Arya Pratap Singh

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Career Objective: Integrating Artificial Intelligence with every possible field of science, for serving the society and contributing to the scientific community.

Academic Record:

- Post-Graduation Diploma (PGD) in Remote Sensing & GIS from Indian Institute of Remote Sensing (IIRS) – Indian Space Research Organization (ISRO), Dehradun with specialization in Spatial Data Science
  Academic duration: 2021-2022
  CGPA: 8.20/10.00

- Bachelor of Technology (B.Tech.) in Computer Science from Acropolis Institute of Technology and Research (AITR), Indore affiliated to Rajiv Gandhi Proudyogiki Vishwavidyalaya (RGPV).
  Academic duration: 2017-2021
  CGPA: 7.40/10.00

- Senior Secondary School Certificate (10+2) from Silver Bells School, Gwalior affiliated to Central Board of Secondary Education with 60.8% in the year 2016.

- High School Certificate (10th) from Little Angels High School, Gwalior affiliated to Central Board of Secondary Education with 7.0 CGPA in the year 2014.

IT/ Core Skills: Python, C++, C, R, Machine Learning, Deep Learning, Parallel Computing, Supercomputing, TensorFlow, Scikit-Learn, Pytorch, Astropy, Gdal, Rasterio, Matplotlib, Hyperspectral, Multispectral, SAR.

Softwares/Tools: Spyder, Jupyter Notebook, Google Colab, QGIS, ArcGIS Pro, ArcGIS, ERDAS Imagine, ENVI, SNAP, Leica Photogrammetry Suite, MS-Office Suite, Planetary Imaging Pre- Processing (PIPP), Registax, Autostakkert.

Research Experience:

- Title: ***Identification of altered minerals (Carbonates and Serpentines) on Mars using Machine Learning.***
  Supervisor: Dr. Mamta Chauhan, Scientist - 'SD', IIRS - ISRO
  Description: Identification of Carbonates and Serpentines on Mars using Deep Learning algorithms, SVM, Random Forest, XGBoost, and their comparative analysis on the basis of accuracy achieved by each algorithm.
  Organization: **Final Project Work in PGD, Remote Sensing & GIS, 2022, IIRS - ISRO, Dehradun (Completed)**

- Title: ***Identification of potential sites for groundwater recharge using Rainwater Harvesting techniques in Bhilwara district of Rajasthan using Python.***
  Description: Integration of multiple parameters that are responsible for rainwater collection in the ground (soil, lulc, slope, runoff potential, aquifer and drainage density). Further AHP was applied for finding suitable sites.
  Organization: Independent Project, July 2022 (Completed)

- Title: ***Analysis and Prediction of Solar Flares from X-ray Solar Monitor (XSM), Chandrayaan -2 data (lc and pha) using Machine Learning in Python.***
  Description: Time Series Analysis of solar flares for their prediction using the light curve (lc) data, and identification of spectral characters using Spectrum file (pha).
  Organization: Independent Project, 2022 (Ongoing)

- Title: ***Development of Parallel Computing Architecture in Python for Hyperspectral Image Pre-Processing.***
  Description: Parallelizing tasks such as Spectral Smoothing, Continuum Removal using Multithreading and Multiprocessing in Python which resulted in **2500** times faster processing speed than traditional softwares.
  Organization: Project Work in PGD, Remote Sensing & GIS, 2022, IIRS - ISRO, Dehradun

- Title: ***Detection of potential sites on the Moon for surface water - ice using temperature and reflectance measurements.***
  Description: Detection of surface water-ice on Moon using temperature (DIVINER, LRO) and normal albedo (LOLA, LRO) in python. Deduced correlation between the two, and visualized the sudden peak changes through matplotlib which indicated potential water-ice sites.
  Organization: Project Work in PGD, Remote Sensing & GIS, 2022, IIRS - ISRO, Dehradun

- Title: ***Detection of Lava Tubes on the Moon using CNN.***
  Description: Binary CNN Classifier was trained and a sliding kernel of a specific size was rolled over the image pyramids (pyrUp & pyrDown - OpenCV) created to detect the object. Training dataset of lava tubes was manually prepared.
  Organization: Project Work in PGD, Remote Sensing & GIS, 2022, IIRS - ISRO, Dehradun

- Title: ***Site Suitability Analysis for prospective lunar colonies.***
  Description: Identification of suitable sites on the lunar poles for prospective colonization using topographic and surface characteristics.
  Organization: Individual project, 2021

- Title: ***Air quality mapping and analysis of Delhi region using GIS tools.***
  Description: Change in pollutants (Particulate Matter, Ozone(O_3), Nitrogen dioxide (NO_2), Sulphur dioxide (SO_2), Carbon Monoxide (CO)) were visualized for pre, during and post COVID in Delhi region using QGIS and ArcGIS, and hotspots were detected where systematically, air purifiers can be installed.
  Organization: Project Work in PGD, Remote Sensing & GIS, 2021, IIRS - ISRO, Dehradun

Publications/Conferences:

- Presented Oral paper titled, "**Advanced vision assisted automated georeferencing methodology for optical payloads for sub-pixel inter-frame accuracy"**, at **VH-RODA 2025**, (Frascati, Italy) organized by **European Space Agency (ESA)** under the session, *Session 4: Processing and Algorithms including AI 1* (19th Nov 2025).

