

CURRICULUM VITAE

STYLIANOS CHATZIDAKIS

Weinberg Fellow, Oak Ridge National Laboratory – U.S.A

PhD in Nuclear Engineering, Purdue University - U.S.A.

M.Sc. Energy Physics, INPG, Grenoble - France

Dipl. Mechanical Engineer NTUA, Athens - Greece

Oak Ridge, TN

July 2016

SHORT BIO

Dr. Stylianos Chatzidakis is currently an R&D Associate and **Weinberg Fellow** within the Reactor and Nuclear Systems Division at **Oak Ridge National Laboratory**. Stylianos received his PhD in Nuclear Engineering from **Purdue University**, his M.Sc. in Energy Physics from the **Institut National Polytechnique de Grenoble** (INPG) in France and his Diploma in Mechanical Engineering (5 year program) from the **National Technical University of Athens**. Prior to joining Purdue University, he was a Reactor Safety Analyst and Project Engineer at the 5MW Greek Research Nuclear Reactor where successfully completed several demanding scientific and engineering projects. Stylianos is performing research in the fields of muon tomography, detector design, particle transport and, nuclear fuel simulations using **GEANT4**. His research also includes monitoring using advanced statistical pattern recognition and machine learning methodologies. Stylianos is a recipient of the Purdue's **Outstanding Research Award**. He is also a recipient of the **Roy G. Post Foundation Scholarship**, the **Bilsland Dissertation Fellowship** and, the **Purdue Ross Fellowship** for graduate research. He has **three Best Paper Awards**, **two Best Poster Awards** and, the **1st place** in the 2014 ANS special student design competition.

CURRICULUM VITAE

Stylios Chatzidakis, PhD

Weinberg Fellow
Reactor and Nuclear Systems Division
Oak Ridge National Laboratory

E-Mail: chatzidakiss@ornl.gov

Education:

1. **Ph.D. in Nuclear Engineering, Purdue University (May 2016)**
Top 5%, GPA 3.92/4.00.
Dissertation title: “*Cosmic Ray Muons for Spent Nuclear Fuel Monitoring*”
2. **M.Sc. in Energy Physics, Institut National Polytechnique de Grenoble, France (2006 – 2007)**
Top 10%, GPA 14.6/20.0.
MSc Thesis: “*Vitrification of high level nuclear waste using time periodic magnetic fields*”.
3. **Dipl. in Mechanical Engineering, National Technical University of Athens, Greece (1999 – 2006)**
Top 10%, GPA 7.58/10.0.
Thesis: “*Experimental investigation of the rewetting of a hot surface, using low pressure, subcooled liquid*”.

Employment History:

1. **Weinberg Fellow, Reactor & Nuclear Systems Division, Oak Ridge National Laboratory (June 2016 – present)**
2. **Reactor Safety Analyst, 5 MW Research Reactor, National Center for Scientific Research “Demokritos” (2009 – 2012)**
Thermal-hydraulics and safety analysis of the 5 MW Nuclear Research Reactor. Preparation of the Safety Analysis Report.
Process Engineer and Team Leader, 5 MW Research Reactor, National Center for Scientific Research “Demokritos” (2007 – 2009)
Responsible for the Primary Cooling System Refurbishment and supporting engineering projects, evaluation of technical drawings, preparation of technical reports.

Honors, Fellowships and Awards:

1. **Weinberg Distinguished Fellow**, Oak Ridge National Laboratory (2016)
2. **Best Paper Award**, International Conference on Advances in Nuclear Power Plants (2016)
3. **Best Poster Award**, International Conference on Advances in Nuclear Power Plants (2016)
4. **Outstanding Research Award**, Purdue University (2015)
5. **Bilsland Dissertation Fellowship**, Purdue University (2015)
6. **Roy G. Post Foundation Scholarship**, Roy G. Post Foundation (2015)

7. **1st Place Award**, ANS Special Student Design Competition for the design of a novel nuclear waste management system (2014)
8. **Best Poster Award**, Sigma Xi Research Poster Competition (2014)
9. **Best Paper Award**, 5th IEEE Conf. on Information, Intelligence, Systems & Applications (2014)
10. **Best Paper Award**, American Nuclear Society Student Conference (2013)
11. **Ross Fellowship**, Purdue University (2012)

Research projects:

1. **International Atomic Energy Agency (IAEA)**
Principal Investigator, Project title: Innovative methods in Research Reactor Analysis: Benchmark against Experimental Data on Neutronics and Thermal-hydraulic Computational Methods for Research Reactors, 2008-2012.
2. **International Atomic Energy Agency (IAEA)**
Co-Principal Investigator, Project title: Innovative Methods in Research Reactor Analysis: Benchmarks against Experimental Data on Fuel Burn-up and Material Activation, 2015-present.
3. **Department of Energy (DoE)**
Co-Investigator, Project title: Creation of a Geant4 Muon Tomography Package for Imaging of Nuclear Fuel in Dry Cask Storage, 2013-2015.
4. **National Nuclear Security Administration (NNSA)**
Co-Investigator, Project title: Smart Data Embedding for Non-Proliferation, 2012-2013.

