Tutorial Proposal
for
IEEE International Conference on Blockchain and Cryptocurrency, 27–31 May 2024 at Dublin, Ireland

1. Title of the Tutorial:

Utility of Blockchain in Industrial Internet of Things (IIoT) in the era of Industry 5.0

2. Abstract, Objectives, and Motivation:

Abstract:

In the era of Industry 5.0, technologies like Internet of Things (IoT) and blockchain are going to play very important role. There shall be extensive cooperation and collaboration between humans and robots in the age of Industry 5.0. Industrial Internet of Things (IIoT) is going to play a vital role in realization of the envisioned applications of Industry 5.0 regime. In this tutorial, various IIoT based applications of the emerging Industry 5.0 phase are going to be highlighted. Utilities of blockchain technologies in realization of transparent and secure IIoT environment are going to be explored in this tutorial. Technical issues like interoperability, secure data gathering, and overall data gathering are going to be elaborated. Open research issues and emerging trends are also going to be highlighted.

Objectives:

-to explore few applications of IIoT in Industry 5.0 environment;

-to discuss various interoperability issues in IIoT environment and possible application of blockchain technology in addressing the interoperability issue;

-to discuss data gathering techniques in IIoT environment, and to explore the opportunities with blockchain in achieving efficient and transparent data gathering in IIoT environment;

-to discuss the security issues in IIoT, and possible countermeasures with blockchain technology.

Motivation:

The IEEE International Conference on Blockchain and Cryptocurrency is a focused and dedicated conference for blockchain technology. The world has just entered into the Industry 5.0 era in which humans and robots are expected to cooperate and play the role of co-workers. There will be heavy dependency on technologies like Internet of Things (IoT). Technology like blockchain is going to play very important roles in this ecosystem. Thus it is felt that this tutorial proposal is very much relevant and well connected to the conference. Such a technology domain is going to be very important for the future society as a whole.

3. Timeline and Intended Audience:

The tutorial shall be of two hours. Students at undergraduate, postgraduate and also at doctoral level shall be benefited out of this tutorial. Interested researchers and practitioners in the area of Blockchain as well as Internet of Things (IoT) shall also be benefited out of this tutorial.

4. Name, affiliation, and a Short Biography of the Speaker:

Name: Professor Hiren Kumar Deva Sarma

Affiliation: Department of Information Technology, Gauhati University, Guwahati, Assam, PIN 781014

Short Biography:

Dr. Hiren Kumar Deva Sarma is a Professor in the Department of Information Technology at Gauhati University. He received B.E. degree in Mechanical Engineering from Assam Engineering College in 1998, completed M.Tech in Information Technology from Tezpur University in 2000 and received Ph.D. degree from Jadavpur University (Department of Computer Science and Engineering) in 2013. He is a recipient of prestigious Young Scientist Award from International Union of Radio Science (URSI) (2005). Dr. Sarma also received prestigious IEEE Early Adopter Award in the year 2014.

He has published more than hundred research papers in different International Journals, referred International and National Conferences. Moreover, Dr. Sarma has co-authored 3 books (one reference book & 2 research monographs), edited one book and five conference proceedings in book format; all are published by prestigious international publishing houses like Springer Nature Group and Apple Academic Press etc. He has also published one patent (India).

His current research interests are wireless sensor networks, IoT, cloud computng, blockchain for network security, healthcare informatics and big data analytics.

5. A description of the technical issues that the tutorial will address, emphasizing its timeliness:

In this tutorial, major focus shall be on application/ deployment of Blockchain in various applications related to the Industry 5.0 ecosystem. Industrial Internet of Things (IIoT) is going to be exploited significantly in the era of Industry 5.0. Security and transparency in the IoT ecosystem are highly important concerns. Thus there is huge opportunity to explore and deploy blockchain in various IoT based applications which are envisioned to be prominent in the Industry 5.0 age.

Various technical issues going to be addressed are as follows:

Interoperability in IIoT ecosystem: Interoperability considering various IIoT applications and devices is a major technical issue; this issue is going to be addressed considering Industry 5.0 environment.

Secure Data Gathering: Data gathering is at the core of the IIoT applications. Data gathering in secure manner is critical to many applications including mission critical applications; this issue considering current solutions and open challenges is going to be addressed considering Industry 5.0 environment.

Secure IIoT: Although many applications are envisioned in the era of Industry 5.0, at the same time security concerns are to be addressed with urgency. In order to make IIoT applications secure, there is a scope to deploy blockchains efficiently. Security threats and their countermeasures (*in IIoT systems for Industry 5.0 environment*) are going to be explored along with opportunities offered by blockchain in making systems secure.

6. An Outline of the Tutorial Content:

Here, an outline of the content is provided:

Introduction:

About IIoT ecosystems, Industry 5.0 environment, and opportunities with blockchain technology.

Technical Issues (challenges and solutions):

-Interoperability in IIoT ecosystem (utility of blockchain);
-Data Gathering in Secure Manner (utility of blockchain);
-Security Challenges and Countermeasures (utility of blockchain).

Block chain based solutions for IIoT, and their analysis:

The Future with blockchain in Industry 5.0 based society:

Conclusion:

7. If appropriate, a description of the past/relevant experience of the speaker(s) on the topic of the tutorial:

The speaker presented tutorials in various International Conferences. However, this proposal is a new one and has not been presented anywhere so far.

It may be worth mentioning that in the year 2022, a tutorial on **Security in Internet of Things** (3 Hours duration) was presented in an International Conference titled as SOFA 2022 held at Arad Romania during Nov 21-23, 2022.

8. A description of any previous tutorial experience of the speaker(s), and past versions of the tutorial:

In the year 2012, a tutorial on **wireless Sensor Networks** was presented in ITC-CSCC 2012 (27th Annual Conference) held at Sapporo, Hokkaido, Japan held during Jul 15-18, 2012.

In the year 2022, a tutorial on **application of Machine Learning and Deep Learning in Software Defined Networks Research** was presented in second International Conference on Emerging Techniques in Computational Intelligence held at Hyderabad, India during Aug 25-27, 2022.

In the year 2022, another tutorial on **Security in Internet of Things** was presented in 10th International Workshop on Soft Computing Applications (SOFA 2022) held at Arad, Romania during Nov 21-23, 2022.

9. State if a similar tutorial has been offered in other conferences (last two years) and how your tutorial differs:

The tutorial proposed here is on a very recent topic. This tutorial covers mainly three different areas of knowledge / technology namely IIoT, Industry 5.0 ecosystem, and Blockchain. As mentioned above, in industry 5.0, human and robots expected to cooperate and work together. This tutorial proposal is unique, and I have not come across any similar tutorial that took place in the recent past.

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