# Immersive Data Visualizations in Cybersecurity

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## Problem / Question

Defense personnel responsible for analyzing the health and vulnerabilities of networks face a range of challenges to prioritize and focus on critical cyber-based threats. For example, they must manage a range of diagnostic tools across multiple software platforms while remaining vigilant for hard-to-detect events that could prove to be signals of phishing or hacking attempts from adversaries. Further diagnosis is often even more difficult for personnel in expeditionary environments with physical limitations on bandwidth, energy, and processing power.

## Hypothesis

- An Immersive VR Context May Help SOC's to be more efficient and effective
- In some Contexts, VR Data Visualization can be more intuitive for analysts
- UX dynamics are not well understood for this medium and must be developed further. UX principles that apply to 2D do not apply to 3D

## Project Overview

Research Question: Under what conditions (if any) can 3D visualizations improve efficiency/effectiveness of cyber analysts?


## Variables / Research

| Controlled variables | Independent variable | Dependent variable |
|---|---|---|
| • Age, Experience, Knowledge Level in Cybersecurity | • Immersive Data Visualizations in Cyber Security | • Currently Establishing Metrics of Success<br>• Qualitative<br>• Quantitative |

## Process

| Materials (detailed list) | Quantity (be specific) |
|---|---|
| Issue #1 | Develop Immersive Env. For Cyber |
| Issue #2 | Develop Metrics of Engagement |
| Issue #3 | Develop Metrics of Efficiency |
| Issue #4 | Develop Metrics of Effectiveness |
| Issue #5 | Methods - Qualitative |
| Issue #6 | Methods - Quantitative |
| Issue #7 | How can the process be iterated? |

## Procedure

**Step 1**

Develop Cyber Issues of Interest

**Step 2**

Present in 2D and 3D

**Step 3**

Analyze Engagement and Efficiency

Effectiveness

**Step 4**

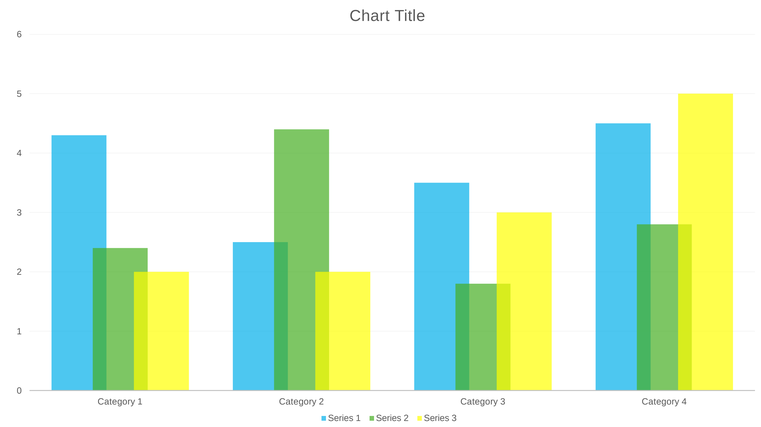
Iterate for Success Measures



## Data / Observations

- Observation Eye Tracking
- Observation Speed of Decision Making in 2D vs 3D
- Observation Qualitative Experience of Analysts in 3D environment

## Results




- This research is in its nascent stages, and we are developing the software to begin testing various ways to convey cybersecurity information in a 3D environment

## Conclusion

- The research has only just begun. Currently, Prof. McElroy is working with two MIS graduate students to begin building a 3D environment on the Oculus Quest 2 platform for an Active DOD Hackathon. In the initial stages, we will be conducting qualitative interviews with cybersecurity analysts to determine their most important metrics of analysis and how these can be translated into a 3D environment.

## Works Cited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- McKenna, S., Staheli, D., & Meyer, M. (2015, October). Unlocking user-centered design methods for building cyber security visualizations. In *2015 IEEE Symposium on Visualization for Cyber Security (VizSec)* (pp. 1-8). IEEE.