

Khawaja Muhammad Umar Suleman, PhD

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Summary

A PhD in AI and Robot Learning from LUMS, BS and MS from FAST in AI-Robotics, rigorous experience of over 2 decades in software industry and academics, puts me in a unique position to deliver innovation. I have founded three software companies during my career, in technical and RnD roles. I am leading AlBee.pk specializing in LLM, computer vision, and edge computing based AI intervention in enterprise and industry. Before that I was the Director at Automatrix Pakistan specializing in AI and statistics based industrial IOT products and consultant to various ICT companies for embedded AI/ML, computer vision, cyber security and IOT. I was incharge of software development at MetaApp Pakistan which was indirectly part of an acquisition by Citrix Systems.

A chronological summary of my experience is given as under.

Tenure	Role	Organization
Dec 2024 - date	Director AI	AlBee.pk
Mar 23 – date	Teaching Fellow	ITU
Mar 20 – date	AI/Computer Vision Consultant	Multiple orgs: Solution Hut, Arhamsoft, Veritus Software, Xisys, etc.
Dec 17 – Nov 24	Director	Automatrix Pakistan
Sep 16 – Feb 23	Assistant Professor	UMT
Dec 15 – Jul 16	Assistant Professor	UCP
Sep 12 – Dec 15	Assistant Professor	FAST-NU
Mar 12 – Nov 17	Director	Isotrix LLC
Feb 11 – Sep 12	Part-time Lecturer	GIFT University
Jan 11 – Feb 12	Senior Technical Manager	Electrix Engineering
Jul 09 – Dec 10	Development Manager	Suleman Automation
Dec 05 – Dec 06	Research Assistant	LUMS
Jul 04 – Dec 07	Manager Software Development	MetaApp (Pvt) Limited
Jul 02 – Jul 04	Architect, Project Manager	Simitrix (Pvt) Limited
Summer 01	Team lead for Academic Automation project	FAST-NU
01 – 11	Several teaching and assistantship jobs for courses: <ul style="list-style-type: none">▪ Programming Fundamentals, OOP, Data Structures, & Applied Programming.▪ Artificial intelligence, Robotics, & Pervasive Smart Environments.▪ Assembly Language, Operating Systems, Automata, Compiler & Laboratory Physics	UMT, UCP, FAST-NU, The Virtual University, Beaconhouse Informatics,, The University of Lahore, BNU, GIFT University, LUMS
Jan 00 – May 01	Programmer	Systems (Private) Limited

Academics and Research

I have done my BS and MS from FAST-NU Lahore, and a PhD from LUMS. I had the honor of being amongst the top 3% in BS and being the pioneer Masters' graduate at the university. Technically, my academic and research works have been related to intelligent/embedded systems, system programming and robotics. In the last few years I have conducted a joint research with University of Kaiserslautern Germany as co-investigator of a DAAD funded project related to agricultural health analysis using autonomous drones. Simultaneously, I have conducted research for diabetic retinopathy grading in collaboration with two leading hospitals of Lahore. Following is the list of publications, and summary of my academics.

Publications

1. Aftab, S., Ali, S.F., Mahmood, A., Suleman, U. A boosting framework for human posture recognition using spatio-temporal features along with radon transform. *Multimedia Tools and Applications*, Aug. 2022.
2. Mahmood, U., & Suleman, K. M. (2016). A Hybrid P2P Storage Scheme Based on Erasure Coding and Replication. *World Academy of Science, Engineering and Technology, International Journal of Computer, Electrical, Automation, Control and Information Engineering*, 10(1), 218-223.
3. Suleman, K.M.U.; Awais, M.M. Learning from Demonstration in Robots using the Shared Circuits Model. *Autonomous Mental Development, IEEE Transactions on*, vol.6, no.4, pp.244,258, Dec. 2014.
4. Suleman, M. U.; Awais, M. M. Learning from Demonstration in Robots: Experimental Comparison of Neural Architectures. *Robotics and Computer Integrated Manufacturing* 27, 794-801, 2011.
5. Suleman, M. U.; Awais, M. M.; Baig, A. R. Learning by Imitation: A Scheme for Offline Learning of Robot Control through Demonstration by Other Robot. *IJCAI-07 Workshop on Multirobotic Systems for Societal Applications*, Haidarabad, 2007.

Milestone	Brief
<i>PhD (Artificial Intelligence) LUMS</i> 06-13	Thesis revolves around the application of the Shared Circuits Model, a theory in cognitive psychology, to robot learning from demonstration. Mobile robots (Pioneer P2DX) were shown to learn navigation behaviors efficiently using the imported model.
<i>MS (Computer Science) FAST National University (FAST-NU)</i> 01 - 03	Specialization in AI Robotics. See Learning by Imitation in Robot.
<i>Learning by Imitation in Robots: A scheme for robot control learning from other robots</i> 01-03	This is an MS thesis work. Outlines a generic and novel scheme for robot control programming. A genetic algorithms approach is applied in a homogeneous robot to robot offline learning scenario through imitation. This research is realized and tested on Sony Aibo robots ERS-220 and demonstrates successful auto-programming for medium complexity, non-trivial tasks.
<i>BS (Computer Science) FAST-NU</i> 97-01	CGPA 3.5
<i>Autonomous Vehicle</i> 99	AV is an indigenous algorithm equipped software interfaced with a three-wheeled robot, applied on search for a path towards a relative destination, without any prior knowledge of the environment
<i>Intelligent Conversational Agent</i> 99	ICA is a Prolog rule-based leisure-time natural language conversational agent with cartoon-character animated interfaces, speech recognition and ability to converse.

Projects

During my professional tenure I have worked on many challenging and versatile projects.

Project	Tools Techs	Year	Role	Brief
Tobacco Contaminant Highlighting with Edge AI Cameras	CV, openCV, C, Python	25	Technical Lead AI	Edge-AI camera system for a major cigarette producer using a custom segmentation network with real-time tracking and on-screen highlighting. Reduces miss-rates in manual removal by drawing operator attention to contaminants.
LLM based Legal Document Alteration & Summarization	C, Python, GPT4o	25	Technical Lead AI	World-leading document transformation product using LLMs and proprietary AI. Automates alteration and high-fidelity summarization with governance controls and auditability.
Traffic Vision Systems	C++, OpenCV, Python	24	Developer	Couple of POCs for specific challenges faced by legacy AI/hybrid systems of respective traffic monitoring authorities in Lahore and Dubai. Designed with extension of usecases in mind, to work in CPU based settings, with naturally lower-cost and wider portability on edge or cloud.
Drone Opensource Extension	C++, Python, C, bash, LLM, Ardupilot, QGC, Gazebo	23-24	Technical Advisor	A suite of tools and pipelines built on top of enhancements of industry standard opensource projects, especially Ardupilot, QGroundControl, and . This suite is developed to augment startups globally in drone space, specifically to assist in rapid development of their POCs in simulation and real. One such POC used LLM (ChatGPT) for easy tasking of autonomous drones using natural language, thus avoiding manual static planning.
AI video content delivery system	C, Python, OpenCV	23	Design Consultant	Helped deliver a multi-stage POC for affordable video content upload, computer vision processing, and streaming of video content via web browsers. Focused more on the image processing and CV parts and also in addressing system inefficiencies.
Themepark digital	C++, .Net	23	Tech Lead	A custom designed secure digital wallet using classic RFID cards and a distributed system consisting of multiple rides and topup stations connected via a fragile wireless network.
Thin client biometric	C	23	Tech Lead	Solution for secure extension of two types of very large thin client infrastructures to support fingerprint biometric. Included development of secure biometric device, and implementation of software solutions on Sun Solaris and MSFT Windows respectively.

Diabetic Retinopathy Intelligent Optic System	C/C++	22	Developer	Developed early prototypes of an extremely low-cost Diabetic Retinopathy diagnostic support system. Included development of multiple prototype hardware for non-mydratic fundus photography and software to grade retinopathy severity.
Autonomous aerial Surveillance	C, python	22	Tech Lead	POC development of an efficient multiple drone systems including multicopter and fixed-winged drones, for different types of autonomous surveillance applications.
Environment IOT	C/C++	21	Tech Lead	Designed and developed IOT system including sensor nodes, concentrators, cloud servers and browser-based front-end.
Carton Quality Monitoring	C, image Processing	20	RnD	POC for smart assembly line sensor to detect manufacturing and expiry dates legibility and presence and to compliance of package art with provided template. Tested on small juice drinks cartons setup.
Chick Count and Health Monitoring	C	18	Developer	Product and algorithm development for thermal and color camera based robotic sensor to count chicks on entire control shed. This product is able to tell dead and sick chicks from healthy ones. Provides 24/7 farm statistics over internet. Ongoing development, which will move into health informatics for epidemic detection and control.
Hot Pursuit	C++ OpenCV C	18	Advisor	Helped design a facial recognition quadcopter on top of standard kits. Once locked on a target person can chase it down.
Fuel and Power IOT	C	18	Developer	Industrial product development for blast proof, IOT enables range of sensors, which measure different fuel aspects, including stock volume, generator fuel consumption, and fuel dispensation.
Ejalbhuj	C	18	Developer	Firmware redesign of commercial remotely controllable high wattage switching device.
Mall Navigation	C# Unity3D	18	Developer	Simple touch friendly Windows app in a Kiosk, for Animated navigational directions from Kiosk to user specified outlets or public areas like parking, food court, ATM and washroom.
Telepresence Robot	Android C	17	Team Lead	Mechanical, Electrical, Firmware and Software development of human sized treaded robot with Android as face. Capable of two way audio and video streaming between robot and an Android control app.
Smart Board	C	17	Designer Developer	Design and development of a 4 switch touch buttons product which is remotely controllable over internet on App as well. Has fancy reports over the internet
Airport Queue Counter	C	17	Developer	Design and development of immigration queue length counting using minimal sensors for Dubai international airport.
Superbike Wear Sensor	Android C	17	Developer	POC of wearable sensor as part of heavy bike gear with graphic visualization on an Android Tablet.

