** and **6-DOF pose estimation** using OpenCV
- **Tech Stack:** OpenCV 4.x, Python, Computer Vision, Embedded C++
- **Hardware:** PID control system

AI-Based Blood Flow Monitoring

January 2026 – Present (Expected: June 2026)

- **Medical AI Application:** Building **non-invasive blockage detection** system using PPG/Doppler sensors
- **ML Pipeline:** Implementing **TensorFlow-based classification model** for real-time arterial blockage detection
- **Tech Stack:** TensorFlow Lite 2.x, Raspberry Pi 4, Python, Signal processing (SciPy), Embedded ML
- **Hardware:** PPG sensor module, Doppler ultrasound sensor, Raspberry Pi 4B

Autonomous Robot Cart

December 2025 – Present (Expected: April 2026)

- **Autonomous Navigation:** Implementing **real-time obstacle avoidance** and **path planning** using computer vision
- **Edge Computing:** Deploying vision algorithms on **NVIDIA Jetson Nano** for on-device inference
- **Tech Stack:** Jetson Nano, C++, Python, OpenCV, ROS (optional), Motor control libraries
- **Hardware:** Jetson Nano 4GB, USB camera, ultrasonic sensors, motor drivers

Professional Experience

June – September 2024: ML Engineer Intern

SecureVision.Tech (IIT Madras Incubated), Remote

- **Model Improvement:** Enhanced facial recognition robustness under challenging real-world conditions (**low-light, motion blur, extreme pose variations**), achieving **15% performance gain** in accuracy
- **Optimization:** Reduced inference latency by **20%** through **model quantization** and **deployment pipeline optimization**
- **Tech Stack:** Python 3.8, TensorFlow 2.x, OpenCV 4.x
- **Skills:** Computer Vision, Model optimization, Real-world ML deployment, Cross-functional collaboration

June – October 2024: Head of AI Development Department

ADM Foundation (Youth Empowerment NGO), Remote

- **Team Leadership:** Led and mentored **15-member technical team** in AI development initiatives with **95% on-time delivery rate**
- **Process Optimization:** Implemented **agile workflow automation** and project tracking, reducing turnaround time by **25%**
- **Coordination:** Facilitated cross-functional collaboration between technical and program teams for integrated project execution
- **Skills:** Leadership, Team management, Technical mentorship, Workflow automation

June – July 2024: C++ Developer Intern

ApnaGuide, Remote

- **Bug Resolution:** Debugged and resolved critical bugs across **10+ modules**, reducing high-severity issues by **30%**
- **Performance Optimization:** Applied **algorithmic optimizations** (data structure improvements, memory management) to improve runtime efficiency by **12%**
- **Tech Stack:** C++14/17, STL, debugging tools (GDB, Valgrind), version control (Git)
- **Skills:** C++ programming, Algorithm optimization, Debugging, Software architecture, Code review

Open Source Contributions

AutoPage – Merged Pull Request

AutoLab-SAI-SJTU, October 2025

- **Feature:** Implemented **domain detection system** for adaptive technical documentation generation
- **Contribution:** Created **section templates** for API manuals, product specifications, and research papers
- **Impact:** Improved documentation quality and consistency for **1,000+ users**

- **Tech Stack:** Python, HTML/CSS templating, Natural Language Processing for domain classification
- **Status: Merged PR** - actively used in production

DeepAgent – Feature Proposal & Implementation

RUC-NLPIR, October 2025

- **Research Contribution:** Designed **emotional context tracking framework** for multi-agent memory systems
- **Experimental Results:** Demonstrated **40% reduction in task failure rate** when preserving emotional signals during memory compression
- **Methodology:** Conducted **baseline analysis** showing **67% average emotional loss** during standard compression; proved correlation between emotional preservation and task success
- **Implementation:** Built working prototype with **emotional signal extraction**, **baseline analysis**, and **task impact correlation**
- **Status:** Received **positive response from maintainers** for future consideration
- **Tech Stack:** Python, JSON schema extension, LLM prompt engineering

Technical Skills

Programming Languages:
Python (3.8+, proficient), C++ (14/17/20, intermediate), C (embedded/systems programming), JavaScript (ES6+), Verilog (HDL)

ML/AI Frameworks & Libraries:
TensorFlow (2.x), TensorFlow Lite, PyTorch, scikit-learn (1.x), OpenCV (4.x), XGBoost, SHAP, NumPy, Pandas, Matplotlib, SciPy

Embedded Systems & Hardware:
Raspberry Pi (3/4), ESP32, NVIDIA Jetson Nano, Arduino, Pixhawk (PX4), ROS (Melodic/Noetic), Snapdragon NPU

Development Tools & Platforms:
Git/GitHub (version control, PR workflows), Linux (Ubuntu, command-line proficiency), Docker (containerization), Flask (web backend), Streamlit, LaTeX (technical writing)

Specialized Skills:
Evolutionary Computation, Multi-Agent Systems, Statistical Analysis (hypothesis testing, effect size), Edge AI (model quantization, NPU optimization), Computer Vision (object detection, pose estimation), NLP (sentiment analysis, prompt engineering)

Professional Competencies

Research & Problem Solving • Technical Communication • Project Management & Execution • Leadership & Collaboration
Demonstrated through GECCO submission, 15-member team leadership (95% delivery rate), YouTube channel (10K+ subscribers), and open-source contributions.

Honors & Awards

- **Qualcomm Edge AI Hackathon 2025:** Top 10 Finalist from 650+ teams nationwide

Science Communication

YouTube Channel: @AnuzkaSharma

Technical content on AI research, evolutionary computation, and embedded systems (2022–Present)

Availability

Available for Summer Research Fellowship June–August 2026 (8-10 weeks) at INSAIT, Sofia, Bulgaria. Returning to B.Tech program (Expected graduation: July 2027) after completion.

Research Expertise Alignment

Machine Learning: Evolutionary algorithms, intrinsic motivation systems, constraint-based learning
Algorithms & Theory: Novelty search, quality-diversity algorithms, genealogical tracking
Natural Language Processing: Sentiment analysis, prompt engineering, conversational AI

Languages

English (Fluent), Hindi (Native)