


# Curriculum Vitae

Personal information	
Name	<b>Talha Ahmed Khan, Assistant Professor (PAK-Austria)</b>
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	<p>I am focused on continue to become independent instructor/faculty. I have experienced both academia and research and my skills are highlighted as follows:</p> <ul style="list-style-type: none"><li>- Course Instructor</li><li>- FYP Supervisor</li><li>- Master's Thesis Supervisor</li><li>- PhD Thesis Supervisor</li><li>- Scheme of Studies</li><li>- Board of Studies</li><li>- NFV Developer</li><li>- SDN Expert</li><li>- Edge Caching, AI-Driven RAN, AI-Driven Core</li><li>- E2E architecture design, orchestration, and operations</li><li>- Zero-Touch Network Operations</li><li>- Energy Efficient Resource Optimization</li><li>- Multi-Objective Optimization and Dynamic Orchestration with Proactive Decisions</li><li>- OpenStack, MicroStack, ONOS, ODL, RYU, OSM, CORD, VIM-EMU etc expertise</li><li>- Web, SQL, Python, FLASK, REST, Shell/Bash</li><li>- LSTM, GNN, RouteNet, NLP, GAN, RNN, ANN, RL, CNN Experienced</li><li>- Kafka, BigData, Hadoop, PySpark, ELK-Stack, Grafana, Prometheus</li><li>- Worked on FlexRAN, Explored O-RAN, C-RAN and vBBU</li><li>- Working experience of OAI (Open Air Interface) Opensource 5G</li></ul>
Education	
<b>PhD in Computer Engineering</b>	<b>Jeju National University, Jeju, South Korea</b> September 2019- August 2022 Thesis: <b>Reinforced Intent-based Networking for e2e Service Orchestration and Optimization</b>
<b>Master of Science in Computer Engineering</b>	<b>Jeju National University, Jeju, South Korea</b> September 2017 – August 2019 Thesis: <b>Dynamic Resource Management on Top of SDN and NFV platforms by applying Machine Learning</b>
<b>Bachelor of Science in Computer Science</b>	<b>FAST-National University of Computer and Emerging Sciences (NUCES), Pakistan</b> September 2013 – August 2017 Thesis: <b>Smart Control Application for Smartphones (Studied multiple courses and have diverse experience of project development)</b>
Skills	
<b>Hands-on</b>	<ul style="list-style-type: none"><li>- Management of OpenStack</li><li>- ONOS</li><li>- Management of CORD platform</li><li>- Management of multidomain OpenSource MANO platform</li><li>- Hands on Experience with OpenAir Interface EPC and FlexRAN.</li><li>- Hands on experience in Automating Research and Education Network of Korea (KOREN).</li><li>- Hands on experience in operating TEIN (Trans-Eurasia Information Network).</li></ul>
<b>Codes</b>	<ul style="list-style-type: none"><li>- Python, C++, JavaScript, JAVA, C, Android, Web and Databases.</li></ul>

- Proficient in Data Science, Realtime Data Collection and Monitoring/Big Data Processing, Machine Learning, Reinforcement Learning and Machine Reasoning Methodologies.
- Proficient in CORD, OSM, OpenStack, ONOS, Mininet, Wireshark, Linux, sflow, Goflow, PySpark, ELK stack, SDN controllers.

**Language**

**English: Advance, Medium of Professional Communication Korean: Basics**

**Expressions**

**International conferences, publications, supervision of undergraduate students and interns.**

**Work Experience**

**Research Fellow**

**Department of Computer Science and Electronics Engineering, Information Communication Centre, University of Surrey, Guildford, United Kingdom**  
Sept 2023- Present

**Works:**

- 6G Non-Terrestrial Networks
- Heterogeneous Service Orchestration
- 6G Architecture Design (Network Function Disaggregation)
- Onboarding of Network Services

**Assistant Professor**

**Department of Computer Science, Air University Islamabad**  
Feb 2022- August 2023

**Courses:**

- Compilers Constructions Lab (BS-CS)
- Tools and Techniques in Data Science (MS-CS)
- Special Topic in Mathematical Reasoning (PhD-CS)
- Digital Image Processing (BS-CS)

**Administrative Activities:**

- Department Board of Studies on Scheme of Studies for the Program of MS in Quantum Computing
- Assisted NCEAC Visit, represented OBE and Course folders
- Course Folders Coordinator

