

## Mohammad Salehi Fashami.

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### College Educations

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- **PhD candidate** , Department of Mechanical and Nuclear Engineering, [Virginia Commonwealth University \(VCU\)](#) , Richmond , USA, GPA **4.0/4.0** (2010-current)
  - **MSc, Nuclear Reactor Engineering**, [Amirkabir University of Technology](#) (Tehran Polytech), Tehran, Iran, 2007
  - **BSc, Physics**, Tarbiate Moallem University, Tehran, Iran, 2004.
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#### ***PhD Thesis, "Multiferroic Nanomagnetic Logic: A Hybrid Spintronic-Straintronic paradigm for ultra-low energy computing".***

Overview: Multiferroic nanomagnetic devices comprising a piezoelectric layer elastically coupled to a magnetostrictive nanomagnet can be switched extremely energy efficiently, that could possibly lead to a new non-volatile spintronic logic and memory technology. This work is experimentally and numerically investigated and the feasibility performance and reliability of such nanomagnetic logic circuits is simulated by nanoscale stochastic magnetization dynamics of dipole coupled nanomagnets clocked by stress.

Advisor: Dr. Jayasimha Atulasimha

**MS Thesis:** "CFD analysis of Comparing the Natural Circulation Phenomena and Flow Instability between PWRs and VVERs Type Nuclear Power Plants in Transient Behavior", Supervisors: Prof. H.Davilu

**BS Thesis:** "Thermal modeling and Flow Instability in Compact Heat Exchanger", Supervisor: Dr. M.Hosseini

### *PhD Related Projects*

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1. **Experimental fabrication and exploring of four-state multiferroic nanomagnetic logic implemented with nanomagnets having biaxial anisotropy.**
2. **Experimental characterization of uniaxial multiferroic nanomagnetic logic and gate with biaxial shape engineering design in order to implement higher nanomagnetic stability during switching.**
3. **Numerical Simulation and dynamics study of multiferroic nanomagnetic logic and gate with LLG and OOMMF.**
4. **Stochastic modeling of multiferroic nanomagnet switching dynamics with thermal noise.**

### Publications

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#### Journal Articles

1. **Mohammad Salehi Fashami**, Kuntal Roy, Jayasimha Atulasimha, and Supriyo Bandyopadhyay. "Magnetization dynamics, Bennett clocking and associated energy dissipation in multiferroic logic." *Nanotechnology* 22, no. 15 (2011): 155201. [\[pdf\]](#).

"This paper has been considered as Highlight paper of Year 2011 at Journal of IOP NANOTECHNOLOGY [\[pdf\]](#)".

2. **Mohammad Salehi Fashami**, Jayasimha Atulasimha, and Supriyo Bandyopadhyay. "Magnetization dynamics, throughput and energy dissipation in a universal multiferroic nanomagnetic logic gate with fan-in and fan-out." *Nanotechnology* 23 , no. 10 (2012) : 105201 . [\[pdf\]](#).

3. Kamaram Munira, Souheil Nadri, Mark B. Forgues, **Mohammad Salehi Fashami**, Jayasimha Atulasimha, Supriyo Bandyopadhyay and Avik W. Ghosh, "Reducing error rates in straintronic multiferroic nanomagnetic logic by pulse shaping", under review, IEEE Trans. on. Electron Devices (IEEE TED). [\[pdf\]](#).
4. **Mohammad Salehi Fashami**, Jayasimha Atulasimha, and Supriyo Bandyopadhyay. "Energy dissipation and error probability in fault-tolerant binary switching." Proceeding of the national Academy of Sciences (PNAS) under review, 2013. [\[pdf\]](#).
5. **Mohammad Salehi Fashami**, Kamaram Munira, Supriyo Bandyopadhyay, Avik W. Ghosh, and Jayasimha Atulasimha. "Switching of dipole coupled multiferroic nanomagnets in the presence of thermal noise: reliability analysis of hybrid spintronic-straintronic nanomagnetic logic." IEEE Trans. Nanotechnology Under review", 2013. [\[pdf\]](#).
6. **Mohammad Salehi Fashami**, Noel D'Souza, Jayasimha Atulasimha, Supriyo Bandyopadhyay. "Strain-Induced Magnetization Dynamics: Paradigm for ultra-low energy computing", review paper, under preparation (2013).

