CDTA

DIVISION IONIZED MEDIA & LASER

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PROJECT TOPICS:
AI-GUIDED IONIZED MEDIA & LASER

LASER SYSTEMS AND APPLICATIONS

LASER SYSTEMS AND APPLICATIONS

- AI for laser-based processes (cutting, welding, marking, and 3D printing)
- Machine learning for process optimization and laser–matter interaction control
- AI for LiDAR data processing, 3D mapping, and remote sensing applications

PLASMA, IONIZED MEDIA & SPECTROSCOPY

PLASMA, IONIZED MEDIA & SPECTROSCOPY

- AI for plasma diagnostics, modeling, and stability prediction
- Machine learning for plasma and ion source optimization
- AI for material identification using Laser-Induced Breakdown Spectroscopy
- AI for radiation therapy

MATERIALS & THIN-FILM DEPOSITION

MATERIALS & THIN-FILM DEPOSITION

- AI for material characterization and property prediction
- Machine learning for multi-layer and composite material analysis
- AI-assisted optimization of thin-film deposition and synthesis

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DIVISION PRODUCTIQUE & ROBOTIQUE

Contact: Dr. KOUIDER Ahmed
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TOPICS:
AI-GUIDED PRODUCTION & ROBOTICS

SMART MANUFACTURING

SMART MANUFACTURING

- AI for distributed and multi-agent scheduling
- AI for decision-making in industrial systems
- AI for robotics and human-robot interaction in production environments
- AI for optimization and manufacturing scheduling

VIRTUAL & AUGMENTED REALITY COLLABORATION

VIRTUAL & AUGMENTED REALITY COLLABORATION

- AI for augmented reality (AR)
- AI for virtual reality (VR) interaction systems
- AI for collaborative virtual environments
- AI for aided medical diagnostics
- AI for computer vision in HMI systems
- AI for software architecture in VR/AR systems

CONTROL OF COMPLEX DYNAMIC SYSTEMS

CONTROL OF COMPLEX DYNAMIC SYSTEMS

- AI for robust control of robotic systems (manipulator robots, mobile robots, UAV)
- AI for optimal control and energy efficiency
- AI for human–machine and human–robot interaction (HMI / HRI)

ARTIFICIAL INTELLIGENCE FOR AUTONOMOUS MOBILE ROBOTICS

ARTIFICIAL INTELLIGENCE FOR AUTONOMOUS MOBILE ROBOTICS

- AI for autonomous mobile robot perception
- AI for autonomous mobile robot navigation
- AI for motion planning and control
- AI for human–robot interaction (HRI)
- AI for service and autonomous robots
- AI for safe and reliable autonomous systems

ADVANCED CNC MACHINING WITH CAD/CAM PROCESS

ADVANCED CNC MACHINING WITH CAD/CAM PROCESS

- AI for machining process optimization (tool–workpiece–machine interaction)
- AI for tool path planning and surface machining
- AI for machine tool monitoring and predictive maintenance
- AI for adaptive machining (real-time optimization)
- AI for quality control and inspection

EMBEDDED SYSTEMS, IOT, AND LOW-POWER ARCHITECTURES

EMBEDDED SYSTEMS, IOT, AND LOW-POWER ARCHITECTURES

- IoT and smart systems
- Low-power embedded architectures
- Real-time optimization in embedded systems

CDTA | DIVISION TELECOM

Contact: Dr. AOUACHE Mustapha, DT Division Director

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PROJECT TOPICS:
AI-GUIDED TELECOM AND INTELLIGENT SYSTEMS

RADIO FREQUENCY (RF) SYSTEMS

RADIO FREQUENCY (RF) SYSTEMS

. AI for signals intelligence in communications systems with software-defined radio
. AI Based radar systems with software-defined radio (SDR)
. Application of AI in RF and antenna design

WIRELESS COMMUNICATION SYSTEMS

WIRELESS COMMUNICATION SYSTEMS

. Smart healthcare and medical monitoring via AI and wireless communication
. Localization and tracking using wireless systems and AI.
. Edge AI implementation for wireless IoT applications.
. Wireless communication (5G and Beyond) and AI.

