



# Curriculum Vitae

## Hyunsuk Lee

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### AFFILIATION

Combined Master's and Ph.D Program (2013.03 ~ )  
Ulsan National Institute of Science & Technology (UNIST)  
44919, UNIST-gil 50, Ulsan Metropolitan City, Republic of Korea

### EDUCATION

Bachelor of Engineering  
• Major: Nuclear Science & Engineering  
Thermo- Fluid & Power Engineering  
• UNIST, Ulsan, Korea, 2009.03 - 2013.02

### WORK EXPERIENCE

- Monte Carlo Code Development
  - Main developer of MCS
- Benchmark Calculation
  - BEAVRS, VERA, MHTGR-350, VENUS-2, C5G7, Hoogenboom-Martin, etc.
- Inter-cycle Correlation in Monte Carlo Simulation
  - Real variance estimation
  - Inter-cycle correlation reduction technique
- Acceleration Technique of Monte Carlo
  - MOC-MC hybrid method
  - Modified Power Method (MPM)
  - Coarse Mesh Finite Difference (CMFD) method
- Self-Powered Neutron Detector (SPND)
  - Development calculation procedure with MCNP6 and BETA-S
- Boron Meter
  - Development calculation procedure with MCNP6

### RESEARCH INTERESTS

- Monte Carlo Method
  - Validation & verification
  - Acceleration technique
  - Inter-cycle correlation
  - Sensitivity and uncertainty quantification
  - Decomposition algorithm
- Monte Carlo Simulation
  - Reactor design

- Self-Powered Neutron Detector (SPND)
- Boron meter
- Reactor Analysis
  - PWR, Gen-IV reactor

## SKILLS

- Nuclear-physics Code
  - MCNP, Serpent, McCARD, NJOY
- Programming Language
  - Fortran, Python, C/C++, Matlab, Shell, Awk, Sed
- OS/Tools
  - Linux, Windows, MS office, git

## CERTIFICATES

- Awards & Scholarship
  - RPHA 17 best student papers Award: Performance Evaluation of CMFD on Inter-Cycle Correlation of Monte Carlo Simulation (August, 2017)
  - KNS best paper prize: Preliminary Solution of BEAVRS Hot Full Power at BOC by Monte Carlo Code (May, 2017)
  - National natural sciences and engineering scholarship, Korean Student Aid Foundation (March, 2009 - February, 2013)
- Training (International)
  - MCNP VISED training (Las Vegas, Feb, 2015)
  - Research reactor Kyoto University Critical Assembly (KUCA) Experiment, Kyoto University (Osaka, July, 2013)
  - MCNP5 training (Paris, March, 2013)
- Training (Domestic)
  - VISUAL MCNP training (Daejeon, 2015)
  - LWR refueling core design training, KHNP CRI (HYU, July, 2014)
  - Basic theory and programming practice of nuclear reactor design and analysis with Monte Carlo method (INTEC, January, 2014)
  - McCARD user training course, Seoul National University (SNU, August, 2013)
  - Whole core transport analysis seminar, KAERI (Muju, March, 2013)
- Membership
  - Korean Nuclear Society Student Member (March, 2013)

## PUBLICATIONS SCI(E) JOURNAL

1. **Hyunsuk Lee**, Sooyoung Choi, and Deokjung Lee\*, "A Hybrid Monte Carlo/Method-of-Characteristics Method for Efficient Neutron Transport Analysis," Nucl. Sci. Eng., 180 (1) pp.69-85, <http://dx.doi.org/10.13182/NSE13-102> (2015)
2. **Hyunsuk Lee**, Sooyoung Choi, Kyoon-Ho Cha, Kwangho Lee, and Deokjung Lee\*, "New Computational Model for Self-Powered Neutron Detector Based on Monte Carlo Simulation," J. Nucl. Sci. Tech., <http://dx.doi.org/10.1080/00223131.2014.975766> (2015)
3. Jaerim Jang, Wonkyeong Kim, Sanggeol Jeong, Eun Jung, Jinsu Park, Matthieu Lemaire, **Hyunsuk Lee**, Deokjung Lee\*, "Validation of UNIST Monte Carlo Code MCS for Criticality Safety Analysis of PWR Spent Fuel Pool and Storage Cask," Annals of Nuclear Energy, Under review (2017)

