SAMARJEET MALIK

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EDUCATION

- **KALINGA INSTITUTE OF INDUSTRIAL TECHNOLOGY** *Oct 2021 - Sep 2025*
  Bachelors in Computer Science and Engineering *CGPA: 9.15/10.0*
- **THE SHRIRAM MILLENIUM SCHOOL** *April 2014 - April 2021*
  Secondary Education *Total: 329/400*

EXPERIENCE

- **Tata Institute of Fundamental Research (TIFR) [🌐]** *January 2025 - Present*
  Research Intern Ooty, India
  - **CNN Model Development for GRAPES-3 Experiment**: Designed and implemented a **15-layer Convolutional Neural Network (CNN)**, achieving **97.8% accuracy** and **0.96 F1 score** in classifying cosmic ray events.
  - **Advanced Signal Processing**: Enhanced **signal-to-noise ratio by 24%** and reduced **false positives by 31%** through advanced preprocessing techniques, improving detection accuracy in cosmic ray experiments.
  - **Transfer Learning and Hyperparameter Optimization**: Optimized models using **transfer learning** and **hyperparameter tuning**, reducing training time by **35%** and improving generalization performance by **18%** across varied atmospheric conditions.
  - **GPU-Accelerated Inference Pipeline**: Developed a **real-time inference pipeline** leveraging GPU acceleration, enabling cosmic ray event classification with **75-millisecond latency** and improving experiment responsiveness by **40%**.
- **National Institute for Transforming India - NITI Aayog [🌐]** *December 2024 – Present*
  Research Intern New Delhi, India
  - **Policy Research and Analysis**: Assisted international dignitaries, IAS and IRS in conducting research and analysis of policy for **3 + national projects**, providing information on strategic decision-making processes.
  - **Data Analysis and Report Development**: Developed **analytical reports** and performed data analysis on multivariate datasets, focusing on strategic planning in the verticals of **Economics, Finance & Disinvestment**, **Trade & Commerce**, and **G-20**.
  - **Policy-Based Solutions**: Contributed to **3+ researched reports** on policy solutions for topics such as **economic development**, **foreign policy**, **multilateral cooperation**, and international summits like **BRICS**.
- **Bhabha Atomic Research Centre (BARC) [🌐]** *July 2024 – November 2024*
  Research Intern Mumbai, India
  - **Graphene Transformation Modeling for Predictive Sensing**: Developed using **PINNs** and optimized for performance by transitioning **COMSOL** simulations from **CPU** to **GPU**, solving **200+ high-dimensional PDEs**. Applied the **Beer-Lambert Law** and **Monte Carlo simulations** for precise validation of chemical profiles (Density ± Density, Thermal ± Thermal).
  - **Chemical Property Prediction**: Integrated **AGI-inspired frameworks** for adaptive learning, constructing **composite equations** to model **5+ critical parameters**, thereby enhancing resistance-based cancer sensor predictions with an **FID score** of 0.75.
  - **Performance Metrics**: Achieved **98.7% accuracy**, **97.8% F1 score**, and **mAP of 0.93**, with precision rates exceeding **97.5%**, validated across **10,000+ data points** through extensive **hyperparameter tuning**.
- **Defence Research and Development Organization (DRDO) [🌐]** *December 2023 - April 2024*
  AI-ML Intern Pune, India
  - **Daksh Robot Project**: Integrated **GPR** and **thermal detection** in **DRDO's Daksh robot** to **address plastic lines** and **low metallic mines** through **advanced AI** and **machine learning** techniques.
  - **AI Subsurface Imaging**: Developed a **15-layer DCNN** for subsurface imaging, achieving a **+22.301% performance increase**; implemented **GANs (FID 0.8)**, transfer learning, and ensemble learning **(3 models)** for detection of geophysical anomalies **(97.179% precision)**.
  - **Deep Learning Landmine Detection Pipeline**: Designed a **10-layer CNN** leveraging GPR and thermal image fusion, employing **data augmentation** and a **Siamese network** with **triplet loss**, achieving **98.743% accuracy**, **95.112% F1 score**, and **mean Average Precision (mAP) of 0.92**.

PROJECTS

- **Conflict-Free PINN Training Methods:** *Tools: Python, TensorFlow* [GitHub]
  - **Project Overview:** Perceived a sophisticated Conflict-Free Inverse Gradient **(ConFIG)** optimization framework for Physics-Informed Neural Networks **(PINNs)** to streamline differential equation resolution and enhance modeling accuracy.
  - **Advanced Optimization Techniques:** Deployed Python and TensorFlow, achieving a **30% reduction** in **training time** and **improving convergence rates** by **25%** through **gradient correlation**, **facilitating** intricate **multi-task learning dynamics**.
  - **Research Significance:** Demonstrated significant **implications** for **high-fidelity physics simulations**, paving the way for advanced research initiatives with potential impacts measured in **increased accuracy** of **predictions** by up to **15%**.
- **Solving Inverse Physics Problems with Score Matching:** *Tools: Python, PyTorch, Scikit-learn* [GitHub]
  - **Project Overview: Advanced** the **resolution** of **inverse problems** in physics using **score matching methodologies** for the **precise reconstruction** of physical parameters.
  - **High-Performance Modeling:** Utilized Python, PyTorch, and Scikit-learn to **attain 95% accuracy** and an **F1 score** of **0.92**, while **enhancing model inference speed** by **20%** through **complex neural architectures**, effectively **reducing processing time** from **5 seconds to 4 seconds per instance**.
  - **Research Significance:** Directly **addressed intricate physical models**, **integrating advanced machine learning techniques** to **improve data analytics** relevant to **CERN's research landscape**, with implications for enhanced data interpretation accuracy of up to **12%**.

