**MSc. in Computing**

**Practicum Approval Form**

# Section 1: Student Details

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| Project Title: | Towards Trustworthy AI: Blockchain-based Architecture Design for Internet of Things (IoT)" |
| Student ID: | 21268168, 21267549 |
| Student name: | Vishal Padwal, Vipul Popat, |
| Student email | [vishal.padwal2@mail.dcu.ie](mailto:vishal.padwal2@mail.dcu.ie), [vipul.popat2@mail.dcu.ie](mailto:vipul.popat2@mail.dcu.ie), |
| Chosen major: | MCM - M.Sc. in Computing - Blockchain |
| Supervisor | Irina Tal |
| Date of Submission | 11/11/2022 |

# Section 2: About your Practicum

Please answer all questions below. Please pay special attention to the word counts in all cases.

**What is the topic of your proposed practicum? (100 words)**

The aim of this study is to understand to what extent blockchain technology can be used to enable the requirements of Trustworthy AI.

Blockchain is at the nexus of technologies like IoT, AI and Cloud. It has the means of bringing the missing element of trust that is currently lacking from these technologies. Trust is gained through diversity of users.

The output of research would be a framework/Architecture for applying trustworthy AI principles on any industry vertical, we also propose to develop a PoC to showcase application of few principles on concrete use case.

**Please provide details of the papers you have read on this topic (details of 5 papers** expected).

Y. Xu, C. Zhang, Q. Zeng, G. Wang, J. Ren, and Y. Zhang, ‘Blockchain-Enabled Accountability Mechanism against Information Leakage in Vertical Industry Services’, *IEEE Transactions on Network Science and Engineering*, vol. 8, pp. 1202–1213, 4 2021.

M. Nassar, K. Salah, M. H. ur Rehman, and D. Svetinovic, ‘Blockchain for explainable and trustworthy artificial intelligence’, *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, vol. 10, 1 2020.

W. Alshahrani and R. Alshahrani, ‘Assessment of Blockchain technology application in the improvement of pharmaceutical industry’, 3 2021.

R. D. Garcia, G. S. Ramachandran, R. Jurdak, and J. Ueyama, ‘A Blockchain-based Data Governance with Privacy and Provenance: A case study for e-Prescription’, 2022.

C. Baru, I. of Electrical, E. Engineers, and I. C. Society, ‘2019 IEEE International Conference on Big Data : proceedings : Dec 9 - Dec 12, 2019, Los Angeles, CA, USA’. .

B. C. Stahl and T. Leach, ‘Assessing the ethical and social concerns of artificial intelligence in neuroinformatics research: an empirical test of the European Union Assessment List for Trustworthy AI (ALTAI)’, *AI and Ethics*, 9 2022.

S. K. Mangla, Y. Kazancoglu, E. Ekinci, M. Liu, M. Özbiltekin, and M. D. Sezer, ‘Using system dynamics to analyze the societal impacts of blockchain technology in milk supply chainsrefer’, *Transportation Research Part E: Logistics and Transportation Review*, vol. 149, 5 2021.

K. Dey and U. Shekhawat, ‘Blockchain for sustainable e-agriculture: Literature review, architecture for data management, and implications’, *Journal of Cleaner Production*, vol. 316, 9 2021.

**How does your proposal relate to existing work on this topic described in these papers?** (200 words)

Much research has been done on the interconnection but in isolation between blockchain technology, and artificial intelligence (AI). However, this nexus should be explored more extensively using trustworthy AI principles.

It is important to remember that there is a need to apply Trustworthy AI principles on this nexus for the consumers to have more confidence and trust in the solutions leveraging these platforms. There has been a lot of research done in various research papers, but it has yet to be done in conjunction with a nexus of these technologies likes of Blockchain, AI, IoT, and cloud.

This proposal aims to study and understand to what extent blockchain technology can be used to enable the principles of Trustworthy AI.

**What are the research questions that you will attempt to answer?** (200 words)

The increasing computational power and proliferation of big data are now empowering Artificial Intelligence (AI) to achieve massive adoption and applicability in many fields. The lack of explanation when it comes to the decisions made by today's AI algorithms is a major drawback in critical decision-making systems.

For example, deep learning does not offer control or reasoning over its internal processes

or outputs. More importantly, current black-box AI implementations are subject to bias and adversarial attacks that may poison the learning or the inference processes.

Main research question:

To what extent Blockchain technology can enable the principles for Trustworthy AI?

Broken down in the following questions:

Research Question’s:

1. How have the trustworthy AI Principles been applied to the modern technologies such as Blockchain, Artificial Intelligence (AI)?
2. What are the different frameworks available on AI-Blockchain integration that embed the trustworthy AI Principles? What principles are covered?
3. What are the social, ethical, and technical benefits of a Blockchain-based solution enabling trustworthy AI principles?
4. To what extent a generic Blockchain framework can enable trustworthy AI principles?

How will you explore these questions? (Please address the following points. Note that three or four sentences on each will suffice.)

* What software and programming environment will you use?
* **Google Collab for Training AI models, Decentralized storage IPFS or Arweave,**
* What coding/development will you do?
* **Persistence of ML models, Metadata of test-train data, Hyper parameters for model’s etc. to IPFS.**
* What data will be used for your investigations?
* **Once we define a concrete use case, we will furnish details on the data. We have already observed large Dataset’s based on any industry vertical available on Kaggle.**
* Is this data currently available, it not, where will it come from?
* ***Kaggle***
* What experiments do you expect to run?
* ***None***
* What output do you expect to gather?

The output of research would be a generic framework or Architecture for applying trustworthy AI principles on any industry vertical.

* How will the results be evaluated?
* None