

Seonho Park

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Updated date: June 14, 2021

Research Interests

- Uncertainty Quantification, Stochastic Optimization, Bayesian Deep Learning

Education

University of Florida

Ph.D. Industrial and Systems Engineering,

Advisor: Dr. Panos M. Pardalos

Supervisory Committee Members: Dr. José C. Príncipe, Dr. Hongcheng Liu, Dr. Mostafa Reisi-Gahrooei

Dissertation proposal title: Uncertainty-aware neural networks and applications

Gainesville, FL.

Aug. 2017-2021 (expected)

University of Florida

M.S. Industrial and Systems Engineering, GPA: 3.93/4.0

Gainesville, FL.

Dec. 2020

Hanyang University

M.S. Mechanical Engineering, GPA: 3.88/4.0

Thesis: Sequential Approximate Optimization using Dual Subproblems based on Diagonal Quadratic Approximation

Advisor: Dr. Dong-Hoon Choi

Seoul, South Korea

Feb. 2012

Hanyang University

B.S. Mechanical Engineering, GPA: 3.81/4.0, summa cum laude

Seoul, South Korea

Feb. 2010

Work Experiences

ERShares

Senior AI Researcher

Boston, MA. (work remotely, part-time)

Dec. 2020 - May 2021

- Apply mathematical and statistical techniques on data to generate investment insights
- Develop tools to optimize the firm's trading strategies and trading signals

Siemens Healthineers

Medical Imaging Deep Learning Research Intern

Princeton, NJ.

May. 2019 - Aug. 2019

- Research on active learning to quantify classification uncertainty to select Chest XRay images to be annotated
- Develop and deploy 3D ResNet architecture to classify rotator-cuff tears
- Mentors: Florin C. Ghesu, Sasa Grbic

PIDO Tech R&D CENTER

Research Engineer

Seoul, South Korea

Oct. 2016 - July. 2017

- Integrated machine learning algorithms including Gaussian process, deep neural networks, support vector machine, ensemble models into the commercial structural design optimization software

MIDAS IT R&D CENTER

Researcher, Section Manager

Seong-Nam, South Korea

Jan. 2012 - May. 2016

- Developed optimization algorithms to solve structural design optimization problems
- Developed reliability analysis module for commercial computer-aided engineering software
- Researched on diagnosis of Alzheimer's disease from fMRI T1 images using deep convolutional neural network

Research Experiences

Center for Applied Optimization, University of Florida

Research Assistant

Gainesville FL.

Aug. 2017 - Present

- Uncertainty-aware neural networks and applications (Current work for dissertation)
 - Research on measuring uncertainty inherent in both model and data that can be efficiently and effectively equipped with deep neural networks
 - Research on anomaly detection based on rate-distortion theory in information theory and variational autoencoder (VAE) and using encoder-only architecture for estimating the data distribution
 - Estimating the data density using the Donsker-Varadhan variational bound on KL-divergence
- Stochastic optimization for training deep neural networks (Done by Aug. 2019)
 - Research on combining negative curvature with the adaptive cubic regularized Newton method for solving nonconvex finite-sum functions that typically arise in machine learning problems
 - The associated paper has been published in the journal, Journal of optimization theory and applications

Airforce Research Laboratory

Research Assistant, Contract Number: FA8651-08-D-0108

Aug. 2019 - Present

- Research on using deep neural network based image matching and retrieval technique for positioning of unmanned aerial systems in GPS-denied environments
- Principal investigator: Maciej Rysz, Kaitlin L. Fair

Awards and Honors

ISE Research Award , <i>Industrial and Systems Engineering, University of Florida</i> <i>Awarded in recognition of outstanding research accomplishment</i>	2021
QSR Data Challenge Competition Finalist , <i>Quality, Statistics and Reliability (QSR) Section of INFORMS</i> <i>COVID19 CT Scan images classification competition, top 4 among 50 participants</i>	2020
KSEA-GFC Scholarship , <i>Korean-American Scientists and Engineers Association</i> <i>Awarded in recognition of outstanding research in STEM area and/or dedicated service for KSEA-GFC</i>	2020
Korean Scholastic Excellence Award , <i>Herbert Wertheim College of Engineering, University of Florida</i> <i>Awarded in recognition of scholastic excellence in graduate studies</i>	2019

Publications

1. **Seonho Park**, Panos M. Pardalos, *Deep Data Density Estimation through Donsker-Varadhan Representation [Arxiv]*, 2021
2. **Seonho Park**, Maciej Rysz, Kaytlin L. Fair, Panos M. Pardalos, *SAR Image-based Positioning in GPS-denied Environments using Deep Cosine Similarity Neural Networks [paper]*, *Inverse Problems & Imaging*, 2020
3. **Seonho Park**, George Adosoglou, Panos M. Pardalos, *Interpreting Rate-Distortion of Variational Autoencoder and Using Model Uncertainty for Anomaly Detection [paper] [code]*, *Annals of Mathematics and Artificial Intelligence*, 1-18, 2020
4. **Seonho Park**, Seung Hyun Jeong, Panos M. Pardalos, *Combining Stochastic Adaptive Cubic Regularization with Negative Curvature for Nonconvex Optimization [paper] [code]*, *Journal of optimization theory and applications*, 184, pp. 953–971, 2020
5. **Seonho Park**, Seung Hyun Jeong, Gil Ho Yoon, Albert A. Groenwold, Dong-Hoon Choi, *A globally convergent sequential convex programming using an enhanced two-point diagonal quadratic approximation for structural optimization*, *Structural and Multidisciplinary Optimization* 50 (5), pp.739-753, 2014
6. Seung Hyun Jeong, **Seonho Park**, Dong-Hoon Choi, Gil Ho Yoon, *Toward a stress-based topology optimization procedure with indirect calculation of internal finite element information*, *Computers & Mathematics with Applications* 66 (6), pp.1065-1081, 2013
7. Seung Hyun Jeong, **Seonho Park**, Dong-Hoon Choi, Gil Ho Yoon, *Topology optimization considering static failure theories for ductile and brittle materials*, *Computers & Structures*, 110, pp.116-132, 2012

Current works

- Contrastive learning for SAR image searching based positioning (Sponsored by AFRL)

Presentations

1. *A high-level task planning of autonomous robots carrying multiple herbicides and treating specific weed types*, 2021 ASABE Annual International Meeting, