

**Dr. Walter B. Richardson, Jr.**  
**Professor**  
**The University of Texas at San Antonio**

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**Education**

Doctor of Philosophy, Mathematics, University of North Texas

Master of Science, Mathematics, University of Houston

Bachelor of Science, Mathematics, Southwest Texas State University

**Academic Positions**

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|----------------|---|
| 1999 - Present | Professor of Mathematics, UTSA                                    |
| 1993 - 1998    | Associate Professor of Mathematics, UTSA                          |
| 1989 - 1993    | Assistant Professor of Mathematics, UTSA                          |
| 1988 - 1989    | Post-Doctoral Fellow, Aerospace Engineering Department, UT Austin |
| 1980 - 1984    | Teaching Fellow, Dept. of Mathematics, University of North Texas  |
| 1977 - 1978    | Teaching Fellow, Dept. of Mathematics, University of Houston      |

**SCHOLARSHIP/RESEARCH/CREATIVE WORKS**

Intellectual Contributions

**Book, Chapter in Scholarly Book-New - Peer-Reviewed/Refereed**

**1997**

- Richardson, W. B. (1997). Chapter 20: Wavelets Applied to Mammograms. In Metin Akay (Eds.), *Time Frequency and Wavelets in Biomedical Signal*

*Processing* (pp. 499-516). New York: IEEE Press.

#### 1994

1. Richardson, W. B. (1994). A Reaction-Diffusion System Modeling Phosphorus Diffusion. In A. Friedman and W. Willard, Series Eds., W. M. Coughran, Jr., Julian Cole, Peter Lloyd, and Jacob K. White, Eds. (Eds.), *Semiconductors, Part I - The IMA Volumes in Mathematics and its Applications* (vol. 58, pp. 67-77). New York: Springer-Verlag.

#### Book, Reference - Peer-Reviewed/Refereed

#### 1996

1. Carey, G. F., Richardson, W. B., Reed, C. S., & Mulvaney, B. J. (1996). Circuit, Device, and Process Simulation: Mathematical and Numerical Aspects. (pp. 425). New York: John Wiley & Sons.

#### Journal Article, Academic Journal - Peer-Reviewed/Refereed

#### 2017

18. Richardson Jr., W., Krishnaswami, H., Vega, R., & Cervantes, M. (2017). A low cost, edge computing, all-sky imager for cloud tracking and intra-hour irradiance forecasting. *Sustainability/MDPI*, 12. [www.mdpi.com/journal/sustainability](http://www.mdpi.com/journal/sustainability)

#### 2008

17. Richardson, W. B. (2008). Sobolev gradient preconditioning for image processing PDEs. *Commun. Numer. Meth. Engng.*, 24, 493-504.

#### 2006

16. Carey, G. F., & Richardson, W. B. (2006). A note on least squares methods. *Commun. Numer. Meth. Engng.*, 22(2), 83-92.

#### 2005

15. Richardson, W. B. (2005). High-order Sobolev preconditioning. *Nonlinear Analysis*, 63, e1779-e1787.

#### 2004

14. Richardson, W. B., Pardhanani, A. L., Carey, G. F., & Ardelea, A. (2004). Numerical effects in the simulation of Ginzburg-Landau models for superconductivity. *International Journal of Numerical Methods in Engineering*, 59, 1251-1272.

#### 2000

13. Ardelea, A., Carey, G. F., Pardhanani, A., & Richardson, W. B. (2000). Simulation of Macroscopic Superconductivity for Microelectronics. *Physica C: Superconductivity*, 341-348(Part 4), 2649-2650.
12. Richardson, W. B. (2000). Sobolev Preconditioning for the Poisson-Boltzmann

Equation. *Computer Methods in Applied Mechanics and Engineering*, 181, 425-436.

11. Richardson, W. B. (2000). Steepest Descent using Smooth Gradients. *Journal of Applied Mathematics and Computation*, 112, 241-254.

#### 1999

10. Richardson, W. B. (1999). Mathematical Aspects of Semiconductor Modeling. *Nonlinear Studies*, 6(2), 231-240.
9. Richardson, W. B. (1999). Sobolev Gradient Preconditioning for PDE Applications. *Iterative Methods in Scientific Computation IV, IMACS Series in Computational and Applied Mathematics*, 5, 223-234.

#### 1992

8. Richardson, W. B., Carey, G. F., & Mulvaney, B. J. (1992). Modeling Phosphorus Diffusion in Three Dimensions. *IEEE Transactions on Computer-Aided Design*, 11(4), 487-496.

#### 1990

7. Mulvaney, B. J., & Richardson, W. B. (1990). The Effect of Concentration Dependent Defect Recombination Reactions on Phosphorus Diffusion in Silicon. *Journal of Applied Physics*, 67(6), 3197-3199.