- Presented Oral paper titled, "**India's first edge computing mission : A technical dive"**, at **JACIE Workshop 2025**, in **USGS HQs**, Reston, Virginia organized **by USGS, NASA, NGA, NOAA, NRO, USDA, *in person*** and as the **only Indian National** invited in person the same year.

- Published paper titled **Machine learning-based approach on PRISMA data for mapping Nidar ophiolites in Ladakh, India,** in the peer reviewed journal **Current Science.**
  Singh, Arya Pratap; Chauhan, Mamta; Sur, Koyel; Srivastava, Ananya; Chauhan, Prakash; Sharma, Richa U.

- Published paper titled **Lithological Mapping of Nidar Ophiolite Complex, Ladakh using High-Resolution Data and Machine learning technique,** in the peer reviewed journal **Advances in Space Research, Science Direct.**
  Mamta Chauhan , Koyel Sur , Prakash Chauhan , Himani Joshi , **Arya Pratap Singh**, Aakanksha S. Borkar.

- Presented paper titled **Classification of Carbonates on Mars using Machine Learning** at **54rd Lunar and Planetary Science Conference** under Planetary Exploration Activities category, organized by Lunar and Planetary Institute and NASA Johnson Space Center**,** in March 2023.
  Singh Arya

- Presented Oral paper titled, "**Machine Learning based approach to remove noise from VIRTIS data and its utilization for detection of sites of active volcanism on Venus"**, at **Venus Science Conference 2022** organized by Physical Research Laboratory, Ahmedabad, in September 2022.

- Presented Poster titled, "**Site Suitability Analysis for prospective lunar colonies using various DEM derivatives and lava tubes identified using Machine learning**" at **53rd Lunar and Planetary Science Conference** under Planetary Exploration Activities category, organized by Lunar and Planetary Institute and NASA Johnson Space Center**,** in March 2022.

- Presented Poster titled, "**Site Suitability analysis for prospective landing sites near lunar poles**" at **3rd Indian Planetary Science Conference**, organized by Physical Research Laboratory, Ahmedabad, in May 2022.

Experience :

- **Sr. Applied Scientist - III – KaleidEO, A SatSure Company**
  Duration [DD/MM/YYYY] - 01/07/2025 : Present
  - (Existing responsibilities as mentioned in the positions below, with mission timeline constrained deliverables. More of a technical representation role for the company. Training new hires, existing researchers, and ownership of end to end business solutions delivery from technological point of view.)

- **Sr Machine Learning Researcher - KaleidEO, A SatSure Company**
  Duration [DD/MM/YYYY] - 01/10/2023 : 01/07/2025
  - Leading the edge computing and data processing division at KaleidEO. Working on Edge Computing devices (NVIDIA Jetson Orion Nano, Unibap-ix10, Intel Neural Computing Stick etc.). Developing **parallel computing** architectures using multithreading, multiprocessing, **GPU computing**

including **CUDA computing** , AMD based **HIP, HIPIFY-Clang**, **LLVM** based optimizations.

- Solo lead architect for developing **India's first Edge Computing Testing Mission** (acknowledged by the satellite partner). Optimised **3** hours of compute time to **1.5** mins. Developed a geography and sensor agnostic **UNET** model for road network detection in real time. Implemented gdal compatible parallel optimized computing packages for **L0 to L2** processing in real time.

- Solo lead architect for KaleidEO's aerial high resolution payload **data processing chain**. Developed a **resolution agnostic**, **multispectral sensor** compatible sub-pixel radiometrically accurate pipeline using **advanced CV** and statistical methods. Corrects for platform instability induced for any imaging system (**aircraft, satellite, drones** etc.)

- Lead and collaborated with the hardware team to develop the calibration and validation **(Cal/Val)** plan for multispectral payloads in terms of radiometry and geometry. Proposed state of the art (SOTA) tests and algorithms for **pre-flight** and **in-orbit** to characterize and correct for **SNR** and **MTF**, lens distortion, filter crosstalks, thermal aberration effects, fixed pattern noise (FPNs), band to band co-registration, TDI linearity etc. Collaborating for satellite system optimizations for **FPGAs**, **data latency** and **power budgeting** for edge computing in real time. Creating L0 (raw) to L4 (Analysis Ready Data) Pipeline at scale.

- **Machine Learning Researcher – SatSure**
  Duration [DD/MM/YYYY] 01/01/2023 : 30/09/2023

  - Developing automated geospatial pipelines (**gdal and rasterio**) for **agri**-oriented crop classification, object detection etc. for multiple business use cases using **Yolo**, **CNNs, Unet, Transformers** etc. Creating **docker** containers for machine cluster compatibility.

  - Development of performance clusters and parallel computing architectures for massive raster and vector processes to run in parallel using **multithreading, multiprocessing, OpenMPI, Cython** etc.

  - Proposed high performance automated pipelines for processing of **DEM**, **automated georeferencing** and **hyperspectral processing** for crop and mineral classification.

