

## Search for a Spanish Partner for a Bilateral R&D Project

Organization	
Date of Request:	January, 2023
Company name:	University of Sharjah, Sharjah, United Arab Emirates
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### SECTION 1: Entity launching the partner search

(Please give brief / to the point explanations. For more explanation on any point below, you may add a short paragraph as an annexure, with this document.)

Sector	Computing, Mathematics, IoT, Environment, Continuum Computing, Edge AI, Air quality, Air pollution, monitoring, integrated information systems;
Entity mission or core functions	<a href="#">University of Sharjah</a> <a href="#">Research Institute of Sciences and Engineering</a> <a href="#">OpenUAE Research and Development Group</a>
Date of establishment	1997 (university of Sharjah) 2016 (OpenUAE research and development)
Ownership (if public and traded, add stock exchange and ticker symbol)	Semi government
Total number of employees	Around ~2423
Number of employees in R&D	Around ~ 995 in total In addition, OpenUAE R&D Group we have more than 95+ members
Key products sold or services provided	<ul style="list-style-type: none"> <li>• Higher Education Institution</li> <li>• Research &amp; Development</li> <li>• Patenting and Industrial Product Development</li> <li>• Training and workshops</li> <li>• Software and Hardware Developing solutions</li> <li>• Technical awareness seminars</li> <li>• Provide training and consultancy services to UAE government entities.</li> <li>• Develop, apply and evaluate OSS solutions in many sectors in the UAE. Our research group will play a vital role and take the lead in many OSS projects such as <ul style="list-style-type: none"> <li>▪ Security application: using artificial intelligence in advance persistent threat, face registration detection, IoT security testbed, Remote attestation of Cyber-Physical Systems, and firmware distribution</li> <li>▪ Medical applications: applications of machine learning in metastatic breast cancer detection, wearable biosensors intelligent system for early detection of COVID-19 using data science techniques, and automated detection and grading of retinopathy</li> </ul> </li> </ul>