**Post Graduate Researcher**

**Jeju National University, Jeju, South Korea**  
Sep 2017- Jan 2022

**Projects:**

- **ZT&T (Zero Trust and Touch Supported by Tri Circle Foundation Korea)**  
Role: Lead designer at SSOT (Single Source of Trust and Truth) using Blockchain technology for Cyber Security and immutable transaction in Cyber Physical System.
- **Asi@Connect Project (IBN@TEIN) Supported by TEIN (Trans-Eurasia Information Network)**  
Role: Lead developer of Intent-based Networking (IBN) for service optimization using Cognitive approaches.
- **KOREN (Korean Research and Education Network) Supported by National Information Society Agency (NIA) named as IBN@KOREN (No.1711117098).**  
Role: Lead design, developer and researcher on AI-Driven Network Automation. Presented live demonstration in front of NIA and in NetSoft conference.
- **Project of MSIT (Ministry of Science and ICT), Korea, under the ITRC (Information Technology Research Center) Supported by IITP-2022-2017-0-01633**  
Role: Research and Development on 5G in the field of NFV/SDN and Network Automation using Intent-Based Networking as result developed an multidomain zero-touch network orchestrator.  
Presented Live Demonstration of IBN-Based 5G network in NOMS conference.

**Module Instructor****Jeju National University, Jeju, South Korea**

Sep 2019- 2022

**Responsibility:** Undergraduate Teaching: Brain-storming session for planning and executing computer software ventures. Identifying problems and evaluating solutions through applied computer science knowledge.**Development History**

- I worked on developing NSSF (Network Slice Selection Function) and utilized the M-CORD platform for Dynamic Slice Handling. In addition, I majorly worked on resource optimization and zero-touch networks using machine learning approaches.
- My recent works include NLP (Natural Language Processing) and MR (Machine Reasoning) for having machine-driven reasoned interaction with the network orchestrators through high-level intents to manage network operations.
- In addition, I have explored the utilization of Reinforcement Learning to orchestrate the network while considering the multi-objective optimization of resources dynamically.
- Similarly, I have explored defining ML-Driven network forwarding and Routing algorithm. I have designed an extended RouteNet algorithm through which we can forecast and decide on optimized e2e service paths.
- I majorly worked on Intent-based Zero Touch Network Operations and designing catalog repositories as SSOT (Single Source of Truths) for translating non-semantic declarative intents to highly semantic complex network configurations.
- I am currently focusing on defining a blockchain-driven network catalog repository for 5G that can utilize smart contracts to determine network configuration at the top. In parallel, it can achieve zero-trust-based service sharing between different stakeholders.
- I researched on applying ML technique using Federated Learning for access, edge and core network optimization.

**Selected Publications**

- RIVERA, J. J. D., AKBAR, W., **KHAN, T. A.**, MUHAMMAD, A., & SONG, W. C. (2023). Secure enrollment token delivery mechanism for Zero Trust networks using blockchain. *IEICE Transactions on Communications*, 2022TMP0005.
- **T. Ahmed Khan**, K. Abbas, A. Muhammad and W. Song, "An intent-driven closed-loop platform for 5g network service orchestration," *Computers, Materials & Continua*, vol. 70, no.3, pp. 4323–4340, **2022**.
- K. Abbas, **T. A. Khan**, M. Afaq and W. -C. Song, "Network Slice Lifecycle Management for 5G Mobile Networks: An Intent-Based Networking Approach," in *IEEE Access*, vol. 9, pp. 80128-80146, 2021, doi: 10.1109/ACCESS.2021.3084834.
- Javier Diaz Rivera, **Talha Ahmed Khan**, Mehmood Asif and Wang-Cheol Song, "[Network Slice Selection Function on M-CORD](#)", *KNOM Review*, Vol. 21, No. 2, Dec. 2018, pp. 35-45.
- Talha Ahmed Khan, Afaq Muhammad, Khizar Abbas and Wang-Cheol Song, "[IBN-based: AI-driven Multi-Domain e2e Network Orchestration Approach](#)", *KNOM Review*, Vol. 23, No. 2, Dec. 2020, pp. 29-41.
- Rafiq, A.; Mehmood, A.; **Ahmed Khan, T.**; Abbas, K.; Afaq, M.; Song, W.-C. [Intent-Based End-to-End Network Service Orchestration System for Multi-Platforms](#). *Sustainability* 2020, 12, 2782.
- **Abbas, K, Afaq, M, Ahmed Khan, T, et al.** An efficient SDN-based LTE-WiFi spectrum aggregation system for heterogeneous 5G networks. *Trans Emerging Tel Tech.* 2020;e3943. <https://doi.org/10.1002/ett.3943>
- **MK Muhammad Afaq, Javed Iqbal, Talha Ahmed, Ihtesam ul haq** "Towards 5G network slicing for vehicular ad-hoc networks: An end-to-end approach". *Computer Communications* 149, 7 <https://doi.org/10.1016/j.comcom.2019.10.018> .
- Khizar Abbas; Muhammad Afaq; **Talha Ahmed Khan**; Adeel Rafiq; Wang-Cheol Song. "Slicing the Core Network and Radio Access Network Domains through Intent-Based Networking for 5G Networks." *Electronics* 2020, 9, 1710 .
- Abbas, K., Afaq, M., **Ahmed Khan, T.**, & Song, W. C. (2020). A Blockchain and Machine Learning-Based Drug Supply Chain Management and Recommendation System for Smart Pharmaceutical Industry. *Electronics*, 9(5), 852.
- Akbar, Waleed, Javier JD Rivera, **Khan T. Ahmed**, Afaq Muhammad, and Wang-Cheol Song. "A Machine Learning-based Real-time Monitoring System for Classification of Elephant Flows on KOREN." *KSII Transactions on Internet & Information Systems* 16, no. 8 (2022).

