

# VAN K. NGUYEN

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## EDUCATION

- **Ph.D.** in Computer Science (expected) 2001 - June 2006  
University of California, Davis  
Advisor: Professor Charles U. Martel  
Program of Study: Major – Algorithms & Theory; Minor – Security
- **M.S. with honors** in Computer Science 1996 - 1997  
University of Wollongong, Australia  
Advisor: Professor Rei Saphavi-Naini  
Program of Study: Computer Security & Cryptography
- **B. S. summa cum laude** in Informatics 1988 - 1992  
Hanoi University of Technology, Vietnam

## DISTINCTIONS

- Best Graduate Researcher Award, Computer Science Department, UC-Davis, 2006
- Vietnamese Government Fellowship, to study for a Ph.D. degree in America, 2001-05
- Australian Government AusAID Scholarship for International scholars, 1996-97

## RESEARCH INTERESTS

- Algorithms for networking and distributed computing: Network graphs and algorithms; Models for real-world large-scale networks; Small-world analysis
- Networking: peer-to-peer; hybrid large-scale wireless networks; dynamic routing for optical wavelength division multiplexing (WDM) networks
- Cryptography and Computer Security

## DISSERTATION: “*Small-world graphs: Models, Analysis and Applications for Large-scale Dynamic Networks*”

The Small-world phenomenon, a surprising feature in many large-scale real-world networks including the Internet and the WWW, has been modeled as a simple local-contact graph augmented by a special distribution of random links, by Watts & Strogatz, and Kleinberg (Nature, 1998 and 2000). We propose a novel approach on these random structures and their generalizations, where we contribute new analysis techniques to work with non-uniform random links. We use these random structures as an effective tool to model real networks and to design better networks and infrastructures. This thesis presents our general framework to construct new small-world graphs and our new model for small-world properties which also considers geographical factors and power-law degrees, and provides several new applications in network design.

## WORK EXPERIENCE

- Research Assistant, Computer Science Dept. UC-Davis, Jan 2003 - present
- Teaching Assistant, Computer Science Dept. UC-Davis, 2001-02
  - TAed “Discrete Mathematics for Computer Science” (3 qtrs) and “Algorithms Design and Analysis” (graduate level).
- Faculty member, Faculty of Informatics, Hanoi U. of Technology, Vietnam, 1997-2001
  - Taught “Computer Security and Introduction to Cryptography”, “Computer Networks”, “Introduction to Computer Science”, Programming Languages (C/C++, Java, Pascal)
  - Supervised two fifth-year undergraduates with their graduate projects (with thesis) in micro-payment, 2000
  - Supervised six fifth-year undergraduates with their graduate projects (with thesis) in distributed systems and electronic payment, 1999
- Project Leader/Team Leader, FPT corp. (Vietnam), 1994-1995
  - Designed and implemented an intranet system for interconnecting multiple LANs
  - Designed and implemented a Telex-communication server in Novell LAN. Product used in major banks in Vietnam
- Programmer/ Software Engineer, FPT corp. (Vietnam), 1992-1993
  - Designed and implemented a software providing an interface and search tools to a text database (of Vietnamese laws)

## PUBLICATIONS

- Van Nguyen & Charles Martel, “Modeling small-worlds with geographical factors: distance-bias & bounded-growth neighborhoods”, Submitted
- Van Nguyen & Charles Martel, “Designing Low Cost Networks with Short Routes and Low Congestion”, to appear in INFOCOM’06
- Van Nguyen & Charles Martel, “Analyzing and characterizing small-world graphs”, in Proc. of the 16th ACM-SIAM symposium on Discrete Algorithms, SODA’2005, pp. 311 – 320
- Charles Martel & Van Nguyen, “Analyzing Kleinberg’s (and other) Small-World Models”, in Proc. of the 23rd ACM Symposium on Principles of Distributed Computing, PODC’2004, pp. 179 – 188
- V.K. Nguyen & R. Saphavi-Naini, “A Framework for Combining Off-line & On-line Electronic Cash”, in Proc. of Pacific-Asia Workshop for Electronic Commerce, 1997, pp. 12-1:16

### In preparation

- Van Nguyen & Charles Martel, “Non-uniform Random Links in Small-world Graphs: Models, Analysis and Applications in Network Designs”, To be submitted for journal publication
- Van Nguyen & Charles Martel, “Efficient Dynamic Routing Schemes in Euclidean Metrics”

### Technical reports

- Van Nguyen & Phillip Rogaway, “Pseudorandom to One-way Hash Function Conversion when the Key Length Equals the Block Length”, CS-UCDavis, 2002
- V.K. Nguyen & R. Saphavi-Naini, “On a new model for electronic cash with the notion of anonymous mirror wallets”, CS-University of Wollongong, 1997

## RESEARCH EXPERIENCE

**Doctoral Research**, UC-Davis, Computer Science Dept., with Professor Martel, 2003 - present  
Analyzed Kleinberg's small-world model, conceptualized new notions and developed new analysis techniques, and extended the results for generalized settings. Investigated a broad surrounding area then came up with new ideas which form two ongoing projects:

- Project "*An algorithmic approach for large-scale dynamic networks*". Achieved:
  - A general model for small-world and power-law properties, also reflecting geographical factors
  - Analysis of a general structure combining a growth-bounded base graph with a distant-bias distribution of random links
  - A general small-world construction framework, featuring a hierarchical family of random structures where *short paths can be found using decentralized routing in more refined classes* [SODA'05]
  - A thorough analysis of Kleinberg's small-world models (and many other) [PODC'04 – SODA'05]
- Project "*Designing large-scale routing networks with distance-bias links*". Achieved:
  - A novel distributed routing scheme (with limited routing database) exploiting the distance-bias tendency, which is used as a building block in our network design
  - Construction schemes for static/dynamic (with fixed/ random links) bounded-degree networks for simultaneously optimizing a set of design factors [INFOCOM'06]
  - Designs of hybrid wireless sensor networks with additional wired short-cuts, achieving cost-effective trade-offs between cost of added long links, route length and congestion [INFOCOM'06]
  - A routing scheme for networks with dynamic capabilities e.g. optical WDM networks, which aims at optimizing adaptivity (to changes in capabilities)

**Independent Project**, "*Conversions of pseudo-random functions to one-way hash functions*"  
with Professor Rogaway – results not submitted since problem already visited 2002

**Mater thesis**, U. of Wollongong, with Professor Saphavi-Naini 1996-97  
Designed and analyzed two electronic payment schemes, using a distributed approach and cryptographic tools.

## PROGRAMMING SKILLS

- C/C++ (DOS/WINDOWS/UNIX)
- Java, Visual Basic, Pascal, Fortran, Assembly
- Networking programming (with sockets), Windows API
- Matlab

## SERVICES

- Program Committee member of Student Workshop on Computing, Dept. of Computer Science, University of California at Davis, October 2004
- Colloquium coordinator, Faculty of Informatics, Hanoi University of Technology, 1998-99  
Initiated, organized and led an weekly colloquium meetings (mainly of young faculty members).

## OTHER AWARDS AND HONORS

- UC-Davis Travel Award (only to top 5 applicants) 2005
- Dept. of Computer Science Funding (Assistantship), UC-Davis 2001-05
- Second Prize in Vietnamese National Competition of Student Software Products, 1992
- University Fellowship, Hanoi University of Technology, 1988-92
- First Prize in Student Scientific Project, Hanoi University of Technology 1992
- Prizes in Vietnamese National Mathematical Olympiads 1986-87

## REFERENCES

- Professor Charles U. Martel (Advisor and Chair of Dissertation Committee)  
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