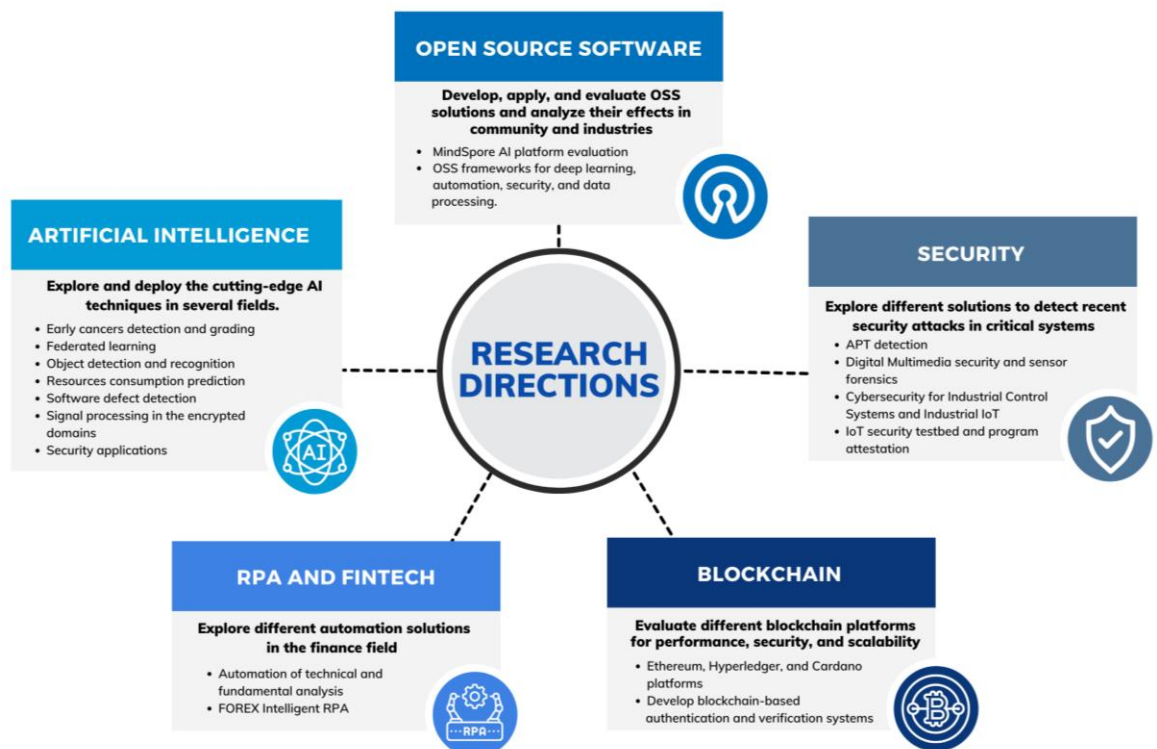
	<p>using computer vision.</p> <ul style="list-style-type: none"> <li>▪ Environmental applications :a comprehensive disaster management framework for smart cities, smart monitoring and control of water quality in residential water tanks, and drone ranger for endangered animals in the UAE using artificial intelligence on the edge device.</li> <li>▪ Blockchain application: IoT-blockchain system design and implementation, improved blockchain infrastructure with IoT for smart government application, and design and implement inter-blockchain communication between heterogeneous blockchain networks.</li> </ul> <ul style="list-style-type: none"> <li>• Contribute to the research world by sharing our findings locally and internationally through workshops, conferences, and journals. The OpenUAE published more than 20 research articles in journals and 16 in conferences. Delivered more than 29 workshops and trained 9 individuals through internships. Raised 21 awareness seminars.</li> <li>• Design of Blockchain reference model, and development of information security management assurance guidelines and security recommendations. (<a href="#">see reference</a>)</li> <li>• Report findings to research partners, and local, regional, and international organizations. Some of the OpenUAE strategic partners are <ul style="list-style-type: none"> <li>▪ General Civil Aviation Authority (<a href="#">GCAA</a>)</li> <li>▪ <a href="#">Aviation Australia</a></li> <li>▪ Dubai Electricity &amp; Water Authority (<a href="#">DEWA</a>)</li> <li>▪ Dubai Electronic Security Center (<a href="#">DESC</a>)</li> <li>▪ <a href="#">Dubai Police</a></li> <li>▪ Telecommunications And Digital Government Regulatory Authority (<a href="#">TDRA</a>)</li> </ul> </li> </ul>
Entity core technical competences	<ul style="list-style-type: none"> <li>• RPA and Fintech: we aim to always support the open-source community by employing RPA solutions that are open and available to everyone. For instance, the following list of opensource RPA frameworks: <ul style="list-style-type: none"> <li>○ <a href="#">Task</a></li> <li>○ <a href="#">Robot Framework</a></li> <li>○ <a href="#">TagUI</a></li> <li>○ <a href="#">UI.Vision</a></li> <li>○ <a href="#">OpenRPA</a></li> </ul> </li> <li>• Artificial Intelligence application in many sectors such as: <ul style="list-style-type: none"> <li>○ Medical such as breast cancer detection</li> <li>○ Security in advance persistent threat detection.</li> <li>○ Environmental applications in a smart IoT environment.</li> </ul> </li> <li>• We have a strong team with high qualifications with industrial</li> </ul>

