# Shomiron "*Ronnie*" Ghose

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**WORK EXPERIENCE:**

## MITRE Corporation
### Federal Systems Security Division
Paid Intern. Sept. 2012 – to date

*I am building a Dynamic Reputation System for the Domain Name System (DNS), an essential Internet protocol used by both legitimate Internet applications and cyber attackers. The cyber attacker that my system helps to identify specifically is the APT (Advanced Persistent Threat) which is responsible for a number of attacks on government agencies, corporations and political activists. They focus on stealth and accessibility rather than the 'smash-and-grab' approach and tend to be focused on a specific set of data which has been pre-researched.*

*The premise of the research is that that malicious, agile use of DNS has unique characteristics, such as DNS TTL Records which specify how long to keep a DNS Record. Through machine learning on query and network data, APTs and malicious attackers can be distinguished from legitimate DNS services. The system once fully operational will identify malicious domains weeks or even months before they appear in public blacklists and will be able to in an 'offline' recognition capacity. I am conducting my work under the mentorship of Dept. Head Mr. Fayad Amgad and Dr. Steven Gianvecchio.*

### ***Aristotle Circle - Peer2Peer Tutors***
*Tutoring Students in Math and Science*
*12/2013 –to~date*

**EDUCATION:**

## Thomas Jefferson High School for Science and Technology (TJHSST)
Grade 12 Graduation: June 2013

- *Till 11 grade: Mathematics-related problem solving as well as programming problems. CS related courses taken include AP Computer Science, Artificial Intelligence I &II, Robotics, Microsystems, Design & Technology.*
- *Currently (12th Grade): Multivariable Calculus, Numerical Analysis, Advanced Math Techniques for Scientists and Engineers and Parallel Computing at TJ in addition to classes outside of school.*

## George Mason University (GMU)
*www.gmu.edu*

- *Math 213 Analytic Geometry and Calculus III (Dual Enrolled) - Fall 2012.*
- *Math 446 Numerical Analysis (Will be dual enrolled) - Spring 2013.*

## Northern Virginia Community College (NOVA)
*www.nvcc.edu*

- *Math 285 Linear Algebra - Fall 2012. Grade: A*
- *Math 291 Differential Equations - Planned for Spring 2013*
- *Math 286 Discrete Mathematics - Planned for Spring 2013*
- *Phys 243 Modern Physics - Planned for Spring 2013*

## Coursera
*www.coursera.org*
*Coursera is a company that "partners with universities to offer courses to students around the world"*

### *Early Fall*
*Certificate(s) granted for:*

- *Machine Learning. Prof. Andrew Ng (Stanford): Aug. 20, 2012 - Oct 29, 2012*
- *Networked Life. Prof. Michael Kearns (Univ. of Pennsylvania): Sept. 10, 2012 - Oct. 22, 2012*
- *Human Computer Interaction. Prof. Scott Klemmer (Stanford): Sep. 24, 2012 - Nov. 26,2012*

### *Late Fall / Winter*

- *Computational Investing P1. Prof. Tucker Balck (Georgia Tech): Oct 22, 2012 - Dec. 30,2012*
- *Think Again: How to Reason. Prof. Sinnott-Armstrong and Prof. Neta (Duke): Nov. 26,2012 - Feb. 18,2012*
- *Heterogeneous Parallel Programming. Prof. Hwu (Univ. of Illinois Urbana-Champaign): Nov. 26,2012 - Jan. 7,2013*
- *Drugs and the Brain. Prof.Harry A. Lester (Caltech): Dec 1,2012 - Jan. 19,2013*

### *Spring*

- *Principles of Economics for Scientists. Prof. Rangel (Caltech): Jan. 7, 2013 - Mar. 18, 2013*
- *Game Theory. Prof. Jackson (Stanford) and Prof. Leyton-Brown (UBC): Jan. 7,2013 - Feb 18,2013*
- *Microeconomics for Managers.Prof. McKenzie (UC Irvine): Jan. 21, 2013 - Apr. 1, 2013*

## Edx

www.edx.org

*Edx is a non-profit that offers online classes from MIT, Harvard, Berkeley and the Univ. of Texas.*