**Journals**

## Conferences

- Asif, M., Afaq, M., **Ahmed Khan, T.**, Rivera, J. D., Iqbal, J., Ul Islam, I., & Song, W. C. (2020). Energy-efficient Auto-scaling of Virtualized Network Function Instances based on Resource Execution Pattern. *Computers & Electrical Engineering*.
- J. J. D. Rivera, M. M. S. Sarwar, S. Alam, **T. A. Khan**, M. Afaq and W. -C. Song, "An Intent-Based Networking mechanism: A study case for efficient path selection using Graph Neural Networks," NOMS 2023-2023 IEEE/IFIP Network Operations and Management Symposium, Miami, FL, USA, **2023**, pp. 1-6, doi: 10.1109/NOMS56928.2023.10154296.
- T. A. Khan, A. Muhammad, W. Akbar, A. Mehmood, A. Rafiq and W. -C. Song, "Intent-based Networking Approach for Service Route and QoS control on KOREN SDI," 2021 IEEE 7th International Conference on Network Softwarization (NetSoft), 2021, pp. 24-30, doi: 10.1109/NetSoft51509.2021.9492690.
- T. Ahmed Khan, K. Abbas, J. J. Diaz Rivera, A. Muhammad and W. -c. Song, "Applying RouteNet and LSTM to Achieve Network Automation: An Intent-based Networking Approach," 2021 22nd Asia-Pacific Network Operations and Management Symposium (APNOMS), 2021, pp. 254-257, doi: 10.23919/APNOMS52696.2021.9562499.
- K. Abbas, T. A. Khan, M. Afaq and W. -C. Song, "Ensemble Learning-based Network Data Analytics for Network Slice Orchestration and Management: An Intent-Based Networking Mechanism," NOMS 2022-2022 IEEE/IFIP Network Operations and Management Symposium, 2022, pp. 1-5, doi: 10.1109/NOMS54207.2022.9789706.
- **T. A. Khan**, A. Mehmood, J. J. Diaz Ravera, A. Muhammad, K. Abbas and W. Song, "Intent-Based Orchestration of Network Slices and Resource Assurance using Machine Learning," *NOMS 2020 - 2020 IEEE/IFIP Network Operations and Management Symposium*, Budapest, Hungary, 2020, pp. 1-2, doi: 10.1109/NOMS47738.2020.9110408. [10.1109/NOMS47738.2020.9110408](https://doi.org/10.1109/NOMS47738.2020.9110408).
- **T. A. Khan**, A. Mehmood, J. J. Diaz Rivera and W. Song, "Machine Learning Approach for Automatic Configuration and Management of 5G Platforms," *2019 20th Asia-Pacific Network Operations and Management Symposium (APNOMS)*, Matsue, Japan, 2019, pp. 1-6, doi: 10.23919/APNOMS.2019.8893119 [10.23919/APNOMS.2019.8893119](https://doi.org/10.23919/APNOMS.2019.8893119).
- Rivera, Jose Diaz, **Talha Ahmed Khan**, Waleed Akbar, Afaq Muhammad, Asif Mehmood, and Wang-Cheol Song. "Automation of network anomaly detection and mitigation with the use of IBN: A deployment case on KOREN." In 2022 IEEE 23rd International Symposium on a World of Wireless, Mobile and Multimedia Networks (WoWMoM), pp. 294-299. IEEE, 2022.
- **T. A. Khan**, K. Abbas, A. Muhammad, A. Rafiq and W. -C. Song, "GAN and DRL Based Intent Translation and Deep Fake Configuration Generation for Optimization," 2020 International Conference on Information and Communication Technology Convergence (ICTC), 2020, pp. 347-352, doi: 10.1109/ICTC49870.2020.9289564.
- **Khan, T. A.**, Afaq, M., Abbas, K., Rafiq, A., Mehmood, A., & Song, W. C. (2020). [Generic Intent-Based Networking approach for end-to-end Slice Orchestration and Lifecycle Management](#). *Korean Communication Society*, Journal of the Korean Institute of Communication Sciences 2020.02, 468-469 (2 pages).
- Mehmood, A., **Khan, T.A.**, Rivera, J.J.D. and Song, W.C., 2019, September. Dynamic Auto-scaling of VNFs based on Task Execution Patterns. In 2019 20th Asia-Pacific Network Operations and Management Symposium (APNOMS) (pp. 1-4). IEEE.
- Rivera, J.J.D., **Khan, T.A.**, Mehmood, A. and Song, W.C., 2019, September. Network Slice Selection Function for Data Plane Slicing in a Mobile Network. In 2019 20th Asia-Pacific Network Operations and Management Symposium (APNOMS) (pp. 1-4). IEEE.
- **Khan, T.A.**, Rivera, J.D., Mehmood, A. and Song, W.C., 2019. Generic Blockchain based Policy and Configuration Framework for Next-Generation Networks, KICS Conference, pp.1483-1484.
- **Khan, T.A.**, Rivera, J.D., Mehmood, A. and Song, W.C., 2018. Network Slicing Using Enhanced OpenAirInterface eNodeB and EPC under M-CORD Platform. KICS Conference, pp.182-183.
- Abbas, M.T., **Khan, T.A.**, Mahmood, A., Rivera, J.J.D. and Song, W.C., 2018, April. Introducing network slice management inside M-CORD-based-5G framework. In NOMS 2018-2018 IEEE/IFIP Network Operations and Management Symposium (pp. 1-2). IEEE [10.1109/NOMS.2018.8406113](https://doi.org/10.1109/NOMS.2018.8406113) .

