Case Study: WIEVEK 4.0 Inspiring the Next Generation Through STEM

Ayush Mohan, Dhruv Varshney, Rhythm Jain, Rupin Jain, Satvik Pandey, Saptarshi Sanyal, Amlan Biswal and Manit Vig

Abstract

WIEVEK 4.0 is the flagship social impact initiative of the IEEE DTU Student Branch, organized under its Women in Engineering (WIE) Affinity Group, with the vision of making Science, Technology, Engineering, and Mathematics (STEM) education more engaging, accessible, and inspiring for school students. Conducted from 23rd to 24th July 2026, the outreach drive introduced school students to Artificial Intelligence, Robotics, and Graph Theory through interactive, hands-on demonstrations delivered across three schools, reaching approximately 250 students. This case study documents the drive's objectives, the hands-on projects showcased, the key learning outcomes delivered to students, and an analysis of post-session feedback data, followed by a discussion of the initiative's impact and future scope.

Index Terms

STEM outreach, IEEE WIE, Artificial Intelligence, Machine Learning, Graph Theory, Arduino, Robotics, Community Engagement.

I. About WIEVEK 4.0

WIEVEK is the flagship social impact initiative organized by the IEEE DTU Student Branch with the vision of making Science, Technology, Engineering, and Mathematics (STEM) education more engaging, accessible, and inspiring for school students. Through interactive workshops, demonstrations, and activity-based learning, the drive seeks to bridge the gap between classroom concepts and real-world applications while nurturing curiosity and innovation among young learners.

The Wievek Outreach Drive was designed to foster interest in STEM among school students by introducing them to emerging fields such as Artificial Intelligence, Robotics, and Graph Theory through engaging, hands-on activities. The initiative aimed to encourage critical thinking, creativity, and problem-solving while providing students with interactive learning experiences that enhanced their confidence and curiosity. Additionally, the drive sought to challenge STEM-related stereotypes, broaden awareness of diverse career opportunities, and inspire students to pursue higher education and future careers in STEM disciplines.

IEEE DTU volunteers conducted STEM outreach sessions across multiple schools, where they introduced students to engaging STEM concepts through interactive learning experiences. Following each session, participants completed structured feedback forms to share their experiences, interests, and perceptions. The collected responses were then compiled, analyzed, and interpreted to evaluate the impact of the initiative and derive meaningful insights for this report.

Table I summarizes the schools visited, the projects showcased, and the number of students reached.

TABLE I
SCHOOLS VISITED DURING WIEVEK 4.0

Date	School	Projects Showcased	Students Reached
23/07/2026	Government Girls Senior Secondary School, Samaipur	AI/ML and Graph Theory	80
23/07/2026	Government Sarvodaya Bal Vidyalaya, Prahladpur	AI/ML and Arduino	100
24/07/2026	KIIT World School, Pitampura	AI/ML and Arduino	65

II. Hands-on Project Demonstrations

A. Graph Theory Projects

1) Graphify:

Overview: Graphify is a Netflix-inspired collaborative recommendation engine simulator designed to visualize how recommendation systems work.

The authors are with IEEE DTU Student Branch, Women in Engineering Affinity Group (WIE AG), Delhi Technological University, Delhi, India.
Event conducted from 23rd July 2026 to 24th July 2026.

Implementation: Instead of static lists, it simulates the complete recommendation pipeline using graph theory, collaborative filtering, and interactive force-directed networks. Built using HTML5, CSS3, JavaScript, and the Canvas API, the platform allows users to select profiles and watch the engine calculate Jaccard Similarity scores in real time to generate personalized movie recommendations.
Outcome: The project successfully bridges mathematical theory and practical web execution, providing an accessible, interactive platform to understand complex data science algorithms.
Project Link: https://github.com/jainrhythm458-crypto/Graphify