Skills and techniques:

Certification: Research Reactor assistant operator, McMaster Nuclear Reactor, Canada

Certification: Thermal-hydraulic and Accident Analysis of Nuclear Reactors using RELAP5/MOD3, Korean Atomic Energy Research Institute (KAERI)

Programming: Fortran, C/C++, MATLAB, R, Python

Large-scale codes: RELAP5/MOD3.3, GEANT4

Web development: HTML, CSS

Machine Learning: Artificial Neural Networks, Fuzzy Logic, Gaussian Mixture Models, Bayesian Classifier

Publications:

1) Published and accepted papers in peer reviewed journals

1. **S. Chatzidakis**, C.K. Choi, L.H. Tsoukalas (2016). *Interaction of Cosmic Ray Muons with Spent Nuclear Fuel Dry Casks and Determination of Lower Detection Limit*. Nuclear Instruments and Methods in Physics Research A, Vol. 828, 37-45.
2. **S. Chatzidakis**, S. Chrysikopoulou, L.H. Tsoukalas (2015). *Developing a cosmic ray muon sampling capability for muon tomography and monitoring applications*. Nuclear Instruments and Methods in Physics Research A, Vol. 804, 33-42.

3. **S. Chatzidakis**, M. Alamaniotis, L.H. Tsoukalas (2014). *Creep rupture forecasting: A machine learning approach to useful life estimation*. International Journal of Monitoring and Surveillance Technologies Research, Vol. 2 (2), 1-25.
4. **S. Chatzidakis**, P. Forsberg, L.H. Tsoukalas (2014). *Artificial neural networks and chaos dynamics for signal encryption*. Nuclear Technology, Vol. 192 (1), 61-73.
5. **S. Chatzidakis**, A. Hainoun, A. Doval, F. Alhabet, F. Francioni, A. Ikonomopoulos, D. Ridikas (2014). *A comparative assessment of independent thermal-hydraulic models for research reactors: the RSG-GAS case*. Nuclear Engineering and Design, Vol. 268, 77-86.
6. P. Savva, **S. Chatzidakis**, M. Varvayanni, A. Ikonomopoulos, N. Chrysanthopoulou, N. Catsaros, M. Antonopoulos-Domis (2014). *Optimized flux trap dimensions in a research reactor core*. Nuclear Technology, Vol. 188 (3), 322-335.
7. A. Hainoun, A. Doval, P. Umbehaun, **S. Chatzidakis**, N. Ghazi, S. Park, M. Mladin, A. Shokr (2014). *International benchmark study of advanced thermal hydraulic safety analysis codes against measurements on IEA-R1 research reactor*. Nuclear Engineering and Design, Vol. 280, 233-250.
8. **S. Chatzidakis**, A. Staras (2013). *A Bayesian approach to unanticipated events frequency estimation in the decision making context of a nuclear research reactor facility*. Annals of Nuclear Energy, Vol. 59, 169-175.
9. **S. Chatzidakis**, A. Ikonomopoulos (2013). *Phenomenological investigation of loss of coolant accident in a research reactor facility*. Nuclear Engineering and Design, Vol. 256, 341-349.
10. **S. Chatzidakis**, A. Ikonomopoulos, D. Ridikas (2013). *Evaluation of RELAP5/MOD3 behavior against loss of flow experimental results in two research reactor facilities*. Nuclear Engineering and Design, Vol. 255, 321-329.
11. A. Ikonomopoulos, M. Alamaniotis, **S. Chatzidakis**, L.H. Tsoukalas (2013). *Gaussian processes for state identification in pressurized water reactors*. Nuclear Technology, Vol. 182 (1), 1-12.
12. **S. Chatzidakis**, A. Ikonomopoulos, M. Alamaniotis (2012). *An algorithmic approach for RELAP5/MOD3 reactivity insertion analysis in research reactors*. Nuclear Technology, Vol. 179 (3), 392-406.
13. **S. Chatzidakis**, A. Ikonomopoulos, S.E. Day (2012). *PARET-ANL modeling of a SPERT-IV experiment under different departure from nucleate boiling correlations*. Nuclear Technology, Vol. 177 (1), 119-131.
14. D. Mitrakos, **S. Chatzidakis**, E.P. Hinis, L.E. Herranz, C. Housiadas (2008). *A simple mechanistic model for particle penetration and plugging in tubes and cracks*. Nuclear Engineering and Design, Vol. 238, 3370-3378.

