

Sidhartha Watsa

✉ sidhartha2182000@gmail.com | ☎ +91-8978478283 | [in sidhartha-watsa](https://www.linkedin.com/in/sidhartha-watsa) | [sidwat](https://github.com/sidwat) | sidwat.github.io

EDUCATION

Indian Institute of Technology (IIT) Kanpur

Bachelor of Technology, Mechanical Engineering (CPI: 9.03/10)

Double Major, Electrical Engineering (CPI: 9.50/10)

Kanpur, India

Jul 2019 – Jun 2023

Jul 2023 – Jun 2024

RESEARCH INTERESTS

Deep Learning · Computer Vision · Image and Video Signal Processing · Robotics · Perception · Embedded Systems

PUBLICATIONS

- [1] “A cyber-physical system based unmanned ground vehicles for safety inspection and rescue support in an underground mine,” *International Journal of Intelligent Unmanned Systems*, Feb. 2025. eprint: <https://www.emerald.com/ijius/article-pdf/13/1/92/9668825/ijius-07-2024-0202.pdf>.
- [2] “Towards autonomous shooting rover via situation aware visual-perception and dynamic action execution,” in *2024 IEEE/SICE International Symposium on System Integration (SII)*, 2024.

PATENTS

Filed at US Patent Office

- **Inverted-L-Scan Method for AI-based Intra-frame prediction in video codec:** Formulated a pre- and post-processing method utilising an inverted L-scan order to prepare neighbouring pixels for a unified AI-based intra prediction model to preserve inter-pixel correlation in next gen codecs, resulting in enhanced coding efficiency
- **Methods and system for AI-based pixel-block prediction for video codec:** Designed a unified, low-complex neural network architecture for intra prediction with multi-scale CNN block, which leverages neighbouring reference lines to predict coding units (CUs) and is optimised for efficient hardware implementation
- **Methods and systems for Test-Time Adaptation of Neural Network for In-loop Filtering in video codec:** Developed a method for test-time adaptation of NN-based loop filters using statistics of encoded CUs

HONORS AND ACHIEVEMENTS

- Secured **third position** globally in the [IEEE ICRA DJI RoboMaster AI Challenge 2022](#) among 40+ teams
- Received the [Academic Excellence Award](#) (2020–21, 2022–23) **twice** for consistent top **10%** academic standing
- Achieved a rank of **1803** in [JEE Advanced](#) and **1065** in [JEE Mains](#) in 2019 among 1.3 million+ candidates
- Felicitated with prestigious [Kishore Vaigyanic Protsahan Yojana \(KVPY\)](#) (Rank: **352**) scholarship in 2018
- Qualified for [Indian National Mathematics Olympiad \(INMO\)](#) by clearing Regional Mathematics Olympiad
- Honored with the **Super-Tech Award** for designing AI-based In-Loop Filters at Samsung Electronics Bangalore
- Attained **Software Proficiency** and **AI Expert** credentials at Samsung Electronics, Bangalore.
- Won **Bronze** Medal at the [Inter-IIT Tech Meet](#) 2023 for the ISRO’s Chandrayaan Moon Mapping Challenge
- Bagged **Silver** Medal at the [Inter-IIT Tech Meet](#) 2020 for the BridgeI2I’s tweets and articles analysis tasks

RESEARCH EXPERIENCE

Samsung Research Institute Bangalore (SRI-B)

Bangalore, India

Senior Engineer – Next Generation Video Codec at AI Visual Processing Lab

Aug 2024 – Present

- Developing core AI-based proposals for next-generation video codec standards beyond [Versatile Video Codec \(VVC\)](#)
- Designing hardware-friendly neural architectures for AI-based In-Loop filters and Intra-Frame Prediction in VVC
- Contributing to open-source codecs: [Advanced Professional Video \(APV\)](#) and [eXtra Essential Video \(XEV\)](#) Codec
- Popularization of APV in ultrasound probes, samsung edge devices and professional video editing tools
- Core intrinsic optimizations for APV and its adoption in [FFMPEG](#), an open-source multimedia framework
- Optimizing on-device AI models for real-time video processing and efficient codec integration on edge devices

Indian Institute of Science (IISc) Bangalore

Bangalore, India

Project Associate – [Robert Bosch Centre for Cyber-Physical Systems](#), Prof. Ravi Prakash

Feb 2024 – Jun 2024

- Investigated imitation learning techniques from imperfect demonstrations across diverse robotic dynamics
- Computed feasibility and optimality scores for each state-action pair in suboptimal human demonstrations
- Trained behavior cloning and inverse reinforcement learning models using refined demonstration subsets
- Simulated model performance on a [KUKA](#) industrial robotic arm using [Gazebo](#) and [Gym](#) environments
- Deployed a complete real-world pipeline for end-effector trajectory planning on a physical robotic arm

