ISEC-700 Fall 2022

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Assignment #2 Guidelines for Research Pre-Idea Paper in Cybersecurity

November 27th, 2022

## **Problem Statement**

The research problem that the study will address is how to defend against centralization in blockchain technology with a focus in Asynchronous Byzantine Fault Tolerance (aBFT) protocols. To properly address how to defend against centralization in blockchain, a few key theories need to be discussed. Beginning with a fault tolerance problem proposed by the works of **(Lamport et al.1982)** called the Byzantine General Problem (BGP). The BGP is argued to be the underlying philosophy behind blockchain theory and is supported by the proposed statement from (**P. Kuo, 2019)** that “The Byzantine general problem is the core problem that consensus algorithms are trying to solve, which is at the heart of the design of blockchains.” The research articles on the BGP mentioned above are important to defending against centralization in blockchain technology because the contents question underlying issues related to decentralized distributed systems.

**-BTC example of BGP, why is this a problem,what is the impact**

The next theory that needs to be addressed is the Blockchain Trilemma. A reference to the Blockchain Trilemma is proposed in the works of **(Aiyar, Halgamuge and Mohammad,2021)**  and states that “three important properties of a blockchain system, involving decentralization, security, and scalability, cannot perfectly co-exist.” The establishment of the Blockchain Trilemma asserted above is important to defending against centralization because the research quoted claims that there is no one size fits all answer to blockchain solutions and that gaining a better position on one side of the Blockchain Trilemma means losing positions on the other side.

**-Ethereum example of Trillema why is this a problem,what is the impact**

The next theory to be discussed is the Fischer Linch Patterson (FLP) Theorem that states “an asynchronous network where messages may be delayed but not lost, there is no consensus algorithm that is guaranteed to terminate in every execution for all starting conditions, if at least one node may experience failure.” **(Fischer, Lynch, and Paterson, 1985)**

**-This is important when studying centralization in aBFT**

**- This is referenced in other aBFT work such as BEAT or THB**

**why is this a problem,what is the impact**

What is/are the current gap in knowledge or contradicting research findings reported in the research literature)

-They all argue decentralization but come up short.-

- Lack of progress in aBFT

## **Research Goals**

- The main goal of this research study is to…

- Better understand the future of aBFT

- The need for this work is demonstrated by the work of ...(explain precisely but short each research and based on what conclusions were made)

- HoneyBadgerBFT, BEAT, ALGO, ABFT

- This dissertation builds on previous research by…

- HoneyBadgerBFT, BEAT, ALGO, ABFT

- The X\* specific goals of this research study are…

-Understand how asyncronicity can help defend against centralization.

- The main research question that this study will address is…

- how does asynchronicity defend again centrlaization.

- The X\* hypotheses that this study will address are... (Each hypothesis should directly be tied to a specific research goal and be a “measurable outcome” – see dissertation guide on what constitute goals!)

-aBFT will become more prevalent in blockchain in the future.

-aBFT will provide advancements in blockchain.

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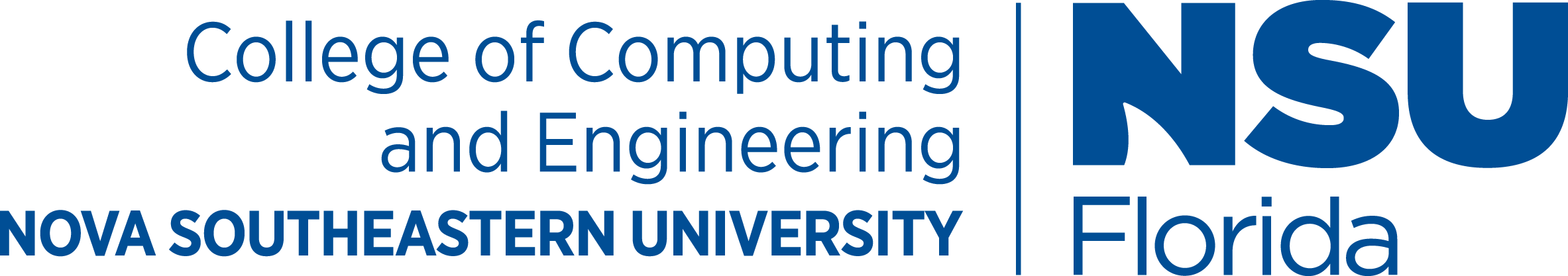
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**Certification of Authorship of Doctoral Course Assignment**



Submitted to: Dr. Yair Levy

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Date of Submission: November 6th, 2022

Purpose and Title of Submission: Assignment #1 Research Problem and Theory Review in Cybersecurity Management Paper

Certification of Authorship: I hereby certify that I am the author of this document and that any assistance I received in its preparation is fully acknowledged and disclosed in the document. I have also cited all sources from which I obtained data, ideas, or words that are copied directly or paraphrased in the document. Sources are properly credited according to accepted standards for professional publications. I also certify that this paper was prepared by me for this purpose.

Student's Signature: ERIC WEBB