2) Published and accepted conference proceedings

1. **S. Chatzidakis**, C.K. Choi, L.H. Tsoukalas (2016). *Theoretical investigation of spent nuclear fuel monitoring using cosmic ray muons*. International Conference on Advances in Nuclear Power Plants (ICAPP2016), April 17-20, San Francisco, CA.
 - **Best Paper Award**
 - **Best Poster Award**

2. **S. Chatzidakis**, P.T. Forsberg, B.T. Sims, L.H. Tsoukalas (2015). *Monte Carlo simulations of cosmic ray muons for dry cask monitoring*. Transactions of the American Nuclear Society, Vol. 112, 534-536.
3. **S. Chatzidakis**, M. Alamaniotis, L.H. Tsoukalas (2015). *An operator support system for reactor transients using fuzzy logic*. Proceedings of the 9th International Conference on Nuclear Plant Instrumentation, Control & Human-Machine Interface Technologies (NPIC & HMIT 2015), February 23-26, Charlotte, NC.
4. **S. Chatzidakis**, M. Alamaniotis, L.H. Tsoukalas (2014). *A Bayesian approach to monitoring spent fuel using cosmic ray muons*. Transactions of the American Nuclear Society, Vol. 111, 369-370.
5. **S. Chatzidakis**, M. Alamaniotis, L.H. Tsoukalas (2014). *Creep rupture forecasting for high performance energy systems*. Proceedings of the 5th International Conference on Information, Intelligence, Systems & Applications (IISA2014), July 7-9, Chania, Greece.
 - **Best Paper Award**
6. **S. Chatzidakis**, P.T. Forsberg, L.H. Tsoukalas (2014). *Chaotic neural networks for intelligent signal encryption*. Proceedings of the 5th International Conference on Information, Intelligence, Systems & Applications (IISA2014), July 7-9, Chania, Greece.
7. M. Alamaniotis, **S. Chatzidakis**, L.H. Tsoukalas (2014). *Monthly load forecasting using Gaussian process regression*. Proceedings of the 9th Mediterranean Conference on Power Generation, Transmission, Distribution, and Energy Conversion (MEDPOWER 2014), November 3-7, Athens, Greece.
8. **S. Chatzidakis**, A. Nikoglou, E.P. Hinis, S.E. Simopoulos (2013). *A study on the rewetting of a hot surface, using low pressure, subcooled liquid*. Proceeding of the 15th International Topical Meeting on Nuclear Reactor Thermal-Hydraulics (NURETH-15), May 12-17, Pisa, Italy.
9. **S. Chatzidakis**, P.T. Forsberg, L.H. Tsoukalas (2013). *Data encryption of radiation signals using chaotic artificial neural networks*. American Nuclear Society (ANS) Student Conference, April 4-6, Boston, MA.
 - **Best Paper Award**
10. J. Knowles, **S. Chatzidakis** (2013). *Defect diffusion simulation through zirconium lattice structure*. American Nuclear Society (ANS) Student Conference, April 4-6, Boston, MA.
11. F. Parozzi, **S. Chatzidakis**, T. Gelain, G. Nahas, W. Plumecocq, J. Vendel, L.E. Herranz, E.P. Hinis, C. Housiadas, C. Journeau, P. Piluso, E. Malgarida (2005). *Investigation on aerosol transport in containment cracks*. Proceedings of the International Conference on Nuclear Energy for New Europe, September 5-8, Bled, Slovenia.

3) Submitted manuscripts

1. **S. Chatzidakis**, C.K. Choi, L.H. Tsoukalas (2015). *Analysis of Spent Nuclear Fuel Imaging Using Multiple Coulomb Scattering of Cosmic Muons*. IEEE Transactions on Nuclear Science, under review.

4) Manuscripts in preparation

1. **S. Chatzidakis**, C.K. Choi, L.H. Tsoukalas (2015). *A New Detector for Muon Momentum and Position Measurement*. Under preparation for submission to Physical Review Letters.

2. **S. Chatzidakis**, L.H. Tsoukalas (2015). *A Bayesian Approach to Monitoring Spent Nuclear Fuel Dry Casks Using Cosmic Muons*. Under preparation for submission to International Journal of Monitoring and Surveillance Technologies Research.