B. AI/ML Projects

1) Computer Vision Sketch Predictor:
Overview: An end-to-end Computer Vision application that transforms hand-drawn sketches into real-time AI predictions.
Implementation: Users draw on an interactive React and TypeScript canvas. A FastAPI backend processes the data, feeding it into a custom PyTorch Convolutional Neural Network trained on 50 Google QuickDraw categories. This setup generates live continuous predictions and visualizes exactly what the model sees.
Outcome: The application successfully achieves low-latency, real-time inference with an impressive 87.36% Top-1 and 96.36% Top-5 test accuracy, delivering a highly responsive and accurate AI drawing experience.
Project Link: https://github.com/vaishnavifrsharma/vision-pictionary
2) Iron Vision:
Overview: A real-time computer-vision application that transforms a standard webcam feed into an interactive, gesture-controlled Iron Man-style Heads-Up Display (HUD).
Implementation: Built using Python, OpenCV, and MediaPipe, the system reads live hand gestures to trigger virtual actions like shields, lasers, and repulsor blasts. It also integrates Ultralytics with YOLOv8 weights to power an optional AI object-detection scanner.
Outcome: The project delivers an immersive experience featuring a suite of virtual superpower effects and an interactive drone-shooting game mode, completely driven by intuitive hand movements.
Project Link: https://github.com/mrinalmeena/Repulsor
3) Person Counting:
Overview: A real-time webcam application designed to automate headcounts, track individuals, and detect facial moods.
Implementation: Powered by YOLOv8 and ByteTrack, the system detects people and assigns them persistent IDs as they move. It features a live HUD for headcounts, a scrolling entry/exit log with timestamps, and a lightweight OpenCV Haar-cascade detector to label moods as “Happy” or “Neutral.”
Outcome: The project successfully eliminates manual counting, delivering automated, real-time tracking and analytics with confidence-coded bounding boxes in a single streamlined interface.
Project Link: https://github.com/mrinalmeena/Person-Counting-OpenCV
4) Hill Climb Racing Gesture Control:
Overview: An AI-powered application that allows users to play the game Hill Climb Racing using hand gestures instead of a keyboard.
Implementation: A webcam monitors the user’s hands while MediaPipe tracks 21 landmarks to detect specific fist gestures. Closing the right hand triggers the gas, closing the left hand applies the brake, and removing both hands from the frame automatically pauses the game. It runs entirely externally, pressing virtual keys exactly like a physical keyboard.
Outcome: The project successfully replaces manual controls with an intuitive, real-time computer vision interface.
Project Link: https://github.com/Harsh7t/HillClimbingUsingGesture

C. Arduino Projects

1) F1-Style Reaction Timer Game:
Overview: An interactive, Arduino-powered game that tests a user’s reaction time using a randomized Formula 1 starting light sequence.
Implementation: An Arduino Nano orchestrates five LEDs, a push-button, an I2C LCD, and a buzzer. The system initiates a 4-second staging phase where four red LEDs light up sequentially with synchronized beeps. A custom polling loop monitors the button during this phase and a subsequent random delay (5 to 5,000 milliseconds) to catch and penalize jump starts. When the final “Green Light” activates alongside a continuous buzzer tone, the system measures the exact milliseconds until the user presses the button, displays the reaction time on the LCD, and awaits a final click to reset the round.
Outcome: The project successfully integrates hardware components and non-blocking logic to create an intense, fully automated, and highly accurate reflex-testing game.

2) DIY Music Reactive LED System:
Overview: An Arduino-based project called "Illuminate Your Sound" that allows users to visually experience the rhythm and melody of their favorite songs through synchronized, pulsating lights.
Implementation: The system is built by combining an Arduino microcontroller with LED lights and an audio input mechanism. The creator assembles the hardware and programs the Arduino to actively listen and dynamically react to the music it hears, driving the LEDs in real time.
Outcome: The project results in a stunning visual spectacle that fuses technology and artistry, creating a personalized, sound-responsive illumination display that deeply enhances the music listening experience.

III. From Curiosity to Careers: What Students Learned

In WIEVEK 4.0, participants were introduced to a wide range of concepts designed to broaden their understanding of STEM and future opportunities. Throughout the drive, students developed a deeper understanding of STEM through interactive sessions, live demonstrations, and project-based learning.

A. STEM Foundations

Introduced the core principles of Science, Technology, Engineering, and Mathematics, highlighting how these disciplines work together to solve real-world challenges and drive innovation.

B. Artificial Intelligence & Machine Learning

Explained how AI systems learn from data, identify patterns, and make intelligent decisions, while showcasing practical applications that students encounter in their daily lives.

C. Computer Vision in Action

Demonstrated how AI enables computers to interpret images through concepts such as edges, textures, and patterns, with applications in healthcare, autonomous vehicles, security, and smart technologies.

D. Robotics with Arduino

Taught the fundamentals of robotics using an Arduino-based project, helping students understand how sensors, microcontrollers, and actuators work together to build intelligent and automated systems.

E. Mathematics Through Graph Theory

Simplified mathematical concepts by demonstrating how graph theory powers navigation systems, shortest-path algorithms, social networks, recommendation systems, and other modern technologies.

F. Engineering Design & Innovation

Introduced the engineering design process, encouraging students to approach problems systematically through ideation, prototyping, testing, and continuous improvement.

G. Interactive Project-Based Learning

Reinforced AI, Mathematics, and Robotics concepts through live demonstrations and student-built projects, allowing participants to visualize theoretical concepts in practical engineering applications.

H. Career Pathways in STEM

Familiarized students with diverse opportunities in engineering, artificial intelligence, robotics, research, entrepreneurship, and other emerging technology domains.