	<p>certifications. For instance, in security, Prof. Qassim is a certified information system security professional. As in the Blockchain field, we have Ms. Takua with ConsenSys certification as an Ethereum developer. Additionally, Dr. Manar and the research team are specialized in software engineering and many others. In addition, the University of Sharjah has a variety of partners including <a href="#">VMware</a>, <a href="#">Amazon</a>, <a href="#">Nvidia</a>, <a href="#">Oracle</a>, <a href="#">RedHat</a>, <a href="#">Huawei</a>, <a href="#">Cyber Wales</a>, and <a href="#">Cisco</a>.</p>
<p>Key R&amp;D programs and activities</p>	<p>The University of Sharjah believes in the crucial role of scientific research in the development of the modern United Arab Emirates. Since its establishment in 1997, the university has put research at the top of its list of priorities. Part of the university's strategy is to promote research among faculty members in all colleges, with the aim of attracting outstanding faculty with impressive research accomplishments. This stems the university's understanding of scientific research as the basis of economic, social, humanitarian, and medical developments. With scientific research we construct knowledge, and within this knowledge lies the solution to many problems. The OpenUAE Research &amp; Development Group established in 2016 is the first of its kind in the country, providing new research opportunities related to the successful adoption of Open-Source Software (OSS) in the region. The group engaged students (undergraduate and graduate at universities and other interested parties) to conduct research on the deployment of OSS in many sectors to serve multiple purposes such as Blockchain, Artificial Intelligence cyber security, smart cities, Internet of Things, ...etc. The group provides the necessary training, develops ICT solutions based on OSS, evaluates and assesses these solutions, and provides consultancy services to enable government-wide, as well as private sector access, to OSS. In the OpenUAE group, several activities were conducted, including the following:</p> <ul style="list-style-type: none"> <li>▪ Machine learning study Jam</li> <li>▪ Flutter Festival Sharjah</li> <li>▪ Introduction to Google Cloud Platform</li> <li>▪ Introduction to Machine Learning using MATLAB workshop</li> <li>▪ Quick Guide to Open Source Development and Software Development Trends Workshop</li> <li>▪ The Usage of Machine Learning and Deep Neural Network in the Medical Field</li> <li>▪ Introduction to ARCGIS System</li> <li>▪ WiDS (Women in Data Science)</li> <li>▪ Research Methodology Workshop</li> <li>▪ Hacktoberfest-The Power of Open Source in Empowering and Shaping our Future</li> <li>▪ Python &amp; Machine Learning Workshop for Advance</li> <li>▪ Python &amp; Machine Learning Workshop for Beginners</li> <li>▪ The Future of Everything is AI @ Sharjah Innovation Week</li> <li>▪ Drones Cyber Security, Localization and Countermeasures-</li> </ul>

	<p>Workshop for Ministry of Defense</p> <ul style="list-style-type: none"> <li>▪ Applications of Machine Learning in Medical Field</li> <li>▪ Django Web Development Workshop</li> <li>▪ Cloud-Native IoT based Applications</li> <li>▪ 2<sup>nd</sup> OpenUAE Annual Meeting</li> <li>▪ Mendeley Workshop Reference Manager</li> <li>▪ Opening Ceremony Byte Lab</li> <li>▪ OpenUAE for Education with Ministry of Education</li> <li>▪ OpenUAE Annual Meeting</li> <li>▪ Dubai Electronic Security Center Workshop</li> </ul> <p>More <span style="float: right;">on:</span>  <a href="https://www.sharjah.ac.ae/en/Research/RISE/OpenUAE/Pages/evt_list.aspx">https://www.sharjah.ac.ae/en/Research/RISE/OpenUAE/Pages/evt_list.aspx</a></p> <p>The group will engage students (undergraduate and graduate at universities and other interested parties) to conduct research on the deployment of OSS in many sectors to serve multiple purposes i.e. cyber security, smart cities, Internet of Things, astronomy, blockchains as below</p> <ol style="list-style-type: none"> <li>1. RPA for Forex Trading</li> <li>2. Wearable Biosensors Intelligent System for Early Detection of COVID-19 using Data Science Techniques.</li> <li>3. Locational Management for Healthcare Facilities during COVID-19 Pandemic: An Artificial Intelligence Approach.</li> <li>4. Breast Cancer Detection Using Statistical and Deep Learning Techniques.</li> <li>5. Data-Driven False Data Injection Attacks Detection in Smart Grid using state estimation.</li> <li>6. Digital Twin for Building Energy Consumption Forecasting using Deep Learning.</li> <li>7. Blockchain Networks for Building Integrated Microgrids and Solar PV Electric Vehicles Charging Station to Support and Foster</li> <li>8. Design and Implement Inter Blockchain Communication between Heterogeneous Blockchain Networks.</li> <li>9. Remote Attestation of Cyber Physical Systems (CPS).</li> <li>10. IoT Testbed</li> <li>11. Blockchain Performance Evaluation</li> <li>12. Program-Flow Attestation of an IoT Application Software</li> <li>13. Blockchain Information Security Assurance Framework for Smart Government</li> </ol> <p>Internet of Things (IoT) Information Quality Framework for Transportation</p>
<p>Examples of accomplishments</p>	<p>In the OpenUAE research group, we have joint collaboration with several governmental entities in wide aspects of technologies. For example, with Dubai Electricity &amp; Water Authority (DEWA) a joint project in security for the advanced persistent threat was conducted. On the other hand, with Telecommunication Regulatory Authority (TRA) a joint project in IoT-</p>

