Scientific Report

First name / Family name	Sheikh Mohammad Idrees
Nationality	India
Name of the *Host Organisation*	Norwegian University of Science and Technology
First Name / family name of the *Scientific Coordinator*	Mariusz Nowostawski
Period of the fellowship	01/11/2019 to 31/10/2021

I – SCIENTIFIC ACTIVITY DURING YOUR FELLOWSHIP

During the tenure of my fellowship, my research was centred around transformations through blockchain technology. The main objective was to investigate and study the contribution of blockchain technology in different industrial sectors. The study further focused on analysing and developing a comprehensive understanding about the various technical aspects and other cutting-edge research areas involving blockchain technology and decentralization. During the fellowship period at NTNU, I was involved in several scientific tasks. Initially it started with the study of analysing the trading/business with Cryptocurrencies and Foreign Exchange/Global fiat currencies. Further I explored to study the various security aspects of blockchain technology intended for industrial application and suggest possible solutions for enhancing the security in blockchain. I was further involved in studying how in recent years the adoption of blockchain technology by multiple industrial sectors has gained momentum along with the financial sector where it is touching new heights day by day. We also attempted to study the adaption of blockchain technology in the healthcare sector, where the focus was on privacy preserving infrastructure for healthcare systems. Furthermore, since 2019 the world has been badly hit by the COVID-19 pandemic. I also tried to study how the use of blockchain technology in contact tracing applications can help in containment of corona virus and also cope with the security concerns of related data. The list of my publications during the fellowship period indicates other scientific activities I have been involved with during my fellowship tenure.

II – PUBLICATION(S) DURING YOUR FELLOWSHIP

Publication List:

Books:

• Idrees, S.M., Mariusz Nowostawski. (2021) "Transformations Through Blockchain Technology" (1st ed.) Springer Nature, (Upcoming - In press)

• Idrees, S.M., (2021). "Blockchain for Healthcare Systems: Challenges, Privacy, and Securing of Data" (1st ed.). CRC Press. https://doi.org/10.1201/9781003141471, ISBN: 9781003141471

• Idrees, S.M., (2021). "Smart Technologies for Energy and Environmental Sustainability" (1st ed.). Springer International Publishing, http://doi.org/10.1007/978-3-030-80702-3, ISBN: 978-3-030-80702-3

Journal Publications:

• Idrees, S. M., Nowostawski, M., & Jameel, R. (2021). Blockchain-based digital contact tracing apps for COVID-19 pandemic management: Issues, challenges, solutions, and future directions. *JMIR medical informatics*, *9*(2), e25245.

• Idrees, S. M., Nowostawski, M., Jameel, R., & Mourya, A. K. (2021). Security Aspects of Blockchain Technology Intended for Industrial Applications. *Electronics*, *10*(8), 951.

• Idrees, S. M., Aijaz, I., Jameel, R., & Nowostawski, M. (2021). Exploring the Blockchain Technology: Issues, Applications and Research Potential. *International Journal of Online & Biomedical Engineering*, *17*(7).

• Idrees, S. M., & Nowostawski, M. (2020). Mobile phone-based contact tracing applications for combating Covid-19 pandemic. *Biomed. J. Sci. Tech. Res*, *32*, 25194-25197.

• Aijaz, Iflah, and Sheikh Mohammad Idrees. "Performance Evaluation of Multi-protocol Label Switching-Traffic Engineering Schemes." *EAI Endorsed Trans* 1 (2020): 103-112.

• Aijaz, I., Idrees, S. M., & Agarwal, P. (2021). An Empirical Study on Analysing DDoS Attacks in Cloud Environment. In *Advances in Intelligent Computing and Communication* (pp. 295-305). Springer, Singapore.

• Agarwal, P. and Idrees, S.M. (2021) "Blockchain and IoT technology in Transformation of Education Sector" *International Journal of Online & Biomedical Engineering*, *17*(11).

Book chapters:

• Idrees, S. M., Nowostawski (2021). Privacy-Preserving Infrastructure for Health Information Systems. *Data Protection and Privacy in Healthcare* (pp. 109-129). CRC Press.

• Idrees, S.M, Aijaz I, Jameel R, "Blockchain Based Smart and Secure Healthcare System", 2020 in Agarwal R , et.al , *Transforming Cyber Security solutions using Blockchain* (Springer Book).

• Rather, I. H., & Idrees, S. M. Blockchain Technology and Its Applications in the Healthcare Sector. In *Blockchain for Healthcare Systems, Challenges, Privacy and Securing of Data.* (pp. 17-25). CRC Press.

• Idrees, S.M, et.al., "Energy Harvesting for Environmental Sustainability", 2021 in Agarwal P , et.al , IOT for Sustainable Smart Cities and Society (Springer Book)

III – ATTENDED SEMINARS, WORKHOPS, CONFERENCES

- Attended 2nd International Conference on Intelligent Computing and Advances in Communication held at SOA University, India, 25-26 November 2020.

Invited Talk

- Delivered a talk on - "Applications of Deep Learning for COVID-19 Diagnosis and Treatment" at Jamia Hamdard, New Delhi India, 30 May 2020.

IV – RESEARCH EXCHANGE PROGRAMME (REP)

For the Research Exchange Program, I visited Blockchain Lab at FIT Fraunhofer, Sankt Augustin, Germany. I was hosted by Professor Thomas Rose for the REP. During the research visit I presented my research work at FIT and got the opportunity to know about the various projects the teams at FIT Fraunhofer is currently working upon. This REP helped me to share my research problems and experiences with the professors, and other researchers at the department and receive valuable inputs and feedbacks from them. The primary purpose of this visit was to find future research collaborations and funding opportunities. REP with FIT Fraunhofer proved to be very beneficial in terms of exchanging new research ideas and establishing collaboration for future work.