*Certificate(s) granted for:*

- *CS184.1x Foundations of Computer Graphics. Prof. Ramamoorthi (Berkeley): Oct. 9,2012 - Jan. 11, 2013*

***In Progress***

- *PH207x Quantitative Methods in Clinical and Public Health Research. Prof. Earl Cook and Prof. Marcelo Pagano (Harvard): Oct.15, 2012 – Jan.18,2012*

***Spring***

- *CS169.1x Software as a Service (SaaS). Prof. Armando Fox and Prof. David Patterson (UC Berkeley): Jan. 7,2013 - Feb.15,2013*
- *CS191x Quantum Mechanics and Quantum Computation. Prof. Vazirani (UC Berkeley): Feb 6,2013 - TBD*
- *CB22x The Ancient Greek Hero. Prof. Nagy (Harvard): Spring 2013 - TBD*
- *6.002x Circuits and Electronics. Prof. Agarwal (MIT): Spring 2013 - TBD*

## SUMMER EXPERIENCE

NIST, Center for Neutron Research (NCNR) (Summer 2012)

*Bayesian uncertainty modeling for parametric systems (BUMPS). BUMPS is a component of a small angle neutron scattering (SANS) modeler. In SANS one is able to find intensity data at a particular location but not how it bounced off the surface to get to said location. In order to find the structure, you then simulate the model positions and calculate expected particle intensities. In order to calculate the probability distribution for certain positions in order to attempt to recover uncertainty. In order to do this, we used Markov Chain Monte Carlo Methods (MCMC) which sampled the data to try and find the most probable (maximum likelihood estimation) as well as the one that fit the data the best.*

*The program uses expensive trajectory calculations as well as Markov Sampling Calculations and runs in parallel on a multicore server – I used a 48 core server. In order to take advantage of the multiple cores and reduce overhead, we looked into how to optimize the parallelization and efficiently combine the results from multiple Markov Chains.*

*In addition, I looked at optimization algorithm robustness (some of these were: the Nelder-Mead Simplex Algorithm, Newton's Method, Random Lines and Parallel Tempering) on a variable dimension Hermite spline in order to test successful convergence percentage and Markov chain convergence. To further determine Markov Chain Convergence, I looked at analytic convergence criterion for multidimensional Markov chains and multidimensional probability distributions. My work was done under the mentorship of scientist Paul Kienzle.*

## VOLUNTEER ACTIVITIES

Fairfax County Public Libraries (FCPL)

- *Summer 2007-2010: Assisted with Summer Reading Program*
- *School Year 2007 & 2009: Book Restacking and Cataloging*
- *Summer 2008: Assisted the Library Tech Ops Center with new computers*

TJIMO 2012,2013

- *Went over contest level problems and taught Boolean algebra to middle school students*

Techstravaganza

- *Taught water cycle, water and well pollution, lift/drag for planes to middle school students*

TJ Spontaneous Invitational 2012, 2013

- *Took teams to testing locations, coordinated with volunteer judges, helped get event back on schedule after events were pushed back*
- *Responsible for scheduling and room management for 2013 Invitational*

TJ IOI

- *Wrote and checked CS problem solutions for theoretical section*

GCER (Global Conference in Education Robotics)

- *Set up Cameras, Power Distribution, COAX/RCA Lines, Game Tables*
- *Set up and maintained camera live stream.*

TJ Big Sibs

- *Mentoring A "Little Sib" ~ a high school freshman*

Regional Mathcounts Competition

- *Graded team papers and solutions*

Red Cross Youth Team 2011-to~date
Belvedere Elementary Tutoring 2011-to~date
TJ Algebra II Tutoring 2011-to~date

**INTERESTS & ACTIVITIES:**

Boy Scouts of America (BSA) Troop 146
- *Eagle Scout: Boy Scouts of America* — *2001- to date*

Symphonic Band : Trumpet — *2006-2010*
- *High School Band (TJHSST)* — *2009-2010*
- *Middle School (RRMS) Symphonic Band : Trumpet* — *2007-2009*