5) Book chapters and review articles

1. Review: *Research Reactor Benchmarking Database: Facility Specification & Experimental Data*. IAEA Technical Report Series No. 480 (2015).
2. M. Alamaniotis, **S. Chatzidakis**, L.H. Tsoukalas. *Data Driven Monitoring of Energy Systems: Gaussian Process Kernel Machines for Fault Identification with Application to Boiling Water Reactors*. Advances in Knowledge Engineering, Chapter 8, Book edited by G. Tsihrintzis et al., DOI 10.1007/978-3-662-49179-9_8, Springer-Verlag Berlin (2016).
3. **S. Chatzidakis**, S.E. Day. *SPERT-IV Benchmark Problem Consolidation*. Chapter In: Research Reactor Benchmarking: Experimental Data & Results. IAEA Technical Report Series, In Press.
4. A. Hainoun, N. Ghazi, F. Alhabet, A. Doval, F. Francioni, **S. Chatzidakis**, A. Ikononopoulos, I.D. Abdelarzek, E.H. Amin, M. Gaheen, A. Gamal. *RSG-GAS Benchmark Problem Consolidation*. Chapter In: Research Reactor Benchmarking: Experimental Data & Results. IAEA Technical Report Series, In Press.
5. **S. Chatzidakis**, S.E. Day. *SPERT-IV Thermal-Hydraulic Analysis using PARET-ANL*. Chapter In: Research Reactor Benchmarking: Experimental Data & Results. IAEA Technical Report Series, In Press.

6) Published conference abstracts

1. **S. Chatzidakis**, P.T. Forsberg, J. Young, A.L. Grelle, L.H. Tsoukalas (2013). *An algorithmic approach for radiation signal encryption using artificial neural networks and chaos dynamics*. Book of Abstracts of the 6th International Conference on Chaotic Modeling and Simulation (CHAOS2013), June 11-14, Istanbul, Turkey.

7) Other

1. **S. Chatzidakis**, Cosmic Ray Muons for Spent Nuclear Fuel Monitoring, PhD Dissertation, School of Nuclear Engineering, Purdue University, 2016.
2. **S. Chatzidakis**, Investigation of the vitrification of high level nuclear waste using time periodic magnetic fields, MSc thesis, Institut Nationale Polytechnique de Grenoble, France, 2007.
3. **S. Chatzidakis**, Experimental investigation of the phenomena occurring during rewetting of a hot surface using subcooled liquid, Diploma thesis, National Technical University of Athens, Greece, 2006.
4. A. Savidou, F. Tzika, **S. Chatzidakis**, I.E. Stamatelatos (2008). *Application of the ALARA principle in dismantling and disposal of a research reactor primary cooling system delay tank*. 11th European ALARA Network, April 9-11, Athens, Greece.
5. **S. Chatzidakis**, A. Ikononopoulos, I.E. Stamatelatos, F. Tzika, V. Maragkos, S. Valakis, A. Savvidou, I.A. Papazoglou, (2012). *Safety Analysis Report of the Greek Research Reactor*

- INT-RP, Research Reactor Laboratory, Doc No. 0011_004_RPT, January 2012.
6. **S. Chatzidakis**, I.E. Stamatelatos, I.A. Papazoglou (2009). *Preliminary Safety Limits for the Greek Research Reactor*. INT-RP, Research Reactor Laboratory, Doc No. 0011_001_RPT, January 2009.
 7. **S. Chatzidakis**, I.E. Stamatelatos, I.A. Papazoglou (2009). *Postulated Initiating Events for Accident Analysis*. INT-RP, Research Reactor Laboratory, Doc No. 0011_002_RPT, June 2009.
 8. **S. Chatzidakis**, I.E. Stamatelatos, I.A. Papazoglou (2009). *Safety Analysis Report Re-writing Plan*. INT-RP, Research Reactor Laboratory, Doc No. 0011_005_RPT, June 2009.
 9. V. Maragos, **S. Chatzidakis**, S. Valakis, F. Tzika, G. Katsoulas, Z. Politis, Z. (2009). *Removal of Radioactive Pool Internals Plan*. INT-RP, Research Reactor Laboratory, Doc No. 0614_034_PRC, September 2009.
 10. **S. Chatzidakis**, D. Mitrakos, E.P. Hinis, C. Housiadas (2006). *Aerosol Penetration and Plugging in Tubes and Containment Cracks*. Network of Excellence for a Sustainable Integration of European Research on Severe Accident Phenomenology, SARNET-ST-P43, Demokritos P-INT-RP-2006/4.

Invited Presentations:

1. Invited lecture, Smart Energy Workshop, Institute for Research and Technology Thessaly (IRETETH), October 2015. Lecture title: Improved security and forecasting capabilities for high performance energy systems using machine learning.
2. Invited lecture, Summer School, National Center for Scientific Research “Demokritos”, Summer 2014. Lecture title: Applications of Cosmic Ray Muon Radiography.

