SDA SD Express Student Competition 2026

Summary of the Initiative, Submitted Projects and Expected Winners

The SDA Student Competition

The SD Association (SDA) launched its university Student Competition in 2025 and continued it in 2026 as an innovative way to expose leading engineering students to SD Express technology while also generating fresh system-level ideas for its use. The competition demonstrates microSD Express can serve as high-performance, removable NVMe-based architectural element in modern edge systems, in addition to content storage.

SDA invited participation from highly ranked universities worldwide, targeting institutions within the top 150 on the Shanghai ranking. Students were intentionally given complete freedom in choosing their application area for submission. The only requirements were to build submissions around an NVIDIA Jetson Orin Nano Super Developer Kit together equipped with a microSD Express memory card connected through an M.2 adapter, and to clearly show how the card was used to implement the submission.

Judging criteria communicated to the students:

- Advantages of microSD Express supported by quantitative analysis **(40%)**
- Incorporation of new technologies (e.g., AI/ML, AR/VR, robotics, gaming), leveraging SD Express speed for potential consumer or mass-market products **(25%)**
- Functioning project that can be demonstrated **(20%)**
- Creativity and originality **(5%)**
- Clarity of submission **(10%)**

The three highest-ranked submissions received prizes of $20,000, $10,000 and $5,000 in USD. They also have an opportunity to demonstrate the submission at an SDA event in 2027.

Project Submissions

After the 2026 SDA's SD Express Student Competition judging team reviewed thoroughly each project, the following winning projects were ranked highest. Their common strength is not simply the use of a faster microSD Express memory card, but the way SD Express becomes part of the system architecture and enables a capability that would otherwise be difficult, inefficient or impractical on conventional removable storage.

1. WildGuard Hierarchical Edge-AI Wildfire Detection — Technion (First Place)

Students: Ori Cohen, Kfir Shauly; Supervisor: Harel Yadid, Vision & Image Sciences Laboratory (VISL)
Technion – Israel Institute of Technology

Summary: WildGuard uses a two-tier architecture for remote wildfire detection: a lightweight tracker runs continuously, while a large vision-language model (VLM) is activated only when smoke is suspected. The VLM weights are memory-mapped from the microSD Express memory card and paged into system memory on demand, allowing the Jetson to use the large model without keeping the entire model permanently resident in its limited DRAM. This is one of the strongest examples of SD Express as an architectural memory and storage component rather than a file repository. The project compares the microSD Express memory card with an M.2 NVMe SSD — the relevant alternative for this architecture — and shows that SD Express provides sufficiently fast VLM wake-up while also reducing idle power. The result is a practical model for power-constrained, unattended Edge-AI sensors.

Evaluation: Judges recognized this submission for its particularly strong architectural idea: memory-mapping a large VLM from microSD Express and loading only when needed. This allows a resource- and power-constrained edge sensor to use a model that cannot practically remain resident. The comparison with an M.2 SSD is appropriate and demonstrates SD Express as an SSD-like removable backing store for AI memory.

2. On-Device Continual Learning for Autonomous Driving Using SD Express — HKUST (Second Place)

Students: Law Chi Chung, Li Chun Ting, Wong Yuk To; Supervisor: Prof. Tim Woo
Hong Kong University of Science and Technology

Summary: A small autonomous vehicle performs real-time perception while continuously recording uncompressed camera data, maintaining a replay buffer and fine-tuning part of its model in the background, as conditions change. SD Express is directly in the learning loop: it must sustain concurrent writes from live logging and reads from replay without disturbing steering inference. The card delivered near-lossless 60 FPS logging, reduced retrieval of a 500-frame replay batch from 6.12 seconds to 0.94s, cut the complete adaptation cycle from 7.70s to 2.52s, and eliminated the heavy frame loss seen on UHS-I during simultaneous replay. The microSD Express is integral part of the learning loop and is used as a removable NVMe storage that enables continual learning at the edge.

Evaluation: Judges recognized this submission for its particularly strong architectural usage of the SD Express that sits directly inside the continual-learning loop: concurrent recording, replay, background adaptation and model update all depend on sustained low-latency storage. The project combines advanced Edge AI with clear quantitative application-level evidence and shows a direct effect on real-time operation.

3. HarvestIQ: Dual-Pipeline Edge AI Harvest Station — UC Davis (Third Place – Tie)

Student: Luis Blas ; Supervisors: Prof. Weijian Yang and Prof. Zhi Ding
University of California, Davis

Summary: A physical strawberry grading station uses a camera, weight sensor and local vision logic while simultaneously building a full-resolution dataset of images, weights, predictions and operator corrections. The microSD Express memory card carries the OS/model and acts as the high-rate logging layer for the second pipeline. In an identical application workload, UHS-I saturated and dropped 32.5% of captured frames, while the SD Express recorded the full 60-second run with 0% loss; the project also measured lower energy per gigabyte and explored thermal behavior over longer runs. HarvestIQ is a product-oriented demonstration of SD Express enabling an Edge-AI system to perform its immediate task while continuously creating the dataset needed for future model improvement.

Evaluation: Judges recognized this submission for its strong product orientation and clear demonstration of the value of SD Express in a real-life application. The microSD Express memory card enables the station to grade fruit and, at the same time, capture the complete full-resolution dataset and human corrections needed for future learning—an important example of storage becoming part of the intelligence-development cycle, not merely a place to save results.