Blockchain System Design & Implementation was developed. Hence, the OpenUAE has several research directions and projects that are presented in *Figure 1* and they consist of 5 main aspects:

- **Opensource software:** Develop, apply, and evaluate open-source software solutions and analyze their effects in communities and industries. Such as MindSpore AI platform evaluation and using open-source frameworks in deep learning, automation, security, and data preprocessing.
- **Security:** Explore different solutions to detect recent security attacks in critical systems. Such as APT detection, digital multimedia security and sensor forensics, cybersecurity for industrial control systems and industrial IoT, and IoT security testbed and program attestation
- **Blockchain:** Evaluate different blockchain platforms for performance, security, and scalability. Studying Ethereum, Hyperledger, and Cardano platforms. Develop blockchain-based authentication and verification systems
- **Robotic Process Automation (RPA) and Fintech:** Explore different automation solutions in the finance field. Such as automation of technical and sentiment analysis by developing a FOREX Intelligent RPA.
- **Artificial Intelligence:** Explore and deploy cutting-edge AI techniques in several fields. For example, early cancer detection and grading, federated learning, object detection and recognition, resources consumption prediction, software defect detection, signal processing in the encrypted domains, and other security applications.



**Figure 1.** Open UAE Research Directions

Company strategic orientation

The Office of the Vice for Research and Graduate Studies (VCRGS) is the leading administrative entity that organizes and supervises all activities of research, development and innovation at UOS. The VCRGS has extensive responsibility and supervision for the development and implementation of all policies and procedures pertaining to the administration and execution of research across all disciplines at the university. The VCRGS works closely with the chancellor, the institutes' directors and college deans, and others administrative units to identify and ease obstacles to research, as the university pursues its strife for excellence in research and education. The Office of the VCRGS consists of the following institutes and Units:

- The Research Institute of Sciences and Engineering (*Figure 2*)
- The Research Institute of Health and Medical Sciences
- The Research Institute of Humanities and Social Sciences
- The College of Graduate Studies
- The Research Funding Department
- The Scientific Publishing Unit
- The Technology Transfer Office
- The Research Outreach Department