*High School Teams:*
- *TJHSST Track & Cross-Country Running Team* — *2010*
- *TJHSST Chemistry Olympiad Team* — *2010*
- *TJHSST Senior Computer Team* — *2009-to~date*
- *TJHSST Future Problem Solving (FPS) Team* — *2011-to~date*
- *FIRST Robotics (FRC) Team* — *2012-to~date*
  - *Lead Programmer 2012-2013, Assistant Programmer 2011-2012*
- *Botball Robotics Team*
  - *Lockheed Martin Team: Participated in GCER Global Tournament Hawaii*
  - *TJHSST Team: Participated in Northern Virginia Regional* — *2012-to~date*
  - *Dead Robot Society Team: (2013 Season)*
- *National Botball Youth Advisory Council Member* — *2011-to~date*
  *(Running for President 1/2013)*
- *TJ Chess Team* — *2011-to~date*
- *TJ Systems Administrator (Senior Sysadmin)* — *2012- to~date*

Volunteering:
- *Red Cross Youth Team* — 2011-to~date
- *Belvedere Elementary Tutoring* — 2012-to~date
- *TJ Algebra II Tutoring* — 2012-to~date

Tennis
- *Fairfax Racquet Club High School Tennis* — 2004 - to date
- *Fairfax Racquet Club USTA Tennis League* — *2009-2010*

Taekwondo
- *First Degree Black Belt: American Taekwondo Association* — 2004- to 2009

**ACHIEVEMENTS:**
- National Junior Honor Society — 2008 – 2010
- National Honor Society — 2012 – to date
  Requires one to be in at least grade 11 to join

**AWARDS:**
- Future Problem Solving State Finalist — Spring 2012
- BSA Eagle Scout Award — Spring 2011
- National Spanish Exam Award (NSE): Gold — Spring 2011
- John Hopkins Univ. CTY High Honors Award for SAT — Spring 2009
- First Degree Taekwondo Black Belt — Fall 2007
- President's Award for Educational Excellence — Spring 2007

**COMPUTER SKILLS:**

**Programming Languages:**

| | |
|---|---|
| Proficient | Python!, Java, Processing, |
| Intermediate | JavaScript , PICBASIC, Arduino Language, C/C++, Mathematica, MATLAB/Octave |
| Beginner | Node.js, R, php, AWK, SED, LOGO, Haskell |

**Python**: Numpy, Scipy, Sympy, Scikit packages

Machine Learning: Scikit-learn, PyBrain,
Graphing Specific: Networkx, Graph-tool, igraph,

**Operating Systems**: Linux, Windows, Macs

**Hardware:** Building high-performance hardware (ex. Computers / servers / general network infrastructure); built personal desktop (ask for specs!). Experience troubleshooting problems in hardware, software and LAN, Arduino Boards and PCB Boards.

**Specifications:** JSON/XML, REST,

**Productivity Suites:** Microsoft Office Suite, LibreOffice, OpenOffice, IBM Symphony

**Shells:** BASH, SH

**Miscellaneous:** Photoshop CS5, GIMP, Windows Movie Maker, Audacity, Cyberlink PowerDirector and other video editing software, Eagle PCB designer, Web Design using various CMSs as well as from scratch, OpenCV,

**IRC**: I idle on ##python, ##programming, ##math and ##statistics on the freenode network

**Databases:** Right now I use MongoDB; I feel I can use with some proficiency various SQL variations and NOSQL variations ~ ex. Redis and CouchDB.

StackExchange: I'm an active member ~ some boards I participate on are StackOverflow and Mathematica

Email Groups: I'm part of a few USENET groups for science: Sci.math, Sci.lang, Sci.physics as well as some others, e.g., Networkx-Discuss, PyData, Scikit-Learn

**WORK IN PROGRESS:** R, Octave/MATLAB, UI in C++/C (Qt) and using Python Qt Bindings. ,J, Ruby, Haskell, DNS, BIND, BGP Routing, TCP, Internet Autonomous Systems

**PRESENTATIONS**

"Color Spaces and Color Models". Lightning Talks. Global Conference in Education Robotics. Honolulu, Hawaii. July 2012.

"Storing Code Online". Lightning Talks. Global Conference in Education Robotics. Honolulu, Hawaii. July 2012.

**PUBLICATIONS**

Ghose, Shomiron. (2012). "Common Coding Errors". Best Practices in Programming. Global Conference in Education Robotics.

**REFERENCES:** Available upon request