4. Helmet-Based Threat Detection System — Technion (Third Place – Tie)

Students: Omri Smak, Noam Gati; Advisor: Oz Shmueli High Speed Digital Systems Laboratory
Technion – Israel Institute of Technology

Summary: A wearable visual threat-detection prototype using multiple helmet-mounted cameras, an inertial measurement unit (IMU) and Jetson-based you only look once (YOLO) inference to detect and track small unmanned aerial vehicles (UAV). SD Express is used as the high-speed removable data layer for synchronized multi-camera event recording, detection and IMU logs, field-dataset collection, model/configuration exchange and deterministic replay. In matched application testing, the SD Express configuration sustained the full five-camera workload with substantially fewer dropped frames, saved event recordings 5.3× faster and offloaded a 100 GB dataset 4.6× faster than UHS-I. The project illustrates an important Edge-AI role for SD Express in maintaining continuous sensing and inference while simultaneously recording and moving large amounts of data on a compact, removable medium.

Evaluation: Judges recognized this submission for its strong system-level use of microSD Express in a demanding wearable Edge-AI workload. It sustained synchronized five-camera event recording alongside real-time inference, reducing dropped frames from 31.3% to 4.56%, cutting event-save time from 5.56 s to 1.04 s, and accelerating 100 GB dataset offload by 4.6x. This demonstrates the practical value of NVMe-style concurrent I/O in a compact removable form factor.

- **Edge-AI Socratic Tutor: Real-Time Circuit Debugging via Jetson Nano — HKUST**
  Students: Chong Shing Tai, Liu Haodong; Supervisor: Prof. Tim Woo
  Hong Kong University of Science and Technology

Summary: A classroom-oriented tutoring system that combines a real breadboard, camera-based circuit understanding on Jetson and cloud-based Socratic reasoning. The demonstrated workflow captures the physical circuit, performs local localization and component processing, and then produces guided AI feedback. A microSD Express memory card is used with the Jetson environment, frame caching and telemetry/logging, supporting the concept of a dedicated edge workstation for many simultaneous students.

- **Edge-AI Real Time Occupant Centric Monitoring and Nudging for Sustainable Smart Cities — HKUST**
  Students: Haolun Huang, Sile Fang, Wenhao Ye, Ruochen Ding; Supervisor: Prof. Tim Woo
  Hong Kong University of Science and Technology

Summary: A privacy-preserving occupancy system uses Wi-Fi Channel State Information (CSI) and a compact local ML model to detect idle, stationary and movement states in indoor spaces. The working prototype demonstrates sensing, local inference and a real-time dashboard. In this submission, however, a microSD Express memory card is primarily a proposed future gateway/training-workstation layer for high-rate CSI logging, dataset movement, model versioning and disconnected operation; it is not yet part of the demonstrated ESP32 edge node. The concept is still relevant to Edge AI because it identifies how removable high-speed storage could support multi-room training, maintenance and data management while keeping operational inference local and privacy-preserving.

- **Project Chiron: Telemedicine Assistant — HKUST**
  Students: MUKKAMALA, Likithpranai and SHUKLA, Saanvi; Supervisor: Prof. Desmond Tsoi,
  Hong Kong University of Science and Technology

Summary: An offline multi-modal telemedicine testbed combining 1080p video, diagnostic audio and sensor telemetry with local Jetson inference for dermatology, cardiology and emergency triage. A microSD Express memory card is the boot volume and carries the operating environment plus an on-card library of medical datasets and model checkpoints; only the active specialty graph is mapped for inference. The project reports zero video-frame drop under concurrent ingest on SD Express versus losses on UHS-I and eMMC, and explores removable specialty-card swapping.

- **Express-Derm: AI-First Offline Lesion Screening with SD Express — Politecnico di Milano**
  Student: Michael Patrini; Supervisor: Stefano Bregni
  Politecnico di Milano

Summary: A fully local dermatology research prototype that combines high-resolution image acquisition, image-quality filtering, lesion extraction, a persistent 3D body map, local AI attention scoring and longitudinal review. A microSD Express memory card stores the full-resolution images, lesion histories, software packages and audit records while supporting simultaneous acquisition, processing and review. In matched testing, it produced 6.89× higher sequential-read throughput, 22.58× higher 4 KiB random-read IOPS, a 44% faster model cold load and 3.02× higher image-ingest throughput than the UHS configuration.

- **CardioVault:Deep Learning-Based ECG Retrieval with Explainable AI for Clinical Decision Support -SRMIST**
  Student: Varshika Rajesh, Vishal U, R. Prathanyaasree; Supervisor: Dr. Snekhalatha Umapathy
  SRM Institute of Science and Technology

Summary: An edge-based ECG decision-support workflow combining a 1D-CNN classifier, FAISS similarity retrieval and an optional local Gemma model for clinician-readable explanations. A microSD Express memory card is used as the Jetson boot and application storage, holding the models, retrieval index and supporting data needed at startup. A matched comparison showed the complete cold-start clinical workflow falling from 108.84 seconds on an microSD card UHS-I to 66.04 s on microSD Express, with faster boot and model/index loading; warm batch inference remained compute-bound, which usefully demonstrates where storage speed does and does not matter.

Closing Perspective

SDA thanks all participating students, faculty advisors and universities for the creativity, engineering effort and openness reflected in the 2026 submissions. Collectively, the projects demonstrate that microSD Express can be much more than a higher-speed removable card. Across Edge-AI use cases it can act as boot media, a model and dataset carrier, a replay buffer, a concurrent logging layer, and even an SSD-like backing store for memory-mapped AI assets. These architectural uses are particularly important as edge systems run larger models, process more sensor streams and need to operate with limited DRAM, power and network connectivity. The competition therefore provides SDA with valuable real-world evidence and new examples of how SD Express may become an active component of future Edge-AI system design.