

Thanh Trung Nguyen, PhD

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SUMMARY OF QUALIFICATIONS

- **More than 12 years of research experience in computational and applied mathematics**, with expertise in inverse problems for partial differential equations, modeling & simulation, and optimization; substantial experience in interdisciplinary research topics, including real world applications.
- **More than 7 years of teaching and mentoring experience** in higher education.
- **Published 34 papers with more than 500 citations** on Google Scholar.
- Developed several software packages for numerical methods for partial differential equations, inverse problems, optimization, and signal processing.

PROFESSIONAL APPOINTMENTS

- *Assistant Professor* 2017 – present
Department of Mathematics, Rowan University
- *Postdoctoral Research Associate & Lecturer* 2014 – 2017
Department of Mathematics, Iowa State University
- *Postdoctoral Research Associate* 2012 – 2014
Department of Mathematics & Statistics, University of North Carolina at Charlotte
- *Research Scientist* 2008 – 2012
Johann Radon Institute for Computational & Applied Mathematics,
Austrian Academy of Sciences
- *Postdoctoral Research Associate* 2007 – 2008
Department of Electronics & Informatics, Vrije Universiteit Brussel, Belgium

EDUCATION

- *PhD in Engineering Sciences (excellent)* 2007
Vrije Universiteit Brussel, Belgium
Dissertation topics: forward and inverse problems for parabolic equations with application in the detection and characterization of buried objects
Dissertation Advisers: Prof. Hichem Sahli and Prof. Dinh Nho Hao
- *MS in Mathematics (excellent)* 2003
Vietnam National University, Hanoi, Vietnam
Thesis: Periodic and almost periodic solutions to differential equations with piecewise constant arguments.
Adviser: Prof. Nguyen Van Minh
- *BS in Mathematics (excellent)* 2002
Vietnam National University, Hanoi, Vietnam

RESEARCH INTERESTS

- Inverse problems
- Numerical analysis
- Mathematical modeling & simulation
- Applications in nondestructive testing, subsurface imaging, geophysics.
- Partial differential equations
- Optimization
- Signal processing

RESEARCH EXPERIENCE

- Iowa State University 2014 – 2017
 - Developed and implemented new numerical methods for solving two inverse problems in non-destructive testing of metal materials using alternating current potential drop measurements and inverse medium scattering problems from multi-frequency measurements; tested the algorithms using real experimental data.
 - Wrote and published 5 papers.
- UNC Charlotte 2012 - 2014
 - Developed and implemented two numerical methods for solving inverse problems in subsurface imaging using radar measurements and tested them with real data; developed and implemented radar data pre-processing procedures.
 - Published 8 papers.
- Austrian Academy of Sciences 2008 – 2012
 - Developed and implemented new computational methods for modeling and inverse problems in infrared thermography and inverse scattering theory with application in the detection and identification of airborne and buried objects.
 - Published 9 papers.
- Vrije Universiteit Brussel 2003 – 2008
 - Led a research team responsible for developing signal processing and imaging algorithms for through-wall radar imaging.
 - Developed a PDE-based mathematical model for simulating time-dependent soil temperature; developed and implemented numerical methods for forward and inverse problems of parabolic equations; applied the algorithms to detect and identify buried objects from infrared images; tested them using experimental data.
 - Principle Research Scientist and research coordinator for the research project “*RADIOTECH - Ultra Wide-band Radio application for localization of hidden people and detection of unauthorized objects*” supported by European Commission (2.3 million euros), 2007-2008.
 - Published 17 papers.

GRANTS & AWARDS

As a co-PI or contributor:

- Co-PI of the grant proposal “Inverse scattering problems using multi-frequency measurements” submitted to Austrian Science Foundation, 2011.
- Contributor of the grant “Electromagnetic Scattering by Complex Interfaces” funded by the Austrian Science Foundation (220,000 euros), 11/2010–10/2013.

As a participant:

- “Globally Convergent Inverse Algorithms via Carleman Weight Functions: Theory, Numerical Studies and Experimental Verifications” funded by the US Army Research Office (\$300,000) (I am a consultant from 5/2016 to 8/2016).
- “Globally Convergent Numerical Methods for Inverse Problems for Time Dependent Maxwell Equations” funded by the US ARO (\$600,000), 2012 – 2014.
- “Ultra Wide-band Radio application for localization of hidden people and detection of unauthorized objects” funded by the European Commission (2.3 million euros), 2007-2009.
- “Concept for Low-risk Efficient Area Reduction Based on the Fusion of Advanced Sensor Technologies” supported by European Commission (4.4 million euros), 2004-2007.