4. Peng Zhang, **Hyunsuk Lee**, Deokjung Lee\*, "Monte Carlo Implementation of the Modified Power Method for Three-Dimensional Criticality Eigenvalue Problems," *Comput. Phys. Commun.*, Under review (2017)
5. Peng Zhang, **Hyunsuk Lee**, Deokjung Lee\*, "On the Transfer Matrix of the Modified Power Method," *Comput. Phys. Commun.*, Under review (2017)
6. Peng Zhang, **Hyunsuk Lee**, Deokjung Lee\*, "Extension of the Noise Propagation Matrix Method for Higher Mode Solutions," *J. Comput. Phys.*, Published Online. <http://dx.doi.org/10.1016/j.jcp.2017.05.007> (2017)
7. Matthieu Lemaire, **Hyunsuk Lee**, Nam-il Tak, Hyun Chul Lee, Deokjung Lee\*, "Multi-physics steady state analysis of OECD/NEA Modular High Temperature Gas-cooled Reactor MHTGR-350," *J. Nucl. Sci. Technol.*, Published Online. <http://dx.doi.org/10.1080/00223131.2017.1299649> (2017)
8. Jinsu Park, **Hyunsuk Lee**, Taewoo Tak, Ho Cheol Shin, Deokjung Lee\*, "Physics Study of Canada Deuterium Uranium Lattice with Coolant Void Reactivity Analysis," *Nucl. Eng. Tech.*, 49 (1): 6-16. <http://dx.doi.org/10.1016/j.net.2016.07.003> (2017)
9. Peng Zhang, **Hyunsuk Lee**, Deokjung Lee\*, "Calculation of Degenerated Eigenmodes with Modified Power Method," *Nucl. Eng. Tech.*, 49 (1): 17-28. <http://dx.doi.org/10.1016/j.net.2016.08.009> (2017)
10. Chidong Kong, **Hyunsuk Lee**, Taewoo Tak, Deokjung Lee\*, Si Hwan Kim, Seokjean Lyou, "Accuracy Improvement of Boron Meter Adopting New Fitting Function and Multi-detector", *Nucl. Eng. Tech.*, Published Online. <http://dx.doi.org/10.1016/j.net.2016.06.012> (2016)
11. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee\*, "Extension of Modified Power Method to Two-Dimensional Problems," *J. Comput. Phys.*, <http://dx.doi.org/doi/10.1016/j.jcp.2016.05.024> (2016)
12. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee\* "A General Solution Strategy of Modified Power Method for Higher Mode Solutions," *J. Comput. Phys.*, 305:387-402 <http://dx.doi.org/doi:10.1016/j.jcp.2015.10.042> (2016)
13. Sooyoung Choi, **Hyunsuk Lee**, Ser Gi Hong, and Deokjung Lee\*, "Resonance Self-Shielding Methodology of New Neutron Transport Code STREAM," *J. Nucl. Sci. Technol.*, 52(9):1133-1150, <http://dx.doi.org/10.1080/00223131.2014.993738>, (2015)

## PROCEEDING CONFERENCES

1. **Hyunsuk Lee**, Wonkyeong Kim, Peng Zhang, Azamat Khassenov, Jinsu Park, Jiankai Yu, Sooyoung Choi, Hwan Soo Lee and Deokjung Lee\*, "Preliminary Simulation Results of BEAVRS Three-dimensional Cycle 1 Wholecore Depletion by UNIST Monte Carlo Code MCS," M&C2017, Jeju, Korea, April 16-20 (2017) [Oral Presentation]
2. **Hyunsuk Lee**, and Deokjung Lee\*, "Application of CMFD with Wielandt Method on Continuous Energy Monte Carlo Simulation for Eigenvalue Problems," ANS MC2015, Nashville, TN, USA, April 19-23 (2015)
3. **Hyunsuk Lee**, Chidong Kong, and Deokjung Lee\*, "Status of Monte Carlo Code Development at UNIST," PHYSOR2014, Kyoto, Japan, September 28 October 3 (2014) [Oral Presentation]
4. **LEE Hyunsuk**, CHOI Sooyoung, KIM Si Hwan, LYOU Seokjean, and LEE Deokjung \*, "Development of MCNPX Model for Boronometer," International Symposium on Symbiotic Nuclear Power Systems for the 21st Century (ISSNP2013), November 22-24, Beijing, China (2013) [Oral Presentation]
5. **Hyunsuk Lee** and Deokjung Lee \*, "Hybrid Method of Deterministic and Probabilistic Approaches for Continuous Energy Neutron Transport Problem," M&C2013, Sun Valley, USA, May (2013) [Oral Presentation]
6. Jiankai Yu, **Hyunsuk Lee**, Khassenov Azamat, Kan Wang and Deokjung Lee, "PERFORMANCE OF ON-THE-FLY CROSS SECTIONS PROCESSING IN