#### Conference:

#### PhD :

1. **Mohammad Salehi Fashami**, Noel D'Souza, Jayasimha Atulasimha, Kuntal Roy, Supriyo Bandyopadhyay, "Hybrid Spintronics and Straintronics: A New Technology for Ultra-Low Energy Computing and Signal Processing Beyond the Year 2020 NEB1124714", 2011 NSF Nanoscale Science and Engineering Grantees Conference.. [\[pdf\]](#).
2. **Mohammad Salehi Fashami**, Jayasimha Atulasimha, and Supriyo Bandyopadhyay. "Ultra low-power straintronics with multiferroic nanomagnets: magnetization dynamics, universal logic gates and associated energy dissipation." *Bulletin of the American Physical Society* 57 (2012). [\[pdf\]](#).
3. Noel D'Souza, **Mohammad Salehi Fashami**, Jayasimha Atulasimha, Kuntal Roy, Supriyo Bandyopadhyay, "Preliminary experiments on multiferroic nanomagnetic logic devices for ultralow power computing" ASME 2012 Conference on Smart Materials, [\[pdf\]](#).
4. **Mohammad Salehi Fashami**, Jayasimha Atulasimha, and Supriyo Bandyopadhyay. "Implications of stochastic magnetization dynamics on reliability of dipole coupled nanomagnetic logic." *Bulletin of the American Physical Society* 58 (2013). [\[pdf\]](#).
5. Noel D'Souza, **Mohammad Salehi Fashami**, Supriyo Bandyopadhyay, and Jayasimha Atulasimha. "Experimental realization of straintronic nanomagnetic logic using strain-induced magnetization switching in magnetostrictive nanomagnets elastically coupled to PMN-PT." *Bulletin of the American Physical Society* (2013). [\[pdf\]](#).

#### MSc:

6. **Salehi Fashami M.**, Davilu H., Talebi S., Mollaei M., **ICONE 15-10111**, "A Theoretical Model for Natural Circulation Flow in PWRs", **ASME and JSME**, 15<sup>th</sup> International Conference on Nuclear Engineering, Nagoya, Japan, April 22-26, 2007.
7. Talebi S., **Salehi Fashami M.**, Davilu H., **ICONE 15-10113**, "Comparison and Optimization of Thermodynamic Irreversibilities in Marine and Submarine Nuclear Reactor's compact Heat exchanger under constant wall heat flux", **ASME and JSME**, 15<sup>th</sup> International Conference on Nuclear Engineering, Nagoya, Japan, April 22-26, 2007.

## Skills

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- **Electron Beam Lithography (EBL).**
- **Scanning Electron Microscope (SEM),**
- **Metal Deposition (E-Beam & RF Sputtering )**
- **Atomic and Magnetic Force Microscopy (AFM/ MFM).**
- Dynamics Modeling of nanoscale magnetic devices, micromagnetic and Stochastic modeling with LLG
- The Object Oriented MicroMagnetic Framework (OOMMF) .
- Data acquisition and Lab VIEW.
- Proficiency in numerical analysis and programming with MATLAB, C++ and Visual C.

### Teaching Assistantships

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- “Computer Aided Engineering”, Fall 2011, VCU, Richmond, USA
- “Thermodynamics”, Spring 2012, VCU, Richmond, USA.
- “Advanced Convection”, spring 2007, Tehran Polytechnic, Tehran, Iran.
- “Electromagnetism”, spring 2004, Tarbiate Moallem University, Iran.

### Honors

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- **Highlight paper of year 2011 at journal of IOP Nanotechnology.**
- Chair of Session **J14: Magnetic Devices and Techniques**, APS March Meeting 2013.
- Nominated for both Best Research Assistant and Best Teaching Assistant Awards at VCU.
- First Ranked student in the undergraduate level (class ~100 students), **2004**.
- First Rank, the Iranian public university graduate entrance exam, **2004**.
- Nuclear Engineering Department “**Graduate Student Researcher of Year**” (Tehran Polytechnic), 2006.

### References

#### 1. Dr. **Jayasimha Atulasimha** ,

Department of Mechanical and Nuclear Engineering, Virginia Commonwealth University.

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#### 2. Prof .**Supriyo Bandyopadhyay**.

Department of Electrical and Computer Engineering, Virginia Commonwealth University.

Email: [sbandy@vcu.edu](mailto:sbandy@vcu.edu) , Webpage: <http://electrical-and-computer.egr.vcu.edu/faculty/bandyopadhyay/>

Address : 601 W Main St, Room 238 , Richmond, VA 23284 . **Phone:** (804)827-6275.

#### 3. Dr **Avik Ghosh**.

Department of Electrical and Computer Engineering, University of Virginia.

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