Contributed Presentations:

1. **S. Chatzidakis**, C.K. Choi, L.H. Tsoukalas (2016). *Theoretical investigation of spent nuclear fuel monitoring using cosmic ray muons*. International Conference on Advances in Nuclear Power Plants (ICAPP2016), April 17-20, San Francisco, CA.
2. **S. Chatzidakis**, M. Alamaniotis, L.H. Tsoukalas (2014). *A Bayesian approach to monitoring spent fuel using cosmic ray muons*. American Nuclear Society, Winter Meeting, 5-9 November, Anaheim, CA.
3. **S. Chatzidakis**, M. Alamaniotis, L.H. Tsoukalas (2014). *Creep rupture forecasting for high performance energy systems*. 5th International Conference on Information, Intelligence, Systems & Applications (IISA2014), July 7-9, Chania, Greece.
4. **S. Chatzidakis**, P.T. Forsberg, L.H. Tsoukalas (2014). *Chaotic neural networks for intelligent signal encryption*. 5th International Conference on Information, Intelligence, Systems & Applications (IISA2014), July 7-9, Chania, Greece.
5. **S. Chatzidakis** (2011). *Steady State & Transient Modeling of Research Reactors*. 3rd Technical Meeting of the Coordinated Research Project on “Benchmark against experimental data on neutronic and thermal-hydraulics computational methods and tools for operation and safety analysis of research reactors”, 5-9 December, Aix-en-Provence, France.

6. **S. Chatzidakis** (2011). *Experience gained during RELAP5 modeling*. Workshop on RELAP5/SCDAPSIM user training for research reactor applications and validation, IAEA Headquarters, 31 January – 11 February, Vienna, Austria.
7. **S. Chatzidakis** (2010). *Steady and Transient state thermal-hydraulic modeling of Research Reactors*. 2nd RCM meeting on Benchmarking against Experimental Data of the Neutronic and Thermal-hydraulic Computational Methods and Tools for Operation and Safety Analysis for Research Reactors, IAEA Headquarters, 14 -18 June, Vienna, Austria.
8. **S. Chatzidakis** (2009). *Modernization and refurbishment of the Greek Research Reactor Confinement, Primary Cooling System and I&C system*. Technical Meeting on Research Reactor Modernization and Refurbishment, IAEA, 5-9 October, Vienna, Austria.
9. **S. Chatzidakis** (2008). *Safety Culture challenges and methods in Greece*. Workshop on Promotion of Safety Culture in Research Reactor Operating Organizations, IAEA Headquarters, 20–24 October, Vienna, Austria.
10. **S. Chatzidakis** (2008). *Review and Assessment of Greek Research Reactor Safety Documents*. Technical Meeting on Review and Assessment of Research Reactor Safety Documents, 30 June – 4 July Budapest, Hungary.
11. **S. Chatzidakis** (2008). *Knowledge Management planning and implementation methods and techniques in Greece*. IAEA Workshop on Knowledge Management for Nuclear R&D Organizations, Karlsruhe Institute of Technology, 5 – 9 May Karlsruhe, Germany.

Other pertinent information:

Journal review activities:

- Invited Reviewer, Journal of Applied Physics
- Invited Reviewer, Journal “Annals of Nuclear Energy”
- Invited Reviewer, Journal “Nuclear Engineering & Design”
- Invited Reviewer, Journal “Progress in Nuclear Energy”
- Invited Reviewer, Journal “Computational Intelligence and Neuroscience”
- Invited Reviewer, Journal “Applied Radiation and Isotopes”

Conference review activities:

- Invited Reviewer, 5th International IEEE Conference on Information, Intelligence, Systems & Applications (2014)

Courses taught:

- Fuzzy Approaches in Engineering (NUCL570), Purdue University, Spring 2014
- Neural Computing in Engineering (NUCL575), Purdue University, Fall 2013

Mentoring activities:

1. Mentor intern student, Purdue University, Summer 2015
Student: Sofia Chrysikopoulou
2. Mentoring undergraduate and graduate students, Spring-2014, part of NUCL570 class.
3. Mentoring undergraduate and graduate students, Fall-2013, part of NUCL575 class.
4. Invited member of the Graduate Student Forum, organized by the School of Nuclear Engineering, to guide and mentor undergraduate students in their transition to graduate studies.

Affiliations:

Member, American Nuclear Society

Member, Sigma Xi Honors Research Society

Member, Alpha Nu Sigma Honors Society