Awards:

- Research Assistant Scholarship, Vrije Universiteit Brussel (€72,000), 2003 – 2007.
- Outstanding Student Awards, Vietnam National University Hanoi, 1999 – 2002.
- Undergraduate Research Award, VNU Hanoi, 2002.
- Second Prize in Vietnam National Student Math Olympiad, 2001.
- Mitsubishi Bank Scholarship for 10 Best Students, VNU Hanoi, 2001.

TEACHING & MENTORING EXPERIENCE

Rowan University:

- Calculus I (Fall 2017)

Iowa State University:

- Calculus I (Fall 2014, Spring 2015, Fall 2016)
- Calculus II (Fall 2015)
- Calculus III (Fall 2014, Fall 2015)
- Calculus for Business & Social Sciences (Spring 2016)
- Differential Equations (Spring 2016, Fall 2016, Spring 2017)
- Partial Differential Equations (Spring 2015)
- Probability (Spring 2016, Spring 2017)
- Participated in the course “An Introduction to Evidence-based undergraduate STEM teaching” organized on www.coursera.org by Vanderbilt University, Fall 2014.

University of North Carolina at Charlotte:

- Intermediate Applied Calculus (Multivariable Calculus & Differential equations) (Spring 2013, Fall 2013, Spring 2014)
- Calculus I (Fall 2013)
- Mentored PhD student Kirill Golubnichiy on Matlab and radar signal processing.

RICAM, Austrian Academy of Sciences:

- Mentored PhD student Durga Challa on numerical methods for inverse obstacle scattering problems (2010-2012).

Vietnam National University, Hanoi:

- Calculus I (Fall 2002), Calculus II (Spring 2003)
- Ordinary Differential Equations (Fall 2003)

PUBLICATION LIST

Preprints:

2. **N.T. Thanh**, M. Klibanov, A. Sullivan and L. Nguyen, "Numerical solution of a 1-D inverse problem with experimental data using a Carleman Weight Function", preprint.
1. J. Bowler, **N.T. Thanh** and P. Sacks, "Evaluation of the electrical conductivity and magnetic permeability variations with depth from surface voltage measurements", preprint.

Journal Papers and Book Chapters:

22. A. Kolesov, M. Klibanov, L. Nguyen, D-L. Nguyen and **N.T. Thanh** (2017), "Experimental single measurement data for an inverse medium problem inverted by a multi-frequency globally convergent numerical method", *Applied Numerical Mathematics* 120, 176-196.
21. **N.T. Thanh**, L. Beilina, M. Klibanov and M. Fiddy (2015), "Imaging of buried objects from experimental backscattering radar measurements using a globally convergent inverse method", *SIAM J. Imaging Sci.* 8(1), 757–786.
20. M. Klibanov and **N.T. Thanh** (2015), "Recovering dielectric constants of explosives via a globally strictly convex functional", *SIAM J. Appl. Math.* 75(2), 518–537.
19. M. Sini and **N.T. Thanh** (2015), "Regularized recursive Newton-type methods for inverse scattering problems using multifrequency measurements", *ESAIM Math. Model. Numer. Anal.* 49, 459 - 480.
18. L. Beilina, **N.T. Thanh**, M. Klibanov and J.B. Malmberg (2015), "Globally convergent and adaptive finite element methods in imaging of buried objects from experimental backscattering radar measurements", *J. Comput. Appl. Math.* 289, 371–391.
17. L. Beilina, **N.T. Thanh**, M. Klibanov and J.B. Malmberg (2015), "Methods of quantitative reconstruction of shapes and refractive indices from experimental data", Book chapter in *Inverse Problems and Applications*, Springer. 13-41.
16. L. Beilina, **N.T. Thanh**, M. Klibanov and J.B. Malmberg (2014), "Reconstruction of shapes and refractive indices from backscattering experimental data using the adaptivity", *Inverse Problems*, 30, 105007.
15. **N.T. Thanh**, L. Beilina, M. Klibanov and M. Fiddy (2014), "Reconstruction of the refractive index from experimental backscattering data using a globally convergent inverse method", *SIAM J. Sci. Comput.* 36(3), B273 – 293.
14. L. Beilina, **N.T. Thanh**, M. Klibanov and M. Fiddy (2014), "Reconstruction from blind experimental data for an inverse problem for a hyperbolic equation". *Inverse Problems*, 30(2), 025002.
13. M. Sini and **N.T. Thanh** (2012), "Inverse acoustic obstacle scattering problems using multifrequency measurements". *Inverse Probl. Imaging*, 6(4), 749-773.
12. D. Gintides, M. Sini and **N.T. Thanh** (2012), "Detection of point-like scatterers using one type of scattered elastic waves". *J. Comput. Appl. Math.*, 236(8), 2137-2145.
11. **N.T. Thanh**, D.N. Hao and H. Sahli (2011), "Thermal infrared technique for landmine detection: Mathematical formulation and methods". *Acta Math. Vietnam.*, 36(2), 1-36.
10. **N.T. Thanh**, D.N. Hao and H. Sahli (2011), "Detection and characterization of buried landmines using infrared thermography". *Inverse Probl. Sci. Eng.*, 19, 281-307.
9. **N.T. Thanh** and M. Sini (2010), "Accuracy of the linear sampling method for inverse