MONTE CARLO SIMULATION CODE," 37th Annual Conference of the Canadian Nuclear Society, Niagara Falls, ON, Canada, Jun 4-7 (2017)

7. Matthieu Lemaire, **Hyunsuk Lee**, Nam-il Tak, Hyun-Chul Lee, Deokjung Lee\*, "Monte Carlo Thermal-Fluids Coupled Calculations for MHTGR-350MW Benchmark," M&C2017, Jeju, Korea, April 16-20 (2017) [Oral Presentation]
8. Peng Zhang, **Hyunsuk Lee**, Deokjung Lee, "A New Accumulation Scheme for the Monte Carlo Implementation of the Modified Power Method," M&C2017, Jeju, Korea, April 16-20 (2017) [Oral Presentation]
9. Wonkyeong Kim, **Hyunsuk Lee**, Sooyoung Choi, Ji-Eun Jung and Deokjung Lee\*, "Hybrid Depletion Method for the Light Water Reactor analysis," M&C2017, Jeju, Korea, April 16-20 (2017) [Oral Presentation]
10. Peng Zhang, **Hyunsuk Lee**, Deokjung Lee, "Monte Carlo Higher Modes Calculation based on the Extension of the Noise Propagation Matrix," M&C, Jeju, Korea, April 16-20 (2017) [Oral Presentation]
11. Jinsu Park, **Hyunsuk Lee**, Deokjung Lee\*, "Optimization of CANDU Lattice Design for Negative Coolant Void Reactivity," PBNC 2016, Beijing, China, April 5-9 (2016)
12. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee\*, "Extension of Modified Power Method to Multi-Dimensional Monte Carlo Simulations," PHYSOR2016, Sun Valley, ID, USA, May 1-5 (2016)
13. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee\*, "On the Characteristics of Transfer Matrix of Generalized Modified Power Method," PHYSOR2016, Sun Valley, ID, USA, May 1-5 (2016)
14. Hanjoo Kim, Kiho Kim, Sooyoung Choi, **Hyunsuk Lee**, and Deokjung Lee, "Analysis of NCA Tungsten Critical Experiment by New Monte Carlo Code," PHYSOR2016, Sun Valley, ID, USA, May 1-5 (2016)
15. Chidong Kong, **Hyunsuk Lee**, Si Hwan Kim, Seakjean Lyou, and Deokjung Lee\*, "Optimization of Boron Meter Model" ICAPP2016, San Francisco, CA, USA, April 17-20 (2016)
16. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee\*, "A Monte Carlo Convergence Acceleration Technique based on the Modified Power Method," SMMS2015, Chiang Mai, Thailand, November 22-23 (2015)
17. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee\*, "A Monte Carlo Convergence Acceleration Technique Based on the Modified Power Iteration Method," Modelling and Simulation: Techniques and Applications 2015, Bangkok, Thailand, June 28-29 (2015)
18. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee\*, "Stabilization Technique of Modified Power Iteration for Monte Carlo Simulation of Neutron Transport Eigenvalue Problem," ANS MC2015, Nashville, TN, USA, April 19-23 (2015)

## CONFERENCE

1. **Hyunsuk Lee**, Eun Jeong, Hocheol Lee, Hyun Chul Lee, Deokjung Lee\*, "Verification of MCS VHTR Modeling Capability," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
2. **Hyunsuk Lee**, Deokjung Lee, Peng Zhang, and Azamat Khassenov, "Preliminary Solution of BEAVRS Hot Full Power at BOC by Monte Carlo Code" KNS Fall Meeting, Gyeongju, Korea, October 26-28 (2016)
3. **Hyunsuk Lee**, Wonkyeong Kim, Peng Zhang, Azamat Khassenov, Yunki Jo, and Deokjung Lee, "Development Status of Monte Carlo Code at UNIST", KNS 2016 spring, Jeju, Korea, May 11-13 (2016)
4. **Hyunsuk Lee**, Azamat Khassenov, Peng Zhang, and Deokjung Lee\*, "Computational Approaches to Large-scale/complex Nuclear Reactor Analysis," CPMMS2016, Bangkok, Thailand, January 24-26 (2016)

5. **Hyunsuk Lee** and Deokjung Lee, Performance Evaluation of CMFD with Superhistory Method on Continuous Energy Monte Carlo Eigenvalue Simulation, KNS Spring Meeting, Jeju, Korea, May 6-8 (2015)
6. **Hyunsuk Lee** and Deokjung Lee\*, "Application of CMFD on Continuous Energy Monte Carlo Simulation for Eigenvalue Problems," KNS Fall Meeting, Pyeongchang, Korea, October 30-31 (2014) [Oral Presentation]
7. **Hyunsuk Lee**, Chidong Kong, and Deokjung Lee\*, "A New Monte Carlo Neutron Transport Code at UNIST," KNS Spring Meeting, Jeju Convention Center, May 28-30 (2014) [Oral Presentation]
8. **Hyunsuk Lee**, Sooyoung Choi, and Deokjung Lee\*, "Development of Boron Meter Model with MCNPX," KNS Fall Meeting, Kyeongju, October (2013) [Oral Presentation]
9. **Hyunsuk Lee** and Deokjung Lee\*, "Application of Analytic Slowingdown Kernel for MOC-MC Hybrid Method," ANS Winter Meeting, Washington D.C., November (2013) [Oral Presentation]
10. **Hyunsuk Lee**, Si Hwan Kim, Seokjean Lyoo, and Deokjung Lee \*, "Performance Evaluation of Boronmeter based on MCNPX Model," ANS Winter Meeting, Washington D.C., November (2013) [Oral Presentation]
11. **Hyunsuk Lee**, Chidong Kong, Sooyoung Choi, and Deokjung Lee \*, "Hybrid Method of MOC and MC for Efficient Continuous Energy Neutron Transport Analysis," ANS Annual Meeting, Atlanta, GA, June (2013) [Oral Presentation]
12. Jinsu Park, Peng Zhang, **Hyunsuk Lee**, Deokjung Lee\*, "Performance Evaluation of CMFD on Inter-Cycle Correlation of Monte Carlo Simulation," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
13. Khang Nguyen, JiwonChoe, Sooyoung Choi, **Hyunsuk Lee**, Wonkyeong Kim, Deokjung Lee\*, Matthieu Lemaire, "Verification of STREAM and MCS against OPR FA depletion calculation," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
14. Matthieu Lemaire, **Hyunsuk Lee**, Bamidele Ebiwonjumi, ChidongKong, Wonkyeong Kim, Yunki Jo, Jinsu Park, Deokjung Lee\*, "Recent Work on Photon Transport with UNIST Monte Carlo Code MCS," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
15. Chidong Kong, **Hyunsuk Lee**, Matthieu Lemaire, Wonkyeong Kim, Yunki Jo, Jinsu Park, JiwonChoe, Bamidele Ebiwonjumi, Deokjung Lee\*, "Introduction to UNIST Spent Nuclear Fuel Transportation Package Analysis Code System," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
16. Vutheam Dos, **Hyunsuk Lee**, Yunki Jo, Deokjung Lee\*, Change Je Park, "Verification of MCS Model of the Jordan Research and Training Reactor for Neutronic Calculations," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
17. Tung Dong Cao Nguyen, **Hyunsuk Lee**, Jiwon Choe, Ho Choel Shin, Hwan Soo Lee, Deokjung Lee\*, "LPPT Analysis of APR1400 Reactor Core by UNIST Monte Carlo Code MCS," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
18. Azamat Khassenov, Jiankai Yu, **Hyunsuk Lee**, Peng Zhang, Deokjung Lee\*, "On the Window Multi-pole Library Generation," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
19. Jiankai YU, **Hyunsuk Lee**, Hanjoo Kim, Peng Zhang, Deokjung Lee\*, "Preliminary

- Validation of MCS Multi-Physics Coupling Capability with CTF," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
20. Jaerim Jang, Jiwon Choe, Sooyoung Choi, **Hyunsuk Lee**, Bamidele Ebiwonjumi, Ho Cheol Shin, Deokjung Lee\*, "Boron-free SMPWR Analysis with MCS and STREAM codes," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
  21. Peng Zhang, **Hyunsuk Lee**, Deokjung Lee\*, "Prediction on Underestimation of Statistical Uncertainty for Fission Source Tally in Monte Carlo Simulation Based on the Modified Power Method," RPHA17, Chengdu, Sichuan, China, August 24-25 (2017) [Oral presentation]
  22. Jinsu Park, Wonkyeong Kim, Sooyoung Choi, **Hyunsuk Lee**, and Deokjung Lee, "Comparative Analysis of VERA Depletion Problems," KNS Fall Meeting, Gyeongju, Korea, October 26-28 (2016)
  23. Matthieu Lemaire, **Hyunsuk Lee**, and Deokjung Lee, Nam-il Tak, Hyun Chul Lee, "MHTGR-350 Coupled Steady-State Results Using MCS and GAMMA+," KNS Fall Meeting, Gyeongju, Korea, October 26-28 (2016)
  24. Peng ZHANG, **Hyunsuk LEE**, and Deokjung LEE, "Extension of NPMM for Higher Mode Solutions," KNS Fall Meeting, Gyeongju, Korea, October 26-28 (2016)
  25. Chidong Kong, **Hyunsuk Lee**, Si Hwan Kim, Seokjean Lyou, Deokjung Lee\*, "Development of High Accuracy Boron Meter," International Conference on Advanced Technology Innovation 2016(ICATI 2016), Bali, Indonesia, June 30-July 3 (2016)
  26. Jinsu Park, **Hyunsuk Lee**, Taewoo Tak, and Deokjung Lee, "Coolant Void Reactivity Analysis of CANDU Lattice", KNS 2016 spring, Jeju, Korea, May 11-13 (2016)
  27. Chidong Kong, **Hyunsuk Lee**, and Deokjung Lee, Ho Cheol Shin and Kyoong-Ho Cha, "Feasibility Study of Silver as Emitter of In-core Neutron Detector", KNS 2016 spring, Jeju, Korea, May 11-13 (2016)
  28. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee, "Application of the Modified Power Method to 2D Core Simulation", KNS 2016 spring, Jeju, Korea, May 11-13 (2016)
  29. Chidong Kong, **Hyunsuk Lee**, Si Hwan Kim, Seakjean Lyou, and Deokjung Lee\*, "Sensitivity Evaluation of Boron Meter Model," KNS Fall Meeting, Gyeongju, Korea, October 29-30 (2015), submitted
  30. Peng Zhang, **Hyunsuk Lee**, Kyoong-Ho Cha, Sun-Kwan Hong, and Deokjung Lee\*, "Application of Modified Power Method to 2D Problems," RPHA15, Jeju, Korea, September 16-18 (2015)
  31. Chidong Kong, **Hyunsuk Lee**, Si Hwan Kim, Seokjean Lyou, and Deokjung Lee\*, "Application of Rational Function for Accuracy Improvement of Boron Meter Model," RPHA15, Jeju, Korea, September 16-18 (2015)
  32. Yongjin Jeong, Sooyoung Choi, **Hyunsuk Lee**, Kyoong-Ho Cha, Sun-Kwan Hong, and Deokjung Lee\*, "Hybrid Depletion Method for Monte Carlo Analysis of PWRs," RPHA15, Jeju, Korea, September 16-18 (2015)
  33. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee\*, "The Implementation of Modified Power Iteration Method in Monte Carlo," 2015 ANS Annual Meeting, San Antonio, TX, June 7-11 (2015)
  34. Peng Zhang, **Hyunsuk Lee**, and Deokjung Lee, Extension of Tom Booth's Modified Power Method for Higher Eigen Modes, KNS Spring Meeting, Jeju, Korea, May 6-8 (2015)
  35. Hyeon-Jun Jeong, **Hyunsuk Lee**, Deokjung Lee and Hyun Chul Lee, MHTGR-350MW Benchmark Analysis by MCS Code, KNS Spring Meeting, Jeju, Korea, May 6-8 (2015)
  36. Taewoo Tak, Jiwon Choe, **Hyunsuk Lee** and Deokjung Lee\*, "Verification of UCFR-100 Depletion Calculation with Deterministic Method by Comparing with Probabilistic Method," ANS Winter Meeting, Washington D.C., November (2013)

[Oral Presentation]

**PATENT**

1. Deokjung Lee et al., “보론미터(Boron Meter),” KOR patent: 1014625040000, NOV., 11 (2014)