

# Soumyadip Kar

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## EDUCATION

Year	Degree/Exam	Department/Specialization	Institute/Board	Grades
2025	M.Tech.	Vision and Intelligent Systems (E & ECE)	IIT Kharagpur	8.97 / 10
2023	B.Tech.	Electronics & Communication Engg.	JGEC, Jalpaiguri	9.17 / 10
2019	Class XII	PCM	WBCHSE	94 %
2017	Class X	All Subjects	WBBSE	93.14 %

## PROJECTS

### Decomposition of a Markovian Dynamical System into Boolean Networks [Jul'24 - Present]

(M.Tech Thesis Project under Prof. Ritwik Kumar Layek, Dept of E&ECE, IIT Kharagpur)

- Developing an algorithm to construct Boolean Networks(BN) from given, Transition Probability Matrix(TPM), an important inverse problem in network inference and my goal is to achieve this using minimal representation.
- Formulated this as AI driven optimization task with max-entropy regularization and dimensionality reduction.
- Applied Newton's method with Conjugate Gradient (CG) to efficiently represent( $\approx 95\%$ ) with minimal BNs.

### Real-Time Wake Word Detection System Using Arduino & TensorFlow Lite [Sep'24 - Nov'24]

(Course Project -Embedded Machine Learning under Prof. Ayantika Chatterjee, ATDC, IIT Kharagpur)

- Developed a real-time voice-controlled wake word detection system achieving 87% accuracy.
- Integrated ML models for audio processing on microcontrollers, optimized for low-power IoT devices.

### EdgeYOLO: Real-Time Object Detection on Edge Devices [Aug'24 - Oct'24]

(Course Project -Embedded Machine Learning under Prof. Ayantika Chatterjee, ATDC, IIT Kharagpur)

- Developed a YOLO-based object detection model on MS COCO 2017, optimized for NVIDIA Jetson Nano.
- Optimized model speed with a low-complexity, anchor-free object detection system for embedded applications.

### Camera Calibration [Jan'24 - Feb'24]

(Course Project - Intelligent Systems Design Lab under Prof. Soumik Bhattacharya, E&ECE, IIT Kharagpur)

- Extracted checkerboard corners using Harris Corner Detector and built image-object pairs.
- Performed intrinsic and extrinsic parameter estimation for precise camera calibration.

### EffiCompress: High-Efficiency JPEG Compression Pipeline [Oct'23 - Nov'23]

(Course Project -Image & Video Processing Lab under Prof. Prabir Kumar Biswas, E&ECE, IIT Kharagpur)

- Designed the entire JPEG compression pipeline using DCT, Zig-Zag, RLE, and Huffman Encoding.
- Achieved 68% compression rate as compared to the state-of-the-art, with only 0.13% loss in accuracy.
- Optimized blockwise processing for high-quality, efficient data compression.

## SKILLS

<b>Programming:</b>	C, C++, Python, OOPs, Assembly (ARM), SIMD (NEON), GPU (CUDA).
<b>Image/Video Processing:</b>	OpenCV, Digital Image Processing Algorithms,H.264, HEVC.
<b>OS Fundamentals:</b>	Multi-threading, concurrency, synchronization, cache-aware design.
<b>Development Tools:</b>	GCC, GDB, LLVM, Git, CMake, QEMU, DSP Optimization Architectures.

## COURSEWORK INFORMATION

- |                            |                                |                           |
|----------------------------|--------------------------------|---------------------------|
| • Image & Video Processing | • Embedded Systems Design      | • Operating System Design |
| • Deep Learning            | • Computer System Architecture | • Embedded ML             |
| • Pattern Recognition & ML | • Computer Vision              | • Multimedia Systems      |

## CERTIFICATIONS

### RISC-V Processor - RV32I Base ISA | Maven Silicon [Sep'24]

- This course covers the RISC-V RV32I processor and 32-bit integer instructions.[\[Certificate\]](#)

### Problem Solving through Programming in C | NPTEL [Apr'20]

- This course covers the fundamentals of C programming and its practical applications.[\[Certificate\]](#)

## POSITION OF RESPONSIBILITY

### Teaching Assistant (TA) — IIT Kharagpur

- Worked as TA for Image and Video Processing Laboratory (EC 69211) for the Autumn semester 2024-25.
- Currently working as TA for Basic Electronics Laboratory (EC 29201) for the Spring session 2024-25.