I. Higher Education & Entrance Examinations

Guided students on educational pathways after school, covering major engineering entrance examinations, higher education opportunities, and career planning.

J. Building Skills Beyond the Classroom

Highlighted the value of technical societies like IEEE, hackathons, internships, innovation challenges, and extracurricular activities in developing practical skills and industry exposure.

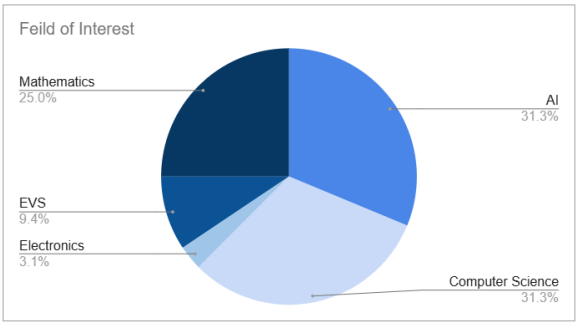


Fig. 1. Distribution of students' field of interest (AI: 31.3%, Computer Science: 31.3%, Mathematics: 25.0%, EVS: 9.4%, Electronics: 3.1%).

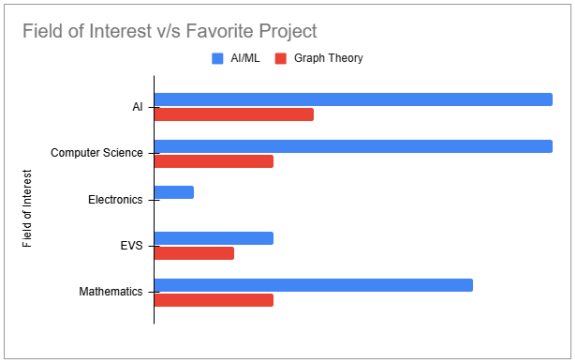


Fig. 2. Field of interest versus favorite project category (AI/ML vs. Graph Theory).

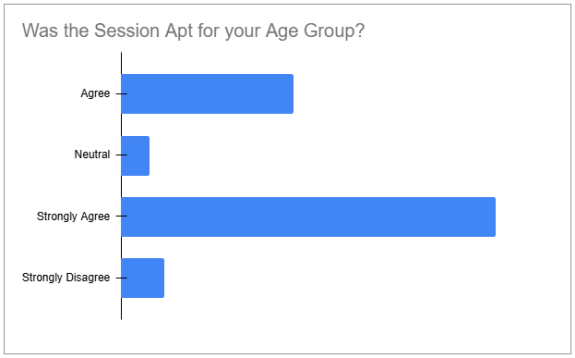


Fig. 3. Student responses on whether the session content was apt for their age group.

K. Future-Ready Professional Skills

Encouraged students to cultivate communication, teamwork, leadership, creativity, critical thinking, and problem-solving skills essential for success in future STEM careers.

IV. Data Analysis and Key Insights

Following the completion of the outreach sessions, feedback from approximately 250 students was compiled and analyzed to assess the success of the initiative. The analysis focuses on students' STEM interests, preferred activities, engagement, and overall perception of the sessions. Figs. 1–3 present the major findings derived from the collected responses.

V. Impact

WIEVEK 4.0 successfully demonstrated how interactive STEM education can inspire young learners to explore technology beyond textbooks. Through project demonstrations, practical learning experiences, and mentorship by IEEE DTU volunteers, students developed greater awareness of emerging technologies and the diverse career opportunities available within STEM. By connecting engineering concepts with real-world applications, the initiative fostered curiosity, creativity, and confidence among school students while reinforcing IEEE WIE DTU's commitment to promoting inclusive STEM education and empowering the next generation of innovators.

VI. Future Scope

Building on the success of WIEVEK 4.0, IEEE WIE DTU aims to expand the initiative by reaching more schools and engaging a larger number of students. Future editions will focus on introducing more hands-on STEM activities, innovation challenges, and mentorship opportunities to provide an even more immersive and impactful learning experience.

VII. Conclusion

WIEVEK 4.0 successfully achieved its objective of inspiring young minds through interactive STEM learning and meaningful community engagement. By fostering curiosity, promoting technological awareness, and encouraging students to explore future careers in STEM, the initiative reaffirmed IEEE WIE DTU's commitment to empowering the next generation of innovators and creating a lasting impact through education.

Acknowledgment

The authors would like to thank IEEE DTU Student Branch, the IEEE WIE Affinity Group, the participating schools – Government Girls Senior Secondary School (Samaipur), Government Sarvodaya Bal Vidyalaya (Prahladpur), and KIIT World School (Pitampura) – and all the volunteers who contributed to the planning and execution of WIEVEK 4.0.