Yunxiang LIU

Personal Information

Name	Yunxiang (Leo) LIU
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Address	Computational Intelligence Lab, School of Computer Science and Engineering
	Nanyang Technological University
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Experience

Sep 2015 – Present
Research Associate in machine learning,
supervised by Prof. Sinno Jialin Pan .
Nanyang Technological University

July 2012 – May 2013
Research Assistant in wireless communications,
supervised by Prof. Yong Liang Guan & Prof. Dmitriy Garmatyuk.
Nanyang Technological University

July 2011 – Aug 2011
American Language Center Intensive English Communication Program.
University of California, Los Angeles

Education

2013 – 2015
Nanyang Technological University, Singapore.
Master of Engineering in wireless communications, School of EEE
Supervisor: Prof. Yong Liang Guan & Prof. Dmitriy Garmatyuk
Thesis: *Narrowband Radar System for Indoor Doorway Detection.*
CGPA: **4.67**/5.00

2009 – 2013
University of Electronic Science and Technology of China, Chengdu, P.R.China.
Bachelor of Engineering in wireless communications, Yingcai Honors College
Supervisor: Prof. Gang Wu & Prof. Yong Liang Guan
Thesis: *SC-FDMA Frequency Domain Oversampling MMSE Equalizer.*
GPA: **3.93**/4.00 or **88.5**/100   Ranking: **16**/110

Research Experience

Sep 2015 – Present
Convolutional Neural Network on Graphs for Android Malware Detection,
supervised by Prof. Sinno Jialin Pan.
Computational Intelligence Lab, School of Computer Science and Engineering, Nanyang Technological University

Android, which is the most prevailing mobile operating system nowadays, leads to Android mobile devices becoming a much more valuable target for cybercriminals. With the dramatic increase of malicious applications, automated malware detection draws a lot of attention. Lots of existing malware detection methods rely on extracting discriminant information from graph structure, either call graph, control flow graph or API dependency graph. The experts are required to design a specific mapping function to represent the substructures of the graph. To ease the burden on security experts, we propose a deep learning based approach, which can explore the substructure of call graph adaptively given the label information. Call graphs of arbitrary structures are passed to the model to produce fixed size representations, in which substructures of the graph are encoded. Besides, the permissions extracted from AndroidManifest are fed into an autoencoder to learn a latent representation. By feeding both learned representations to a full connected neural network, the entire end-to-end full differentiable model is proposed to identify whether the app is malicious. Experiments show that our malware detection method is comparable with the existing state of the art method DREBIN.

◇ Analyse Android apps to extract discriminant features, i.e. permission list and API-related call graph in our case.
◇ Propose a convolutional neural network on graphs to construct latent representation for API-related call graph.
◇ Implement an autoencoder to produce low dimension representation for permission list.
◇ Combine both learned representations to build up an end-to-end system for malware detection.

Mar 2014 – June 2014 **Distributed MIMO Relaying for Range Extension and Diversity Enhancement**,
supervised by Prof. Yong Liang Guan.
INFINITUS Lab, School of Electrical and Electronic Engineering, Nanyang Technological University

In the battlefield, the communications between two users (soldiers or vehicles) may fail due to the low received signal power (long distance signal attenuation or severe fading). In these cases, the relaying technique may help by decreasing the transmission distance (hence signal attenuation) and extracting multi-path diversity, in which other users in-between are chosen to be the relays. Therefore, we develop a real-time Universal Software Radio Peripheral (USRP)-based relaying system.

◇ Compared the BER performance between CPM (GMSK) and SC-FDE by simulation. (collaborated with Dr. ZiLong LIU)
◇ Built up an USRP-based full-duplex relaying system using GMSK modulation in one path Rayleigh fading channel. (collaborated with Dr. NGUYEN Thanh Hieu)
◇ Built up an USRP-based transmission system based on SC-FDE in non-ideal wireless channel.

Oct 2012 – Jan 2015 **Narrowband Radar System for Indoor Doorway Detection**,
supervised by Prof. Yong Liang Guan & Prof. Dmitriy Garmatyuk.
INFINITUS Lab, School of Electrical and Electronic Engineering, Nanyang Technological University & Department of Electrical and Computer Engineering, Miami University

Radar is an object-detection system that uses radio waves to determine the range and direction of objects. It could be employed on an Unmanned Ground Vehicle (UGV) for autonomous navigation. We propose a low-cost narrowband radar system based on USRP hardware and C++/MATLAB programming to enable UGV autonomous indoor navigation. The main purpose is to investigate open doorway detection in an indoor environment utilizing a narrowband radar.

◇ Implemented, calibrated and verified the proposed USRP-based radar system.
◇ Collected the open doorway detection data in realistic indoor environment.
◇ Developed effective radar processing algorithms.
◇ Demonstrated the open doorway detection of radar-guided UGV.

July 2012 – **SC-FDMA Oversampling MMSE Equalizer**,
June 2013 *supervised by Prof. Yong Liang Guan & Prof. Gang Wu*.
INFINITUS, School of Electrical and Electronic Engineering, Nanyang Technological University &
National Key Laboratory of Science and Technology on Communications, University of Electronic
Science and Technology of China

Single Carrier Frequency Division Multiple Access (SC-FDMA) is an alternative technique comparing
with Orthogonal Frequency Division Multiple Access (OFDMA). However, it also suffers greatly from
carrier frequency offset (CFO) due to the reason that CFO destroys the orthogonality among subcarriers.
In order to improve the BER performance, we propose a novel frequency domain oversampling MMSE
equalization receiver for SC-FDMA system.

◇ Designed an oversampling MMSE equalizer for SC-FDMA
◇ Compared the BER performance with the conventional MMSE equalizer.

Social Experience

July 2015 – **Vice Secretary-General**.
present UESTC (University of Electronic Science and Technology of China) Singapore Alumni

Dec 2014 – **Committee Member**.
present Intelligent Transport Society (ITS) Singapore Student Branch

June 2014 – **Committee Member**.
Jan 2016 Graduate Student Council, Nanyang Technological University

Teaching

Spring 2012 TA, Introduction to Information Theory

Honors, Awards and Scholarships

2015 – 2016 **Outstanding Individual of UESTC Alumni Association**.
University of Electronic Science and Technology of China

2016 **Travel Grant for attending UESTC 60th Anniversary Celebration**.
Yingcai Honors College, University of Electronic Science and Technology of
China

2013 – 2014 **Master of Engineering Award**.
School of EEE, Nanyang Technological University

2009 – 2012 **Second-class People's Scholarship**.
University of Electronic Science and Technology of China

Skills

Programming C/C++, MATLAB, Python, Java
Typesetting LaTeX

Language	English, Chinese (native)

Standardized Tests

GRE	155 (Verbal) + 170 (Quantitative) + 3 (A.W.)
TOEFL	99 (Total) = 27 (Reading) + 26 (Listening) + 20 (Speaking) + 26 (Writing)

Publications

Publications

[1] **Yunxiang, Liu**, YongLiang Guan, Dmitriy Garmatyuk, and Jade Morton. USRP-based OFDM Radar Systems for Doorway Detection. In *Radar Conference*, pages 0875–0880. IEEE, 2014.

[2] **Yunxiang, Liu**, YongLiang Guan, Dmitriy Garmatyuk, and Francois Quitin. Improved Exit Path Identification with Indoor USRP-based Radar System. In *ION PNT 2015, Pacific Positioning, Navigation and Timing Meeting*, 2015.