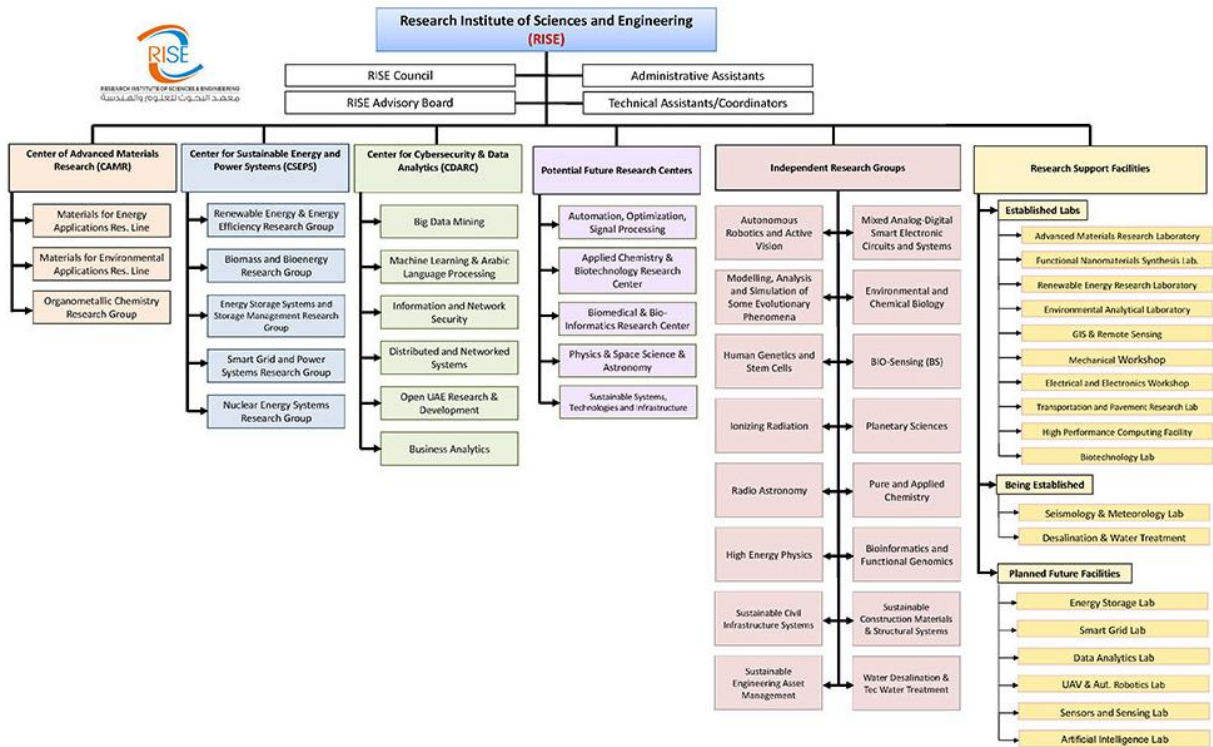


Figure 2. Research Groups

## SECTION 2: Spanish Company Profile

(Please provide a brief summary of the prospective partner company or organization. This summary may address some or all of the points below)

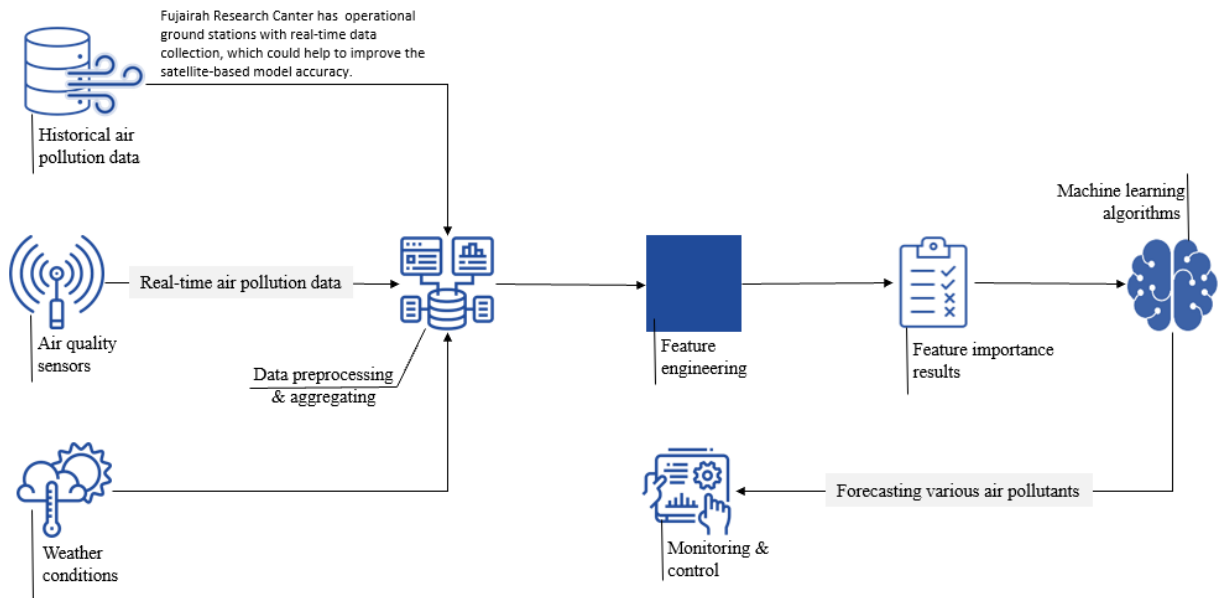
Profile of ideal technology partner

In the OpenUAE research group, we have joint collaboration with several governmental entities in wide aspects of technologies. For example, with Dubai Electricity & Water Authority (DEWA) a joint project in security for the advanced persistent threat was conducted. On the other hand, with Telecommunication Regulatory Authority (TRA) a joint project in IoT-Blockchain System Design & Implementation was developed. Hence in this partnership our ideal technology partner is preferred to have the following:

- Strategic planning for designing air quality monitoring and decision-support system.
- Identifying a set of requirements for establishing a process tailored to specific business needs
- Refining the conceptual framework for air quality monitoring and decision-making.
- Designing a consolidated concept-level framework for sensing and processing environmental data.
- Building a framework with integrating recent research on AI-based decision-making, including raw sensor measurement improvements (interpolation and imputation), data-centric consensus (DCC), and federated learning across edge-cloud topologies.
- An evaluation of the framework on the operational ground stations with real-time data collection, which when fused with satellite-based observations helps to improve the model accuracy and therefore leads to more meaningful predictions.
- The project integration with another ongoing project at FRC on weather monitoring and modeling
- Preparation of the framework for practical deployment

*Figure 3* illustrates the air pollution forecasting framework





**Figure 3.** Air pollution forecasting framework

<p>Core technological competencies and expertise</p>	<ul style="list-style-type: none"> <li>• Strategic planning for designing air quality monitoring and decision-support system.</li> <li>• Identifying a set of requirements for establishing a process tailored to specific business needs</li> <li>• Refining the conceptual framework for air quality monitoring and decision-making.</li> <li>• Designing a consolidated concept-level framework for sensing and processing environmental data.</li> <li>• Building a framework with integrating recent research on AI-based decision-making, including raw sensor measurement improvements (interpolation and imputation), data-centric consensus (DCC), and federated learning across edge-cloud topologies.</li> <li>• An evaluation of the framework on the operational ground stations with real-time data collection, which when fused with satellite-based observations helps to improve the model accuracy and therefore leads to more meaningful predictions.</li> <li>• The project integration with another ongoing project at FRC on weather monitoring and modeling.</li> <li>• Preparation of the framework for practical deployment.</li> </ul>
<p>Other essential qualifications (e.g.: ownership, track records etc.)</p>	<p>Track record on research and development, product development, and collaboration with universities and government agencies</p>
<p>If you have a list of companies</p>	<p>The University of Sharjah is interested to collaborate with the research project partners working on Real Monitoring Air Quality</p>

<p>with whom you are in contact or interested in contacting, please provide contact details</p>	<p>and Decision Support System. Moreover, the University of Sharjah has a variety of partners and collaborators, such as: <a href="#">VMware</a>, <a href="#">Amazon</a>, <a href="#">Nvidia</a>, <a href="#">Oracle</a>, <a href="#">RedHat</a>, <a href="#">Huawei</a>, <a href="#">Cyber Wales</a>, and <a href="#">Cisco</a>. There are several partners and colleagues that the OpenUAE Research &amp; Development Group works with:</p> <ul style="list-style-type: none"> <li>• FRC: Fujairah Research Center, located in the North of the UAE.</li> <li>• ZHAW: Zurich University of Applied Sciences, School of Engineering.</li> <li>• HES-SO: University of Applied Sciences and Arts of Western Switzerland.</li> </ul> <p>Additionally, the research partners maintain contact to three highly specialized Swiss industry partners who will give guidance in a wider project context concerning practical feasibility and customer expectations. These collaborators are:</p> <ul style="list-style-type: none"> <li>• OrbiWise</li> <li>• SecurAxis</li> <li>• Adnexo</li> </ul>
<p>If you are interested in collaboration: please specify details and other important information you want to share with a potential company</p>	<p>Manar Abu Talib and the research team are interested in collaborating on research projects related to designing air quality monitoring solutions to achieve a sustainable economy through cutting-edge innovative research, especially in environmental sciences. This will include but not limited to: expertise in IoT applications and edge-cloud continuums and in large-scale infrastructures, federated learning, edge-cloud topologies, edge AI, noise and air quality sensors, complementing air quality measurements with e.g. a determination of the effects of vehicles of certain classes on the air quality, an IoT/sensor device manufacturer and platform operator with air quality sensors (e.g. CO2, moisture, temperature, organic components), etc.</p>
<p>Interested areas of collaboration</p>	<ul style="list-style-type: none"> <li>• Research evaluation air quality monitoring and decision-making solutions: Converge the understanding of a highly capable framework for data acquisition and interpretation, given the opportunities and limitations of infrastructure in practice related to ML tooling, IoT and edge devices as well as cloud platforms.</li> <li>• Socioeconomic and transport-related projects</li> <li>• Social/ecological and business projects.</li> <li>• Air pollution forecasting solutions</li> <li>• Air quality monitoring, data processing, and generation of decision-making from data, IoT and computer engineering, and technology on sensing and cloud processing.</li> </ul>
<p>Specific R&amp;D contribution you</p>	<p><b>Industrial Projects:</b></p>