#### 1989

6. Richardson, W. B. (1989). Comments on 'Sufficient Conditions for Existence and Diffeomorphism of a Nonlinear Vector Function'. *Proceedings of the IEEE*, 77(3), 496-497.
5. Richardson, W. B., & Mulvaney, B. J. (1989). Nonequilibrium behavior of charged point defects during phosphorus diffusion in silicon. *Journal of Applied Physics*, 8(4), 2243-2247.
4. Mulvaney, B. J., Richardson, W. B., & Crandle, T. L. (1989). PEPPER - A Process Simulator for VLSI. *IEEE Transactions on Computer-Aided Design*, 8(4), 336-349.

#### 1988

3. Richardson, W. B., & Mulvaney, B. J. (1988). Plateau and kink in P profiles diffused into Si - A Result of Strong Bimolecular Recombination?, *Applied Physics Letters*, 53(20), 1917-1919.

#### 1987

2. Mulvaney, B. J., & Richardson, W. B. (1987). A Model for Defect-Impurity Pair Diffusion in Silicon. *Applied Physics Letters*, 51(18), 1439-1441.

#### 1986

1. Richardson, W. B. (1986). Steepest Descent and the Least C for Sobolev's Inequality. *Bulletin of the London Mathematical Society*, 18, 478-484.

## **Conference Proceeding - Peer-Reviewed/Refereed**

### **2017**

3. Richardson, W. B., Krishnaswami, H., Shephard, L. E., & Vega, R. (2017). Machine Learning versus Ray-Tracing to Forecast Irradiance for an Edge-Computing SkyImager. IEEE ISAP. (In Press)
2. Cañadillas, D., Richardson Jr., W. B., González-Díaz, B., Shephard, L. E., & Guerrero Lemus, R. (2017). First Results of a Low Cost All-Sky Imager for Cloud Tracking and Intra-Hour Irradiance Forecasting serving a PV-based Smart Grid in La Graciosa Island. (pp. 5). IEEE PVSC-44.

### **2016**

1. Cervantes, M., Krishnaswami, H., Richardson, W. B., & Vega-Avila, R. (2016). Utilization of Low Cost, Sky-Imaging Technology for Irradiance Forecasting of Distributed Solar Generation. IEEE GreenTech. (Presented)

## Intellectual Property

### **Patent**

#### **2016**

1. Richardson, W. B., Vega-Avila, R. E., Krishnaswami, H., & Cervantes, M. Low-cost superimager to map, forecast and publish distributed solar energy predictions.2015.033.UTSA (292007-8160).

## Contracts, Fellowships, Grants, Sponsored Research and Residencies

### **Grant - Funded**

#### **2018**

7. Richardson, W. B. (Principal), & Shephard, L. E. (Co-Principal), "Using machine learning to improve intra-hour prediction of solar irradiance and ramp events in the CPS microgrid at JBSA," Sponsored by CPS Energy, Local, \$113,432.00. (September 1, 2017 - August 31, 2018).

#### **2016**

6. Richardson, W. B., "NREL INTEGRATE Project," Sponsored by Texas Sustainable Energy Institute and CPS Energy, UTSA, \$10,000.00. (August 1, 2016 - September 1, 2016).

#### **2015**

5. Richardson, W. B., "Grid of the Future," Sponsored by Texas Sustainable Energy Institute and CPS Energy, UTSA, \$5,000.00. (September 2014 - August 2015).

#### **2014**

4. Krishnaswami, H. (Co-Principal), Vega, R. (Principal), Jamshidi, M. (Co-Principal), Dong, B. (Co-Principal), & Richardson, W. B. (Co-Principal), "CPS Solar Forecasting," Sponsored by Texas Sustainable Energy Research Institute and CPS Energy, Local, \$172,262.00. (September 2013 - August 2014).

#### **1994**

3. Richardson, W. B. (Principal), "Research Experiences for Undergraduates in the Mathematical Sciences: Wavelets and their Applications," Sponsored by National Science Foundation, DMS-9300473, \$30,000.00. (April 1, 1993 - September 30, 1994).

#### **1993**

2. Richardson, W. B. (Principal), "Mathematics of Point-Defect Diffusion Models for Semiconductors," Sponsored by National Science Foundation, Division of Applied Mathematics, DMS-9024712, \$50,000.00. (June 1, 1991 - June 1, 1993).

#### **1990**

1. Richardson, W. B. (Co-Principal), "Computational Grid Optimization in Engineering," Sponsored by National Science Foundation Research Opportunity Award ECS-870-8082, \$14,403.00. (June 1, 1990 - July 31, 1990).

### **Grant - Not Funded**

#### **2017**

5. Richardson, W. B. (Co-Principal), Krishnaswami, H. (Principal), Shadaram, M. (Co-Principal), & Qian, C. (Co-Principal), "Retention and Advancement towards Program completion through Innovatively Designed (RAPID) Student-centered Engineering Support Services," Sponsored by Department of Education, Federal, \$3,408,791.00. (October 1, 2017 - Present).
4. Richardson, W. B. (Co-Principal), Krishnaswami, H. (Principal), & Beebe, N. L. (Co-Principal), "NRT-DESE: Collaborative Research and Training in Data Enabled Smart Energy Systems," Sponsored by National Science Foundation - NSF Research Traineeship, Federal, \$2,998,255.00. (January 1, 2017 - Present).

#### **2016**

3. Richardson, W. B. (Co-Principal), Krishnaswami, H. (Principal), Beebe, N. L. (Co-Principal), Elnakat, A. (Co-Principal), & Ko, D. (Co-Principal), "NRT-DESE: Collaborative Research and Training in Data Enabled Smart Energy Systems," Sponsored by National Science Foundation - NSF Research Traineeship, Federal, \$2,998,255.00. (January 1, 2016 - Present).
2. Richardson, W. B. (Principal), Bagley, R. (Co-Principal), Lancaster, J. L. (Co-Principal), & Salinas, F. (Co-Principal), "Modeling Transcranial Magnetic Stimulation with Fractional Order Operators," Sponsored by UT Brain Seed Grant, State, \$99,945.00. (June 1, 2015 - May 31, 2016).

#### **2015**

1. Richardson, W. B. (Co-Principal), Krishnaswami, H. (Principal), & Vega, R. (Co-Principal), "Active power control of a solar plant using superresolution sky imaging, feature-based cloud advection models and PV array power forecast," Sponsored by National Science Foundation - ECCS - ENERGY, POWER, ADAPTIVE SYSTEMS, Federal, \$281,419.00. (June 1, 2015 - Present).

## Presentations

### **Invited Talk - Peer-Reviewed/Refereed**

#### **2016**

4. Richardson, Jr., W. B. (Author & Presenter), & Vega, R. (Author), "The UTSA Sky-Imager," SMALLGRID Conference, Universidad de La Laguna, Canary Islands. (June 13, 2016).

#### **2011**

3. Richardson, W. B., "Sobolev Gradients for Imaging Applications," International Congress of Industrial and Applied Mathematics (ICIAM), Vancouver. (July 2011). (Accepted)
2. Richardson, W. B., "Sobolev Gradient Descent in  $H^1$ ,  $p \neq 2$ ," US National Congress on Computational Mechanics (USNCCM), Minneapolis. (July 2011). (Accepted)

#### **2004**

1. Richardson, W. B., Legacy of R. L. Moore Conference, Austin. (2004).

### **Paper - Peer-Reviewed/Refereed**

#### **2006**

22. Richardson, W. B., IS06 - SIAM Conference on Imaging Science. (2006).

#### **2005**

21. Richardson, W. B., 8th US National Congress of Computational Mechanics, Austin. (2005).

#### **2004**

20. Richardson, W. B., World Congress of Nonlinear Analysts, Orlando. (2004).

#### **2003**

19. Richardson, W. B., SIAM Conference on the Geosciences, Austin. (2003).

#### **2000**

18. Richardson, W. B., 6th International Conference on Materials and Mechanisms of Superconductivity and High Temperature Superconductors (M2S-HTSC-VI), Houston. (2000).

**1999**

17. Richardson, W. B., AMS Sectional Meeting, Austin. (1999).
16. Richardson, W. B., Joint AMS-SMM Meeting, Denton, Texas. (1999).
15. Richardson, W. B., SIAM Conference on the Geosciences, San Antonio. (1999).

**1998**

14. Richardson, W. B., IMACS Conference, Austin. (1998).

**1996**

13. Richardson, W. B., Texas Institute for Computational and Applied Mathematics, UT Austin. (1996).

**1994**

12. Richardson, W. B., Interface '94 Applications of Wavelets, Research Triangle. (1994).
11. Richardson, W. B., Invited Talk on PDE Filters and Wavelets, NASA Lewis. (1994).
10. Richardson, W. B., Least Squares Finite Element Conference, NASA Lewis. (1994).

**1993**

9. Richardson, W. B., SPIE Special Session on Digital Image Processing in Mammography, San Jose. (1993).

**1992**

8. Richardson, W. B., SIAM 40th Anniversary Meeting, Los Angeles. (1992).
7. Richardson, W. B., SPIE Conference on Mathematical Methods in Medical Imaging, San Diego. (1992).
6. Richardson, W. B., Wavelets and Applications Conference, Toulouse, France. (1992).
5. Richardson, W. B., World Congress of Nonlinear Analysts, Tampa. (1992).