- obstacle scattering: effect of geometrical and physical parameters". *Inverse Problems*, 26(12), 125004.
8. **N.T. Thanh** and M. Sini (2010), "An analysis of the accuracy of the linear sampling method for an acoustic inverse obstacle scattering problem". *Inverse Problems*, 26(1), 015010.
 7. D.N. Hao, **N.T. Thanh** and H. Sahli (2009), "Splitting-based conjugate gradient method for a multi-dimensional linear inverse heat conduction problem". *J. Comput. Appl. Math.*, 232(2), 361-377.
 6. **N.T. Thanh**, D.N. Hao and H. Sahli (2009), "Infrared thermography for landmine detection", Book chapter in *Augmented Vision Perception in Infrared. Algorithms and Applied Systems*, Springer, 3-36.
 5. **N.T. Thanh**, D.N. Hao and H. Sahli (2008), "Infrared thermography for buried landmine detection: inverse problem setting". *IEEE Trans. Geosci. Remote Sens.*, 46(12), 3987-4004.
 4. **N.T. Thanh**, H. Sahli and D.N. Hao (2008) "Estimation of piecewise constant coefficients of parabolic equations: applications to the detection of buried objects". *Inverse Probl. Sci. Eng.*, 16(7), 903-925.
 3. D.N. Hao, **N.T. Thanh** and H. Sahli (2007), "Numerical solution to a nonlinear parabolic boundary control problem", Book chapter in *Advances in Deterministic and Stochastic Analysis*, World Scientific Publisher, 115-129.
 2. **N.T. Thanh**, H. Sahli and D.N. Hao (2007), "Finite-difference methods and validity of a thermal model for landmine detection with soil property estimation", *IEEE Trans. Geosci. Remote Sens.*, 45(3), 656-674.
 1. **N.T. Thanh** (2005), "Massera criterion for periodic solutions of differential equations with piecewise constant argument", *J. Math. Anal. Appl.*, 302(2), 256-268.

Conference Papers:

12. **N.T. Thanh** and M. Sini (2011), "Reconstruction of acoustic obstacles using multifrequency scattering data", the 10th Int. Conf. on Mathematical & Numerical Aspects of Waves, Canada.
11. **N.T. Thanh**, D.N. Hao and H. Sahli (2011), "Passive infrared technique for buried object detection and classification", Workshop on Object Tracking and Classification beyond Visible Spectrum, the IEEE Computer Vision and Pattern Recognition Conference, USA.
10. **N.T. Thanh** and M. Sini (2010), "On the accuracy of the linear sampling method for inverse acoustic obstacle scattering problems", the 5th Int. Conf. on Inverse Problems, Control and Shape Optimization, Spain, 261-267.
9. D.N. Hao, **N.T. Thanh** and H. Sahli (2008), "Numerical solution to a multi-dimensional linear inverse heat conduction problem by a splitting-based conjugate gradient method". *J. Phys. Conf. Ser.*, 135, 012049.
8. **N.T. Thanh**, L. van Kempen, T.G. Savelyev, X. Zhuge, M. Aftanas, E. Zaikov, M. Drutarovsky and H. Sahli (2008), "Comparison of basic inversion techniques for through-wall imaging using UWB radar", European Radar Conference, Netherlands, 140-143.
7. J. Sachs, M. Aftanas, S. Crabbe, M. Drutarovsky, R. Klukas, D. Kocur, **T.T. Nguyen**, P. Peyerl, J. Rovnakova, E. Zaikov (2008), "Detection and tracking of moving or trapped people hidden by obstacles using ultra-wideband pseudo-noise radar", European Radar Conference, Netherlands, 408-411.
6. J. Rovnakova, M. Svecova, D. Kocus, **T.T. Nguyen** and J. Sachs (2008), "Signal

processing for through-wall moving target tracking by M-sequence UWB radar", the 18th Int. Conf. Radioelektronika, Czech Republic.