are seeking/offering

- Environment
  - Data-driven Forecasting Algorithms for Community-level Water and Electricity Consumption
  - A Comprehensive Disaster Management Framework for Smart Cities
- Security
  - Data Driven False Data Injection Attacks Detection in Smart Grid using state estimation
  - Awareness of cybercrimes Among Youth in the UAE Society
- Open Source
  - Open Source Software in the Arab World.
  - Open Source Software in the UAE: Challenges, Opportunities & Recommendations.
  - Open Source Software Use in Law Enforcement/Education in the UAE.
  - Quality in Use Models & Metrics.
- Robotics Process Automation (RPA) or BOTs applications and enhancements in different areas
- Blockchain and IoT
  - Blockchain performance
  - Blockchain security
  - Blockchain Networks for Solar PV Electric Vehicles Charging Station to Support and Foster Clean Energy Transition
  - Blockchain Framework for Academic Certifications (BSV)
  - Improved Blockchain Infrastructure with IoT for Critical/Smart Government
  -
- Machine Learning Application in in different areas
  - Anomaly Detection in IDS
  - APT – Advanced Persistent Threats
  - AI in Dentistry
  - Breast and Liver cancer detection
  - Software Defect Prediction and Ranking their Criticality using AI
- Programming Languages
  - Operating Systems: UNIX, Novell, Linux, Windows...
  - Database Management System: Oracle, SQL Server, MySQL, MS Access
  - Design Methods: UML, Design patterns
  - Modelling Tools: Rational Rose, Microsoft Office Visio
  - Programming languages: C++, Java, Python, SQL, VB, .Net, Open GL
  - Software Measurement Methods: COSMIC-FFP, Cyclomatic Number, LOC
  - Software Testing Methods: Alpha, Beta, Unit, Regression, Integration
  - Specification Languages: Larch, PVS, Z...
  - Mathematical Software: Scientific Notebook, Minitab, Maple...
  - Web Development: Dreamweaver, FrontPage, HTML, XML, JavaScript

- Compilers: Lex and Yacc and Java Compiler Compiler.

### Short Bio & Research Interests:

**Manar Abu Talib** is Associate Professor and Chair of Research Outreach Department, Office of Vice Chancellor Office for Research & Graduate Studies at University of Sharjah, UAE. She is also a faculty member at College of Computing & Informatics. Dr. Abu Talib's research interest includes software engineering with substantial experience and knowledge in conducting research in software measurement, software quality, software testing, ISO 27001 for Information Security, and Open Source Software. Manar is also working on ISO standards for measuring the functional size of software, and has been involved in developing the Arabic version of ISO 19761 (COSMIC-FPP measurement method). She published more than 70 refereed conferences, journals, manuals and technical reports, involved in more than 500 professional activities and sponsored research activities and supervised 7 Master thesis, 3 PhD thesis and 35 capstone projects. She received the Best Teacher Award two times, the Exemplary Faculty Award in 2008 and 2010, Google CS4HS Award in 2014, QCRI ArabWIC and Anita Borg Institute Faculty scholarships in 2015, outstanding University & Community Service Award in 2016, Exemplary Leader Award in WiSTEM 2016 and Exemplary Leader Award in ArabWIC 2019. She was the Counselor of IEEE Student Branch at Zayed University, 2012-2013 and founder and former CEO of Emirates Digital Association for Women (EDAW111). She is the ArabWIC VP of Chapters in Arab Women in Computing Association (ArabWIC), Google Women Tech Maker Lead, an executive member in UAE IEEE Section & Women in Engineering (WIE), the Sharjah Google Developer Group Advisor, the UAE representative for the COSMIC-FPP Education Committee, Co-coordinator of OpenUAE Research & Development Group and the International Collaborator to Software Engineering Research Laboratory in Montreal, Canada.