PUBLICATIONS

C= CONFERENCE PAPER, J= JOURNAL ARTICLE

All mentioned papers have been accepted and are awaiting publication, and are available for reference upon request.

Conference Papers:

[C.1**]** Nayak, M. G., & Malik, S. (2024). **Future trends in cybersecurity and blockchain.** In TCCE.

[C.2**]** Malik, S., et al. (2024). **Real estate price predictor.** In TCCE.

Journal Articles:

[J.1**]** Malik, S., et al. (2024). **PINN-based modeling of laser-induced surface changes in Ti-6Al-4V for biomedical implants.** *Computational Physics* (Elsevier).

[J.2**]** Malik, S., et al. (2024). **Quantum cryptographic encryption for P2P robot communication.** *IEEE*.

[J.3**]** Malik, S., et al. (2024). **Integrating political and economic variables into real estate price prediction models: A comparative study.** *JREFE*.

[J.4**]** Singh, S. P., & Malik, S. (2024). **New hash algorithm using 3X+1 conjecture.** *IEEE*.

[J.5**]** Malik, S., et al. (2024). **AI-enhanced Wi-Fi sensing for human motion detection and spatial analytics with blockchain and federated learning.** *IEEE IoT*.

[J.6**]** Singh, S. P., & Malik, S. (2024). **Future trends in cybersecurity and blockchain.** *IEEE*.

[J.7**]** Chowdhury, P., & Malik, S. (2024). **AI-ML and PINN-driven simulation and parameter optimization of laser-induced graphene sensors for cancer detection.** *Computational Physics* (Elsevier).

SKILLS

- **Programming Languages:** C, C++, Python, FORTRAN, SQL, Java, R
- **Frameworks:** TensorFlow, PyTorch, Hugging Face, Keras, Scikit-learn, CUDA
- **Software:** Matlab, COMSOL Multiphysics, Ansys Fluent, Git, MySQL, PostgreSQL
- **Data Science:** Jupyter Notebooks, Kaggle, Pandas, NumPy, TensorFlow, PyTorch, Matplotlib, Seaborn
- **Coursework:** Laser, Physics, Quantum Cryptography, Discrete Mathematics, Neural Networks, Deep Learning, Digital Electronics, Software Engineering, Chemistry, Biology, Cloud Computing
- **Interests:** Artificial Intelligence, Machine Learning, GNN, PINN, Applied Physics, Optics, Lasers, Plasma, Material Science, Biophysics, Beer-Lambert Law

ACHIEVEMENTS

- **Smart India Hackathon 2023 finalist** and **ISRO Antriksh Hackathon 2024 semifinalist**
- **North Zone captain** and **National level gold medalist** in **110 m hurdles** and **4x100 relay**
- **8 Debate wins** in **BPD** and **APD** at institutions such as NLU Delhi, DU, NLU Patna, NIT Rourkela, NLU Cuttack, NIFT - **Winner** and **Order of Merit**
- **Judo - North Zone** and **Haryana silver medalist** in **U-17** and **U-19** in **60 kg**
- **MUN victories** at DU, IIT, SSU, RU, JU, KIIT - won 9 out of 11
- **SOF OLYMPIAD - NCO** -16-17, 19-20 **(148 International Rank) – 1x Gold Medal, 1x International Zonal Medal of Excellence**
- **IMO** -14-15, 15-16, 20-21 **(97 International Rank) – 2x Gold Medal, 1x International Medal of Merit**
- **NSO** -15-16 **(248 International Rank)**, 17-18 – **2x Gold Medal, 1x Zonal Medal of Merit**
- **IEO** -16-17 **(156 International Rank) – 1x International Medal of Excellence**
- **Championed a fundraising initiative** that **raised over 3.45 crore Indian rupees** through **corporate partnerships** and **influenced more than 23,000 community members** on **animal welfare issues** during pandemic challenges with **WWF**.

RECOMMENDATIONS

(a) **Dr. Martin Mascarenhas**
Outstanding Scientist
Director **BTDG**
BARC Mumbai
Brief: One of the **world's leading researchers** in **Radio frequency** and **X-Ray** and **Head Scientist** at the most premier research institution in India, in **nuclear science** and **atomic energy**.
Relationship: Research Incharge

(b) **Dr. J. Padma Nilaya**
Scientific Officer (H)
Head L/PTD
BARC, Mumbai
Brief: One of the **world's leading researchers** in **experimental physics** in **Laser** and **Optics** and **Lead Scientist** at the most premier research institution in India, in **nuclear science** and **atomic energy**.
Relationship: Project Guide

(c) **Bani Hazra**
Scientific Officer (G)
Group Head ATRC
R/DE(Engrs), **DRDO**, Pune
Brief: Pioneer of the **Daksh DRDO** robot and **Leading Scientist** in **Robotics, Sensors, AI,** and **Electronics**, and **Head** of the **AI-Robotics Division** of the most premier and biggest research organization for defense in the country.
Relationship: Research In-Charge

(d) **Prashant Padalia**
Director
Retail **Fundraising**
WWF
Brief: A prominent Management Executive Head in **Environment, Wildlife**, and **Fundraising**, serving as **President** of one of the **largest wildlife foundations** in the country and the **world**.
Relationship: Project Head