5. L. van Kempen, **N.T. Thanh**, H. Sahli and D. N. Hao (2007), "Solving the full nonlinear inverse problem for GPR using a three step method", the 4th Int. Workshop on Advanced Ground Penetrating Radar, Italy, 147-152.
4. **N.T. Thanh**, H. Sahli and D.N. Hao (2007), "Detection of buried landmines using infrared thermography", the 5th Int. Conf. on Computational Heat & Mass Transfer, Canada, 393-402.
3. **N.T. Thanh**, D.N. Hao and H. Sahli (2006), "Thermal modelling for landmine detection: efficient numerical methods and soil parameter estimation", Proceedings of SPIE 6217, Detection and Remediation Technologies for Mine and Minelike Targets XI, 517-528.
2. F. Cremer, **T.T. Nguyen**, L. Yang and H. Sahli (2005), "Stand-off thermal IR minefield survey, system concept and experimental results", Proceedings of SPIE 5794, Detection and Remediation Technologies for Mine and Minelike Targets X, 209-220.
1. **T.T. Nguyen**, D.N. Hao, P. Lopez, F. Cremer and H. Sahli (2005), "Thermal infrared identification of buried landmines", Proceedings of SPIE 5794, 198-208.

PhD Dissertation:

N.T. Thanh (2007), *Infrared Thermography for the Detection and Characterization of Buried Objects*. VUBPress, 2007. ISBN: 978-90-5487-434-8.

TALKS

Conference talks:

- **(Invited speaker)** Special Section on the Analysis of Inverse Problems and their Applications, AMS Fall Southeastern Sectional Meeting, Raleigh, NC, 2016.
- **(Invited speaker)** Iowa PDE Seminar, Ames, IA, 2015.
- **(Invited speaker)** Special Section on Applied Analysis and Inverse Problems, AMS Fall Southeastern Sectional Meeting, Louisville, KY, 2013.
- Int. Conf. on Computational Analysis of Inverse Problems and Partial Differential Equations, Orlando, FL, 2013.
- The 5th Int. Conf. on High Performance Scientific Computing: Modeling, Simulation and Optimization of Complex Processes, Hanoi, Vietnam, 2012.
- **(Invited Speaker)** Workshop on Wave Propagation and Scattering, Inverse Problems and Applications in Energy and the Environment, Linz, Austria, 2011.
- **(Invited Speaker)** The 8th IEEE Workshop on Object Tracking and Classification Beyond the Visible Spectrum, IEEE Computer Vision & Pattern Recognition Conference, Colorado Springs, CO, 2011.
- The 10th Int. Conf. on Mathematical and Numerical Aspects of Waves, Vancouver, Canada, 2011.
- The 5th Int. Conf. on Inverse Problems, Control & Shape Optimization, Cartagena, Spain, 2010.
- The 6th Int. Conf. on Inverse Problems in Engineering, Paris, France, 2008.
- SPIE Conference on Detection and Remediation Technologies for Mine and Minelike Targets XI, Orlando, FL, 2006.
- The 6th Vietnam National Congress of Mathematics, Hue, Vietnam, 2002.

Colloquium talks:

- Department of Mathematics and Statistics, University of North Carolina at Charlotte, 2015.

- Department of Mathematical Sciences, Florida Institute of Technology, 2015.
- RICAM, Austrian Academy of Sciences, 2008.
- Optimization for Engineering Center, Katholic Universiteit Leuven, 2008.

Seminar talks:

- Computational & Applied Mathematics Seminar, Iowa State University, 2016.
- PDE Seminar, Hanoi Institute of Mathematics, 2015.
- Computational & Applied Mathematics Seminar, Iowa State University, 2014.
- Computational & Applied Mathematics Seminar, UNC Charlotte, 2013.
- Mathematical Physics Seminar, UNC Charlotte, 2013.
- Scientific Computing Seminar, Hanoi Institute of Mathematics, 2012.
- Inverse Problem Group Seminar, RICAM, Austrian Academy of Sciences, 2010.
- Inverse Problem Group Seminar , RICAM, Austrian Academy of Sciences, 2009.
- Department of Electronics & Informatics, Vrije Universiteit Brussel, 2006.

PROFESSIONAL SERVICES

- **Organizer** of the mini-symposium "Latest Advances in Inverse Problem and its Application in Physical Science" (with Dr. Jun Liu at Ames Laboratory of US Department of Energy). The 11th International Conference on Numerical Analysis and Applied Mathematics (INCAAM), Rhodes, Greece, September 21 - 27, 2013.

- **Reviewer** for:

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| Appl. Numer. Math. | Appl. Anal. | J. Inverse Ill-Posed Probl. |
| Comput. Math. Appl. | Appl. Math. Lett. | Inverse Probl. Sci. Eng. |
| Inverse Problems | Comput. Geosci. | Math. Comput. Simulation |
| J. Comput. Appl. Math. | J. Phys. A | IEEE Trans. Image Process. |
| IMA J. Appl. Math. | Math. Method Appl. Sci. | IEEE. Trans. Geosci. Remote Sens. Lett. |

- **Reviewer** for Zentralblatt MATH.

OTHER SKILLS

- Programming languages: MATLAB, C++.
- Operating systems and tools: Windows, Linux, Office, Latex, GitHub.
- Online teaching & learning systems: Moodle, BlackBoard.