BIOMETRICS, MULTIMEDIA SECURITY, AND FORENSICS

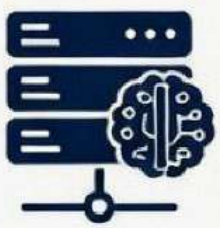
BIOMETRICS, MULTIMEDIA SECURITY, AND FORENSICS

. AI-driven biometric systems (face, fingerprint, iris, voice)
. AI for multimedia security (image, audio, video protection)
. AI for digital forensics (analysis of image, video, and audio data)
. AI for biometric system attack detection (deepfakes, spoofing, morphing)
. AI for real-world biometric and forensic applications

ADVANCED INFORMATION SYSTEMS

ADVANCED INFORMATION SYSTEMS

. AI for vision-driven information systems
. AI for data platforms and information systems management
. AI for monitoring systems and intelligent platforms
. AI for medical information systems (CAD and PACS integration)
. AI for real-time data stream processing and event detection
. AI for predictive maintenance systems



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DIVISION MICROELECTRONIC & NANOTECHNOLOGY

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TOPICS:
AI-GUIDED MICROELECTRONICS AND NANOTECHNOLOGY

VLSI

TOPIC: VLSI, CIRCUIT DESIGN & EDA

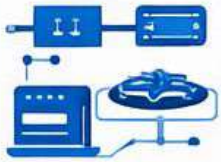
VLSI, CIRCUIT DESIGN & EDA

- AI for ASIC/FPGA design space exploration and optimization
- Machine learning for low-power circuit design
- Reinforcement learning for VLSI placement and routing
- AI-enhanced EDA tools and hardware design automation
- Generative AI for automated circuit and schematic design

HARDWARE SOFTWARE CO-DESIGN & SOC

HARDWARE-SOFTWARE CO-DESIGN & SoC

- AI for FPGA/SoC architecture mapping and optimization
- Machine learning for hardware accelerator selection (CPU/FPGA/ASIC)
- AI-based SoC performance prediction
- Intelligent optimization of embedded computing systems



MEMS NEMS & NANO DEVICES

MEMS, NEMS & NANO DEVICES

- Machine learning for MEMS/NEMS design optimization
- AI for fabrication yield and defect prediction
- Data-driven modeling of RF MEMS and BioMEMS devices
- AI for thin films synthesis and characterization

SEMICONDUCTOR RELIABILITY & CHARACTERIZATION

SEMICONDUCTOR RELIABILITY & CHARACTERZATION

- AI for fault detection in semiconductor devices
- Predictive models for device aging and lifetime estimation
- Machine learning for failure analysis in integrated circuits
- AI-based wafer testing and anomaly detection

TCAD: SIMULATION & MULITYWOND WOELING

TCAD, SIMULATION & MULTIPHYSICS MODELING

- AI surrogate models for TCAD CMOS process simulation
- AI acceleration of multiphysics (COMSOL) simulations
- Data-driven modeling of thermal/mechanical stress in devices
- Hybrid physics–AI models for device behavior prediction

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DIVISION OF SYSTEM AND MULTIMEDIA ARCHITECTURE

Contact: Dr. YKHLEF Fayçal, Division Director

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PROJECT TOPICS:

EMERGING TECHNOLOGIES IN AI, EMBEDDED SYSTEMS, AND COMPUTER ARCHITECTURE

IMAGE & SPEECH PROCESSING

- AI for image and speech classification in complex environments
- AI-based image segmentation (medical and industrial applications)
- AI for speech emotion recognition
- AI-driven Braille character recognition (assistive technologies)
- AI for audio–visual multimodal systems in real-world applications

MEDICAL & BIOMEDICAL

- AI for tumor detection and organ segmentation (MRI/CT scans)
- Deep learning for automated diagnosis using multimodal medical data
- AI for early disease detection from medical imaging
- AI for hearing loss detection, prevention, and assistive systems

SECURITY, CRYPTOGRAPHY & INFORMATION SYSTEMS

- Cryptography and information security
- Embedded and real-time systems
- Intelligent systems for instrumentation
- FPGA, ASIC, SoC, embedded systems

VLSI & COMPUTER ARCHITECTURE

- Binary arithmetic & VLSI applications
- High-speed and low-power digital design
- IP specification, design, and verification