Face Attendance Gadget	<i>OpenCV</i>	17	<i>Developer</i>	Attendance system with off-the-shelf algorithms for face detection and recognition using raspberry pi with camera.
Smart Commercial Fridge	<i>C</i>	17	<i>Developer</i>	Complete IOT kit product design and development for commercial fridges, to report abuse, temperature log, etc, and for temperature control.
Water Treatment Cloud	<i>node.js</i>	16	<i>Developer</i>	Reporting and remote control tool for a sizeable network of automated water treatment plants with state of the art instrumentation in Pakistan given as a scalable web application.
ANPR	<i>C++</i>	16	<i>Developer</i>	Intelligent OCR for standard and non-standard number plates passing through high-way toll plazas in Pakistan. Estimated to supersede any competitive software in the market.
Keyfob Emergency gear	<i>C, TI Bluetooth platform</i>	15	<i>Developer</i>	Programming and hardware troubleshooting of a keyfob shaped gadget to connect with iOS phones via Bluetooth low-energy (BLE). Pressing buttons in a specific manner, generates emergency call to saved number. The product is initially funded at kickstarter.
Number plate reader for Punjab plates	<i>Matlab</i>	14	<i>Consultant Developer</i>	RnD and prototype development for Teradata for their potential partnership with the Government of the Punjab. Logs the incoming cars registration numbers inside parking of a building.
Jalbhuji	<i>C</i>	13	<i>Consultant Developer</i>	An Android controlled, via Bluetooth low energy, snap-on gadget for the conventional domestic hot water gezeer that controls the temperature of water according to given schedule.
Android test report tool	<i>ASP.Net</i>	12	<i>Consultant</i>	Front-end development and integration with backend web services for another company for a product of Android application testing and benchmarking.
VLC maintenance	<i>C/C++</i>	11	<i>Consultant Developer</i>	Removal of few bugs in the latest version of that time and few tweaks.
Weigh Fill	<i>C</i>	09-11	<i>Developer</i>	Weigh Fill is a by-weight filling machine with a small foot print, an efficient mechanical and electrical design and high affordability.
Research Sharing web-portal	<i>ASP.Net 2.0 C# Javascript Java</i>	06-07	<i>Director Engineering, Architect, Developer</i>	RSWP is a large-scale public specialized user-base web-based product. It is a web 2.0 concept application to allow collaboration in research and documentation. It includes multiple collaborative sub-applications like research content capturing, editing, calendaring, tutoring, etc.
Corporate E-mail Search and Recovery	<i>.Net VC undecided</i>	05	<i>Manager, Team Lead</i>	CESAR is an intelligent corporate-level searching and archiving product for e-mail data. It is aware of discussion threads throughout the corporate and hence can bring out entire picture of a communication incidence of interest. Additionally, it can reliably backup and instantly restore e-mail data in case of a disaster. It also provides traditional style but intelligent searching and lost e-mail recovery for end-users.

