جامعة خليفة Khalifa University

جامعة قطر QATAR UNIVERSITY

1. Free-Space Quantum Communication for Next-Generation Secure Networks

QU PI: Dr. Mazen Hasna
KU PI: Prof. Sami Muhaidat

This project develops advanced models and design guidelines for free-space quantum communication systems to enable ultra-secure data transmission across terrestrial and satellite networks. By accurately capturing the impact of atmospheric turbulence, pointing errors, and quantum channel properties, it will help optimize performance, boost reliability, and enhance the security of future communication infrastructures.

2. VITRA-HEAL (Predictive Development of Peptide-Enhanced Vitreous-Derived Biomaterials for Regenerative Wound Healing)

QU PI: Dr. Osama Halabi
KU PI: Dr. Peter Corridon

With VITRA-HEAL, we aim to develop sustainable, peptide-enhanced biomaterials derived from vitreous humor to accelerate wound healing and combat infection, supported by AI-driven predictive modeling. By combining regenerative biology, advanced delivery platforms, and circular bioeconomy principles, the project aims to deliver next-generation wound-care solutions for diabetic and high-risk patients in the UAE and Qatar.

3. Visual-Haptics for Remote Robot Operation, Inspection & Physical Intervention

QU PI: Dr. Susu Zughaier
KU PI: Prof. Jorge Manuel Miranda Dias

We propose advancing our visual-haptic robotic teleoperation system from lab prototype to real-world validation, targeting critical applications in underwater inspection and greenhouse harvesting. By integrating multimodal feedback and predictive safety control within an immersive XR interface, the system overcomes the limitations of conventional visual-only teleoperation—enhancing situational awareness, reliability, and safety in extreme environments. Our dedicated software stack fuses haptic and visual sensing, supports predictive control in simulation, and is validated on terrestrial and underwater robotic platforms. The result will be a robust, repeatable solution ready for deployment in semi-structured infrastructure settings.

4. **360T2DM: Omics-to-Behavior Novel AI-based Platform for Type 2 Diabetes Prevention and Personalized Care in the UAE and Qatar**
   QU PI: Dr. Mohammad Kamel Bader Alomari
   KU PI: Prof. Ahsan Khandoker

The 360T2DM project aims to develop an explainable AI–driven, omics-to-behavior platform to enable early prediction, prevention, and personalized management of Type 2 Diabetes Mellitus, addressing its early and high prevalence in Gulf populations. By integrating multi-omics, physiological, and behavioral data through multidisciplinary collaboration and clinical validation, the project will deliver population-specific biomarkers, predictive risk models, and personalized digital interventions to advance precision metabolic medicine in the MENA region.

5. **Process Intensification for Sustainable Hydrogen and Carbon Nanomaterials from Methane via in-situ Catalyst Regeneration and Carbon Removal Strategies**
   QU PI: Dr. Anand Kumar
   KU PI: Prof. Srinivaskannan Chandrasekar

This project develops a Hybrid Catalytic Conversion (HCC) process for zero-emission hydrogen via Thermo-Catalytic Decomposition (TCD) of methane. Unlike Steam Methane Reforming, TCD avoids CO_2 emissions but faces catalyst deactivation from carbon buildup. HCC introduces mild CO_2 co-feeding to define an Optimal Operational Ratio (ROPT), balancing H_2 yield, syngas generation, and catalyst longevity. QU will design mixed oxide catalysts and establish ROPT, while KU applies it in fixed and fluidized beds, enabling catalyst regeneration through CO_2 gasification. This dual-product strategy—clean H_2 and high-value carbon—advances regional decarbonization via integrated HCC–CCU pathways.

6. **Optimal Energy Management Framework for Inverter-based Interconnected Microgrids with 100% Renewable Penetration**

   QU PI: Dr. Khaled Shaban
   KU PI: Dr. Tarek El Fouly

The proposed project aims at designing a scalable, intelligent energy management framework that can be used with inverter-based interconnected microgrids with 100% renewable penetration. An optimal operation framework will be developed to allocate grid-forming/grid-following inverter-based sources in multiple interconnected microgrids and develop their optimized localized control setting while being coordinated at the system control level within the multiple interconnected microgrids.