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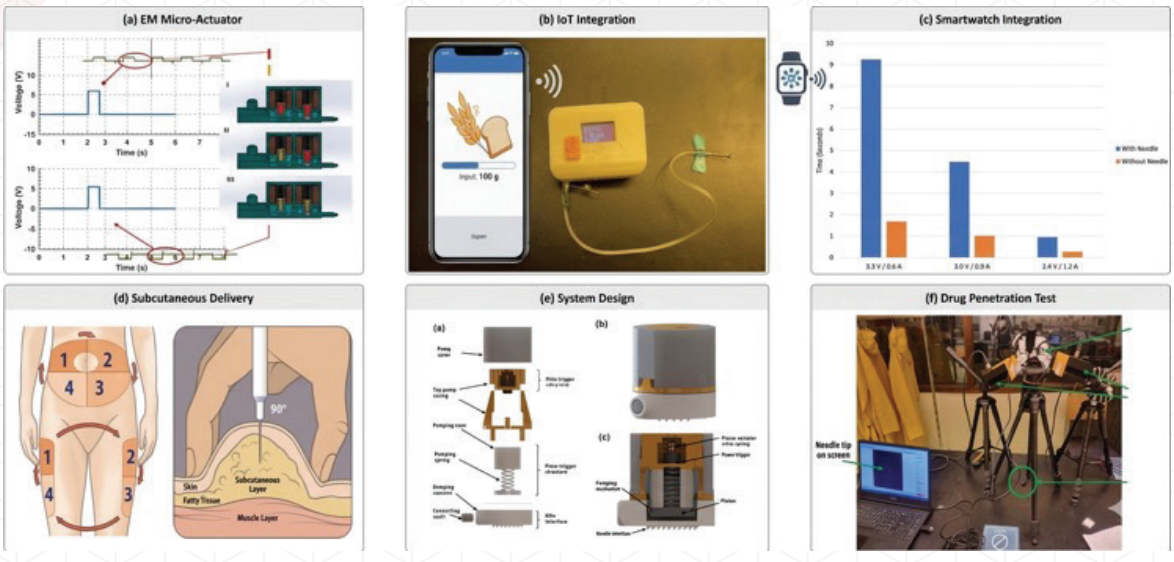
ICT R&D Newsletter in Egypt

SMAR-TO2 Bandage: A Closed-Loop Wearable for Chronic Wound Healing

American University in Cairo · Pulse for Integrated Solutions (Egyptian Industrial Partner) · Regner Engineering SLU (Spanish Industrial Partner)

Researchers from the American University in Cairo, Pulse for Integrated Solutions (Egyptian Industrial Partner), and Regner Engineering SLU (Spanish Industrial Partner) developed SMAR-TO_2 — a smart bandage delivering Sensing, Monitoring, Active control, and localized Release of Therapeutics and Oxygen for chronic wounds. Chronic wounds affect over 40 million people worldwide and cost global health systems above $20 billion annually, with diabetic foot ulcers alone reaching 6.3% prevalence among diabetics; topical oxygen therapy is now a Grade-A indication of the American Diabetes Association for diabetic foot ulcers. The platform integrates four subsystems on a single flexible patch: a 3D-printed shape-memory-alloy micropump with hollow microneedle array and polymeric-nanoparticle drug encapsulation for rapid transdermal delivery, achieving a near-100% gain in skin deposition over untreated solution; a catalytic H_2O_2/MnO_2 oxygen generator producing ≥95%-purity O_2 at the 3–15 mL/hr continuous-diffusion-therapy range; a hybrid TPU/ZnO piezoelectric–triboelectric nanogenerator harvesting body motion (up to ~40 V) to self-power onboard electronics; and high-gauge-factor TPU/graphene (GF 949) and TPU/MWCNT (GF 117) strain sensors driving a 2D-CNN spectrogram pipeline that predicts sleep-apnea events with a 1–3% accuracy gain. A Pulse-developed SpO_2 prototype on MAX86140/MAX86150/AFE4400 streams heart-rate and oxygen-saturation data over BLE to a mobile and web dashboard with ML-driven clinician alerts. Branded S-GUARD for electric-wheelchair OEMs across Nordic, EU, and US markets, the device projects an 11.58× ROI. “Outputs include published Q1 papers, multiple Q1/Q2 manuscripts under review, and filed US patents. SMAR-TO_2 collapses an entire wound-care clinic into a battery-light bandage,’ says Dr. Mohamed Serry, American University in Cairo.



Generative AI for tapestry and Carpet design

Egypt-Japan University of Science and Technology

Researchers at Egypt-Japan University of Science and Technology (E-JUST) have employed Generative artificial intelligence (G-AI) for automated carpet design, aiming to initiate the momentum to support Egypt's creative industries through AI. The project addresses a major challenge in the handmade carpet industry: generating new artistic designs while preserving the visual identity, geometric balance, and cultural characteristics of traditional Oriental carpets.

The developed platform combines several Generative AI techniques, including diffusion models, LLM-based fine-tuning, Generative Adversarial Networks (GANs), neural style transfer. The proposed framework was specifically tailored for carpet design, enabling the generation of realistic carpet layouts that preserve the main characteristics of different carpet types. Additionally, the research team collected Egyptian heritage symbols and employed G-AI to create new Egyptian-inspired motifs that could be integrated in the carpets designs while ensuring artistic coherence and geometric consistency.

The research team also developed a custom graphical user interface (GUI) that enables users to interactively generate carpets, customize styles and edit decorative elements. The project resulted in motifs dataset, AI-generated carpet prototypes, an operational GUI platform, and two international research publications. "We believe that the developed technology can accelerate carpet production, expand its diversity, and contribute to preserving and integrating cultural heritage in the carpet industry' says Dr. Maha Sabrouty, professor at Department of Electronics and Communications Engineering, E-just.

New Cloud-Based AI Platform Advances Faster and More Accurate Cardiac CT Diagnosis

Cairo University and ADVINTIC

A group of researchers from Cairo University and ADVINTIC have developed cloud-based AI platform which set to transform cardiac CT diagnostics by enabling faster, more accurate, and more affordable analysis of Coronary CT Angiography (CCTA) scans. Designed to address the growing burden of Coronary Heart Diseases (CHD) and the global rise in radiology diagnostic errors, the platform delivers advanced cardiac image processing and analysis as an on-demand cloud service for radiology centers and hospitals. The technology combines automated coronary artery segmentation, AI-powered centerline extraction, Curved Multi-Planar Reformation (CMPR), and secure HL7/DICOM interoperability within a scalable cloud-native infrastructure. Unlike conventional standalone solutions, the new platform offers fully automated workflows, remote accessibility, rapid deployment, and pay-per-use operation, reducing the need for costly on-site systems and minimizing reporting subjectivity. The project successfully delivered a complete ecosystem including cloud analytics engines, responsive web and mobile DICOM viewers, monitoring and CRM modules, and integration tools for PACS, RIS, and HIS systems. “The platform achieved CE certification and secured pilot deployment and strategic partnerships in the UAE and MENA region, highlighting its strong commercial readiness and its potential to accelerate the adoption of AI-powered tele-radiology services in cardiac imaging’ says Dr. Tamer Basha, Professor, Cairo University.