SCS 3216
Research methods- Assignment 1

U.W.T.O Weerasinghe
18001912

Research papers selected:

1. A Longitudinal View of Netflix: Content Delivery over IPv6 and Content Cache Deployments (paper 14)
2. Pinpointing Hidden IoT Devices via Spatial-temporal Traffic Fingerprinting (paper 10)
3. Towards Pattern-aware Privacy-preserving Real-time Data Collection (paper 03)

Paper 1:

A Longitudinal View of Netflix: Content Delivery over IPv6 and Content Cache Deployments (paper 14)

- This paper presents a test to measure Netflix content delivery from residential networks over IPv4 and IPv6 networks.
- Netflix Open Connect Appliance (OCA) infrastructure's TCP connect times can be drastically reduced if caches are deployed inside the ISP. (This is a theory developed by proof but not implemented)

- "scamper" dataset was used to examine whether IP path lengths toward Netflix destinations have improved over the observation period.

Paper 1:

A Longitudinal View of Netflix: Content Delivery over IPv6 and Content Cache Deployments (paper 14)

Strengths	Weaknesses
Nice Data visualization using plots and graphs	No clear distinction of Hypothesis stage and therefore data analysis of stage data collection is unclear
Gives a problem on streaming and multimedia content and its performance	Some data plots (Scatter plots describing CDF vs. TTL in IV. D are unclear) maybe because of cluttering
Takeaways of the Research along with limitations are noted with future improvements.	
Architecture and infrastructure of Netflix is described nicely.	

Paper 2:

Pinpointing Hidden IoT Devices via Spatial-temporal Traffic Fingerprinting (paper 10)

- Due to complexity of IoT, most ISPs are unable to find which type of devices are connected to a particular network.
- Via spatial-temporal traffic fingerprinting and CNNs even the type of traffic can be known with high accuracy.
- The CNN models were trained for each IoT device to achieve best accuracy.
- The system can scale up to large networks and work in an online fashion with a low time complexity.

Paper 2:

Pinpointing Hidden IoT Devices via Spatial-temporal Traffic Fingerprinting (paper 10)

Strengths	Weaknesses
Clear data presentation and analysis with 3D plots and scatter plots	Complex terminology used makes it harder for understanding for people unfamiliar with the domain.
Use of statistical analysis methods such as F-score and research questions(RQ) for standardization.	The Scientific method was present but had to undergo serious reading to identify the components (Data collection and analysis were in separate tables of part IV)
Many types of IoT devices were taken for investigation under many categories (cameras, speakers, printers etc.)	There is no mention of a solid Hypothesis to prove the findings. (A target or percentage)

Paper 3:

Towards Pattern-aware Privacy-preserving Real-time Data Collection (paper 3)

- Addresses the issue of protecting data privacy using a novel pattern-aware privacy-preserving approach, called PatternLDP (local differential privacy).
- To sample the remarkable points in time-series and adaptively perturb them according to their impacts on patterns Piecewise Linear Approximation (PLA) is used.
- The experimental results also demonstrated that PatternLDP is sensitive at capturing pattern change and robust to the change of privacy budget and window size.

Paper 3:

Towards Pattern-aware Privacy-preserving Real-time Data Collection (paper 3)

Strengths	Weaknesses
Addresses a sensitive problem: privacy in the digital space across devices.	Large paragraphs make reading less interesting (Although justified by simple language.)
Clear division of sections and relevant spread of content.	
Explanation of preliminaries make even a beginner to understand easily (Section III B.)	
Easy-to-understand language and terminology	

Scientific Method:

Step	Paper 1	Paper 2	Paper 3
Observations	✓	✓	✓
Preliminary Study	✓	✓	✓
Problem Definition	✓	✓	✓
Theoretical Framework	✓	✓	✓
Hypothesis	✗	✓	✓
Experimental Design	✓	✓	✓
Data Collection	✓	✓	✓
Data Analysis	✓	✓	✓
Conclusion	✓	✓	✓

Best research paper:

paper 3: Towards Pattern-aware Privacy-preserving Real-time Data Collection (paper 3)

Justification:

- It follows the Scientific method properly with standardized data and analysis.
- It is conducted by researchers of reputed state-funded organizations and universities.
- The issue addressed is a controversial and rising problem in the world.
- The complex theories used are explained in an easy-to-understand manner even though it is a research paper.
- Therefore, out of the selected three research papers, "**Towards Pattern-aware Privacy-preserving Real-time Data Collection**" can be considered as the best paper.