**1991**

4. Richardson, W. B., NASECODE VII Conference (Semiconductor Modeling), Copper Mountain. (1991).
3. Richardson, W. B., Texas PDE Conference, San Marcos. (1991).

**1990**

2. Richardson, W. B., Texas Partial Differential Equations Conference, Arlington. (1990).

**1988**

1. Richardson, W. B., NUPADS Semiconductor Modeling Conference, San Diego. (1988).

**TEACHING**

## **Directed Student Learning**

Dissertation Committee Member, "Using Satellite Imagery to forecast Global Horizontal Irradiance." Proposal, (June 1, 2016 - Present).

Advised: Shuang Xia

Master's Non-Thesis Committee Member, "Utilization of Low Cost, Sky-Imaging Technology for Irradiance Forecasting of Distributed Solar Generation." Completed, (April 2015 - May 31, 2016).

Advised: Michael Cervantes

Internship, "NUMERICAL MODELING OF TRANSCRANIAL MAGNETIC STIMULATION: MAXWELL'S EQUATIONS FOR THE BRAIN." Completed, (September 2014 - May 2015).

Advised: Vince Velocci

Master's Thesis Committee Member, "INTRODUCTION TO UTSA-MS SMART IMAGER AND COMPARISON WITH TSI IMAGER TECHNOLOGY." Completed, (August 2013 - February 2015).

Advised: Alejandro Camargo

RA Supervision, "INTRODUCTION TO UTSA-MS SMART IMAGER AND COMPARISON WITH TSI IMAGER TECHNOLOGY." Completed, (August 2013 - December 2014).

Advised: Alejandro Camargo

Internship, "PCA, SVD, AND INDEPENDENT COMPONENT ANALYSIS FOR DIMENSION REDUCTION AND FEATURE EXTRACTION USING ARTIFICIAL NEURAL NETWORKS." Completed, (September 8, 2014 - December 10, 2014).

Advised: Lu Zheng

Dissertation Committee Member, "PERIDYNAMIC BEAMS, PLATES, AND SHELLS: A NONORDINARY, STATE-BASED MODEL." Completed, (August 2013 - October 30, 2014).

Advised: James O'Grady

Master's Thesis Committee Member, "ENHANCEMENT CLASSIFICATION OF GALAXY IMAGES." Completed, (June 2013 - August 15, 2014).

Advised: John Jenkinson

Internship, "ARTIFICIAL NEURAL NETWORKS AND SUPPORT VECTOR MACHINES FOR SOLAR FORECASTING." Completed, (June 9, 2014 - August 12, 2014).

Advised: Shindara Tan



Master's Thesis Committee Member, "SIX DEGREE OF FREEDOM POSE ESTIMATION USING DEPTH AND COLOR FEATURE DESCRIPTORS FOR AN INDUSTRIAL APPLICATION." Completed, (August 2013 - April 22, 2014).

Advised: Christina Gomez

Master's Thesis Committee Chair, "Image Denoising using PDE Filters and Functional Minimization." (December 2006).

Advised: Sean Beatty

## **SERVICE**

### **Department Service**

2016	Committee Member, DFRAC
2016	Faculty Advisor, Mathematical Association of America (MAA) Student Chapter
2016	Committee Member, Department CPER Committee 2016
2016	Committee Chair, NTT Faculty Evaluation Committee
2014 - 2015	Committee Member, Search Committee for Dan Parman Endowed Chair in Applied Mathematics
2013 - 2014	Committee Chair, Search Committee
2012 - 2013	Committee Member, Mathematics Search Committee 2012-13

### **Media Contributions**

2018	KLRN - PBS Station
2017	San Antonio Express-News
2016	Energy Business Review

### **Government, Industry, Military and Professional Positions**

1985 - 1988	Researcher, Microelectronics and Computer Technology Corp.
1978 - 1980	Geophysical Applications Programmer, Atlantic Richfield Company

1973 - 1976 1st Lieutenant, Air Weather Officer, United States Air Force

**Faculty Development Activities Attended**

- 2016 Workshop, Department of Energy VOLTRON, UTSA, San Antonio, TX
- 2016 Conference Attendance, UTeach Conference, UT Austin, Austin, TX
- 2016 Tutorial, Webinar: Mathematical Programming for the Solution of ACOPTF (AC Optimal Power Flow), NSF, San Antonio, TX
- 2016 Conference Attendance, 2016 Texas FreshAIR Big Data & Data Analytics Conference, UT System, San Antonio, TX
- 2016 Workshop, NSFCLOUD Informational Session, Open Cloud Institute UTSA, San Antonio, TX
- 2014 Seminar, DISTRIBUTED ELECTRIC GRID ANALYTICS FOR THE GRID OF THE FUTURE, TSERI- UTSA and CPS Energy, San Antonio, Texas