- Developed an unmanned excavator with a 2-DOF robotic arm for remote terrain inspection and data collection
- Integrated gas, microphone, and vision sensors, and implemented fusion algorithms for visual-acoustic analysis
- Designed complete electronics architecture including power management, actuator, and robotic arm control systems
- Formulated decision algorithms for BIRAC's brain-controlled wheelchair using Ultracortex Mark IV EEG headset

RESEARCH PROJECTS

AI-Based In-loop Filters

Samsung Research Bangalore, India

- Aimed to design a low-complexity neural network (NN) model for suppressing compression and banding artefacts
- Combined artefact-aware handcrafted filters with NN-based loop filters (NNLF), trained on [DIV2K](#)
- Introduced a dedicated scaling and signaling framework enabling NNLF to operate alongside the deblocking filter
- Delivered state-of-the-art Bjøntegaard Delta Bitrate (BD-BR) gains at ultra-low complexity less than 5kMAC/pix¹
- Integrated the proposed model within the [VVC Test Model \(VTM\)](#), enabling C++ inference using optimized [SADL](#)

AI-Based Intra-Frame Prediction

Samsung Research Bangalore, India

- Aimed to construct a unified AI-driven intra-frame prediction method applicable across multiple coding unit sizes
- Designed an intelligent input preprocessing stage to retain strong inter-pixel correlations in reference regions
- Developed a unified neural model featuring multi-scale CNN blocks adaptable to differing spatial resolutions
- Integrated the NN-based intra-prediction mode alongside classical predictors in post-VVC, enabling C++ inference
- Delivered notable coding efficiency gains using a single model, replacing seven separate post-VVC model variants

Open Advanced Professional Video Codec (APV)

Samsung Research Bangalore, India

- Contributed core algorithms for APV, an open-source, professional-grade video codec which is perceptually lossless
- Optimized the DCT² transform and quantization steps using platform-specific intrinsic tools ([NEON](#) and [AVX](#))
- Popularized APV plugins in FFMPEG, ultrasound edge devices and editing tools like [Premiere Pro](#) for [NAB](#) demo
- Integrated APV codec end-to-end on Samsung edge devices for Samsung Developer Conference (SDC) demo

IEEE DJI RoboMaster AI Challenge

Prof. Laxmidhar Behera

- Engineered two [DJI](#) autonomous robots for intelligent shooting in dynamic arena with advanced AI behaviour
- Customized the [YOLO-v5](#) model for target's armour plate detection with 85% mAP and shooting accuracy of 90%
- Developed motion planning and localization module via visual marker detection combined with [rf20](#) laser odometry
- Utilized DarkNet framework to deploy YOLO-v5 on the outpost camera feeds for global robot and enemy localization

ISRO's³ Chandrayaan Moon Mapping Challenge

Inter-IIT Tech Meet

- Aim was to train an AI network that produces high-resolution lunar terrain images from medium/low resolutions
- Processed the training dataset ([TMC](#) and [OHRC images](#)) to obtain ortho-corrected rectangular patches
- Trained and fine-tuned [SRGAN](#) cascaded with [Shifted Window Transformer \(SwinIR\)](#) to achieve 16x upscaling
- Achieved SSIM score of 0.71, indicating high similarity between output images and high resolution OHRC images

TEACHING EXPERIENCE

Indian Institute of Technology (IIT) Mandi

Mandi, Himachal Pradesh, India

Invited by Prof. Laxmidhar Behera, Director, IIT Mandi

May 2022 – Jul 2022

- Designed an institute-wide compulsory interdisciplinary course, "Foundations of Design Practicum", at IIT Mandi
- Conducted a 30-day workshop to train teaching assistants on building a robot from scratch for the course

Samsung Research Institute Bangalore

Bangalore, India

Invited by Learning and Development Team

Oct 2025 – Dec 2025

- Delivered interactive sessions on the fundamentals of device drivers using Linux kernel programming on RPi

RELEVANT COURSEWORK

Image processing, Deep learning specialisation, Embedded and Cyber-Physical Systems, Statistical NLP, Signals and Systems, Digital Electronics, Robot Motion Planning, Control Systems, Probability Theory, Communication Principles

RELEVANT SKILLS

Python, C, C++, Java, Git, Bash, Hallide, OpenGL, Drivers, Embedded C, Device Drivers, On-Device AI, Android Programming, OpenCV, FFMPEG, OpenAPV, Pytorch, Tensorflow, Robot Operating System (ROS), Agentic AI

¹5000 Multiply-ACcumulate operations per pixel

²Discrete Cosine Transform

³Indian Space Research Organization