  - Led innovative research projects including **Quantum Computing** using **Hybrid Quantum Neural Networks** to solve **big-data** geospatial problems.

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- **Internship, 2C Secondary Cities, Department of US Government**
  Duration [DD/MM/YYYY] - 01/01/2018 : 01/07/2018

  - Contributed to Open Street Maps (OSMs) for mapping medical facilities which could be used at the time of calamities.

- **Internship, Walkover Web Solutions (Technical Support Engineer)**
  Duration [DD/MM/YYYY] - 05/07/2019 : 01/10/2019

  - API testing through Postman

Invited as Guest/ Lectures Given:

- Invited as a lecturer at NITK-Surathkal to demonstrate hands on training for **EDA, Model Tuning with AutoML and Edge Computing** organized in collaboration with **IEEE-GRSS** for Bachelor's, Master's and PhD students.
- Invited at Skyserve HQs, Bengaluru India to give an industry talk on Edge Computing, its potential in real time disaster responses, strategic use cases and future of space based computations organized by Let's Talk Spatial.
- Mentored 100+ students about geospatial computing in real time organized by Hex Star Universe through a 2 day workshop on 13-14 July, 2024
- Trained researchers, professionals and students about Deep Learning and Edge Computing for Remote Sensing problems at a 2 day workshop organized by Hex Star Universe on 31st Aug - 1st Sep 2024.
- Trained researchers, professionals and students about Parallel Computing, Geospatial Computing, Edge Computing for a 1 month training program organized by Hex Star Universe on 07th Jan - 07th Feb 2025
- Invited at LAHS Gwalior as a guest scientist to mentor school kids about how they can aspire to make their careers in the space industry.
- Interviewed by the interview portal as an impactful data scientist working in a space based domain.
- Invited as a guest speaker at Acropolis Indore to mentor students about careers in space based computations domain.
- Invited as a guest for a podcast organized by Phoenix Robotics Club to discuss my work on Moon, Mars and Earth based problems.
- Invited as a guest for a podcast discussing challenges and future of space-based computations.

Achievements/Awards/Honors:

- Became the **first Indian** in the **history** **of Indian space ecosystem** for demonstrating successful edge computing in space. Created algorithms which are **80 times faster** than any known techniques and **reduced** the data volume by **99%** leading to faster downlinking without data loss.
- **Best paper presentation award** at Venus Science Conference 2022 organized by Physical Research Laboratory, Ahmedabad, in September 2022.

- Achieved **All India Rank – 3** in **Geo-Innovation Challenge** on **Geospatial Science and Technology in Hyperspectral Image Analysis and Applications** organized by **National Geospatial Program**, **Department of Science and Technology (DST)**, **Government of India** in collaboration with BVM Engineering & ISTAR College.

- Titled as the "**Most Active Youth of Gwalior "** by the Municipal Corporation of Gwalior for organizing events and solving various social problems through the N.G.O, **Beautiful Tomorrow.**
- Earned **Gold Medal** at the University's **Classical Music Nodals Competition** organized by RGPV, Indore.
- Achieved **1st position** at the **Intercollege Debate Competition** organized by AITR, Indore.

- Crowned as **Swaranjali - Indore** in 2019 on achieving **1st position** at the music competition - Swaranjali organized by AITR, Indore.
- Achieved **1st position** at **Apna Manch (Open Mic)** organized by AITR, Indore.
- Achieved **1st position** at **Inter College Music Competition (Beatbox)** organized by SDPS College, Indore.

Leadership/Teamwork Experience:

- **Leading** the edge computing division at KaleidEO. Taking end to end ownership for collaborations with various space organizations around the globe with successful executions till date.
- **Founder** of the N.G.O **Beautiful Tomorrow**, which aims to bring sustainable changes in the environment, provides free education to the needy, resources to calamity-stricken people etc.
- **Founder** of Gwalior's 1st Astronomy Club, **GWALIOR ASTRONOMY CLUB**, which aims to provide free education in terms of astronomical observation through telescope, and optical astronomical data processing, conducting workshops and organizing quizzes.
- **Former Head** of the **Music club** of Acropolis Institute of Technology and Research from 2019 to 2021.
- **Campus Director** at RGPV for **Hult Prize Foundation** affiliated to the **United Nations** in 2020 and 2021.

Hobbies/Interests: Astronomical Observations through my telescope, playing guitar, Chess, Basketball, composing music, identifying real world problems, Astrology, Theology, Reading Vedic Texts, Meditation.

Strengths: Leadership qualities, Adaptable nature, Quick Learner, Confident, Multi-tasker, Active Visionary, Problem Solving ability, Ability to work in challenging situations, Fearless.

Additional Skills:

- **Languages:** English (Full professional proficiency), Hindi (Full proficiency) and Sanskrit (Elementary Proficiency).
- **Sports**: State-level Chess player, District-level Basketball player, District-level Badminton player.

Declaration:

I would take this opportunity to thank you for going through my resume and would request you to consider me for the area suitable to my caliber in your prestigious organization. The information provided above is up-to-date and correct to the best of my knowledge.

Place: Bangalore