<i>Zenprise</i>	<i>XML C# .Net</i>	<i>04-0 5</i>	<i>Manager Development , Knowledge engineer</i>	<i>Zenprise is a Microsoft Exchange Auto-diagnosis and Remedial System, Windows ® operating system-level expert system to 'auto-pilot' complex and costly large corporations MS Exchange infrastructure. Expert knowledge is the heart of this software and is divisible into classical sense expert rules to diagnose malfunction of any kind and remedial scripts aimed to rectify diagnosed ailments.</i>
<i>USTAD</i>	<i>VC</i>	<i>04</i>	<i>Project Manager & System Analyst</i>	<i>Urdu Speech Training Aid for the Deaf is a Windows ® based 3-D face animation and rendering system to aid deaf school children in learning to speak or utter common Urdu language in Pakistan.</i>
<i>Rate Tracking Application</i>	<i>VB MS Office</i>	<i>04</i>	<i>Architect and Lead Developer</i>	<i>RTA is a small application for stock businessmen. It takes and interprets feeds from local markets and displays in real-time. Inputs personalized user rules through legacy tabular Excel sheets and generates alarms and triggers with sounds and/or familiar visuals for optimal and automated, buying and selling of stocks.</i>
<i>Bluetooth Pagers</i>	<i>C++</i>	<i>03-0 4</i>	<i>Architect & Lead</i>	<i>Bluetooth pager is a complete Bluetooth wireless communication embedded device for vicinity based preference matching and wireless gaming. Includes complete hardware and software design and full featured prototype development. These pagers work within the Bluetooth standard range e.g. 10 meters for class C Bluetooth model.</i>
<i>Acutus Video Conferencing</i>	<i>C/VC++</i>	<i>02-0 3</i>	<i>Developer</i>	<i>Acutus Video Conferencing project is an enhancement and development of 'Net meeting' type video conferencing software based on Acutus Inc. PCI video cards, for all major Windows platforms. The project includes debugging of Acutus PCI card device driver for Windows ® 2000.</i>
<i>Bar-code Readers</i>	<i>C++</i>	<i>02-0 3</i>	<i>Lead Engineer</i>	<i>Bar-code Readers project includes research and prototype development of CCD based PC-interfaced bar code scanners.</i>
<i>Gas Station Tracking System</i>	<i>VC Access</i>	<i>02</i>	<i>Architect & Lead</i>	<i>Gas Station Tracking system includes software and hardware prototype development for a comprehensive and automatic gas station monitoring, quality control and accounting purposes.</i>
<i>CPen</i>	<i>VC++</i>	<i>02</i>	<i>Development Consultant</i>	<i>CPen basically includes consultancy in development and enhancement of standard software application of CPen's standalone data acquisition gadgetry. This effort includes CPen SDK study and straw man application development.</i>
<i>AAS</i>	<i>JSP MySQL</i>	<i>01</i>	<i>Lead & Developer</i>	<i>Development of Registration module of the Academic Automation System at the FAST National University.</i>

<i>National ID Card</i>	C++	01	<i>Developer</i>	Some core image processing research and utilities development for the National ID card computerization project.
<i>Wireless Enterprise Proxy</i>	VC++ ISAPI	00-01	<i>System Analyst & Developer</i>	Wireless Enterprise proxy is an intelligent protocol translation 'proxy' software to link wireless/hand-held devices with existing http based websites on the run. The idea behind this proxy is to avoid costly redundant development and maintenance of http and WAP-based websites. The challenge is to intelligently convert larger, more graphical dynamic pages into multiple smaller and connecting mobile device-compatible WAP pages.
<i>Raakim</i>	VC++	00	<i>Developer</i>	Enhancement of an Urdu editor active-x control, including addition of few graphical features.
<i>CDAS2000</i>	VC++	00	<i>Developer</i>	CDAS2000 is a telephone data enquiry and database maintenance system developed over a legacy enquiry system used in the capital and other cities of Pakistan, to port on to windows environment using visual C.

Technical Expertise

During the course of professional work and teaching, I have developed expertise in the following.

Tools / Languages	Domains
<ul style="list-style-type: none"> • C • C++ • C# • Prolog, CLIPS, LISP • Matlab • Assembly language • Specific SDKs (Netmeeting SDK, OPEN-R SDK, CPen SDK) • Visual Programming (Win 32, MFC) • UML • Java / JSP • Visual Basic • Oracle, SQL Server, MySQL etc. 	<ul style="list-style-type: none"> ▪ Robotics & embedded systems ▪ Aerial robotics ▪ Bio-medical engineering ▪ Machine learning ▪ Computer vision ▪ Image Processing

Extra-curricular and co-curricular

I am the founding Regional Contest Director of ACM International Collegiate Programming Contest (ACM-ICPC) in Pakistan, which is the most prestigious international programming competition for university students. I have been member of the executive committee of the alumni body of FAST National University. I had been elected as the President of this body for the two consecutive terms. I had been the founding President of STARfALL for two consecutive years, an NGO focused on STEM recognition in youth, which played the role of the Pakistan chapter for the famous First Lego League (FLL). I am also member of the program committee of FIT and WFAR technical conferences in Pakistan. I have been involved in one or the other form of sports including volleyball, basketball, badminton, table tennis, tennis and football throughout. I have been member of FAST-NU volleyball and football teams, and also LUMS volleyball team during my studies.

References

To be furnished on demand.