**Patents  
(National South Korea)**

- 1020180161617 - December 14, 2018 - Network Slice Selection Function and how to implement it in 5G system (in Korea)
- 1020200164780 - November 30, 2020 "Intent-based network management system and method using GAN and DRL" (in Korea)

**Posters/Events**

- [Presenter at ONE-Summit 2022](#): "ZT&T Intent-Based Networking and Blockchain-Driven Approach for Zero Trust and Touch" Javier Jose Diaz Rivera & **Khan Talha Ahmed**, Jeju National University.
- [Asif Mehmood](#), Talha Ahmed Khan, and Wang-Cheol Song, "IBN Tool for deployment of Mobile Network Contracts using M-CORD" ONF Connect 2019.
- **Javier Diaz Ravera**, Asif Mehmood, Talha Ahmed Khan, and Wang-Cheol Song, "[NSSF on M-CORD Platform](#)" ONF Connect 2018.
- Afaq Muhammad, Asif Mahmood, Shafvier Diaz, **Talha Ahmed**, and Wang-Cheol Song, "A Framework for Slicing in an M-CORD-based Platform" presented in SDN Science Fair at ONOS Build 2017, Seoul Korea

**Participation in Training Courses, Seminars, and Workshops**

- IETF meeting 2020, Jeju, South Korea.
- Workshop on Deep Learning Featuring with RL examples, 2020, Korea University, South Korea
- Open Networking Korea (ONK) 2018 spring workshop
- ONOS Build 2017
- [SDN/NFV Forum] ONOS/CORD WG 2017 6th Meeting (KREONET Workshop Tutorial Day & ONOS/CORD WG Workshop)
- Future Network Korea (FNK) 2017 KOREN Workshop
- Internet Infra System Research Centre (ITRC) Workshop, 2017, Sungsil University, South Korea

**Honours and Awards**

- Student best paper award APNOMS 2022 for paper entitled "Secure Enrolment Token Delivery for Zero Trust Networks Using Blockchain"
- Student best paper award APNOMS 2021 for paper entitled "Network data analytics function for ibn-based network slice lifecycle management"
- Outstanding paper award at the conference APIC-ICT 2021 for paper entitled "5G Service Orchestration and Assurance for UAVs: A Blockchain-Driven Approach"
- Awarded with four years National Information and Communication Technology scholarship ([NICT R&D](#)) for bachelor's studies.

**Certifications**

- Introduction to Data Visualization with Python Course, [Data Camp, 2017](#).
- Immediate Python for Data science, awarded by, [Data Camp in 2017](#).