**Qassim Nasir** is currently a professor at the University of Sharjah since 2009 and IT director, and chairman of the scientific publishing unit, and was chairman of the electrical and computer engineering department. In his current position, Dr. Nasir teaches undergraduate and graduate courses in computer architecture, quantum computing, mobile computing, error control coding, telecommunication engineering, computer networks, network programming, and programmable logic controllers. He supervises several master and Ph.D. students working in different research areas. Dr. Nasir's current research interests are in robotic process automation, telecommunication and network security Internet of Things, Artificial intelligence, and blockchain. He also conducted research in telecommunication security, drone detection, localization, and GPS jamming He is a co-coordinator in the OpenUAE research group which focuses on blockchain performance and security, and the use of artificial intelligence in security applications. He is CISSP, CISA, Cisco trainer, Juniper, ITIL V4 Certified.

#### INDUSTRIAL PROJECTS:

- Project leader for ADSL Modem Firmware at NORTEL Networks – Canada. (1999-2001)
- Project Leader for OC-12 express (optical switch) at NORTEL Networks – Canada (1998-1999)
- Project Leader for OC-192 express (optical switch) at NORTEL Networks – Canada (1996-1998)
- Project Leader for Physical Router Management Software at Prior Data Sciences – Canada (1996-1996)
- Operation Manager computer centers at Ministry of Finance (IRAQ). (1978-1996)
- Project leader for computerized irrigations system – Iraq. (1991-1994)
- Robotics Process Automation (RPA) or BOTs applications and enhancements in different areas
- Data and Network Security
  - Quantum Computing in AI and QKD
  - Real Time Encryption Systems
- Blockchain and IoT
  - Blockchain performance
  - Blockchain security
- Machine Learning Application in Security
  - Anomaly Detection in IDS
  - Attack classifications and Clustering.
  - APT – Advanced Persistent Threats
- Digital Communications
  - Software Defined Radio platform for Cognitive Radars
  - Modulations detections.
  - Quantum Radar
  - Signal Intelligence
- Computer Networks
  - Power, Security and QoS aware MAC and routing protocols in mobile ad-hoc networking.
  - Haptic applications layer protocols.
- Programming Languages
  - Python in AI and security application
  - Network programming with python, C, C#, and Java network programming.
  - e-automation, PLC ladder programming, and SCADA.

**Fouad Lamghari** is currently the Director of Research at the Fujairah Research Centre, adviser of the Fujairah Authority, and leading applied research programs related to Weather forecasting, Artificial intelligence and deep learning, Air quality, and Air pollution monitoring and modeling, Underground water and hydrogeological mapping, Marine ecosystem monitoring, and Oil

	<p>Spill early detection and monitoring. He is actively engaging in startup creation, technology scale-up, and interacting with global manufacturers, partners, and technology providers for data analysis and knowledge transfer according to international standards Fouad Lamghari is a renowned Laboratory expert who has successfully participated in Aramco's billion dollars projects. He commissioned some of the world's most iconic research centers, namely King Abdullah University of Science and Technology (KAUST) and The Francis Crick Institute in London. Before joining the Fujairah Research Centre, Fouad Lamghari was the R&amp;D Manager of the DEWA R&amp;D Centre at the Mohammed bin Rashid Al Maktoum Solar Park, where he oversaw PV testing, Advanced Materials, 3D Printing, Power Systems, Smart Grids, Water Analysis, Experimental Desalination, Robotics and Drones, Building Performance, and HVAC development, Fouad Lamghari speaks five languages and earned his Bachelor of physics from the University Cadi Ayad, Marrakech, Morocco, and his Ph.D. in Chemistry from the University of Aix Marseille III, France.</p>
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**Signature**  
**Name: Manar Abu Talib**  
**Date: 4 Jan, 2023**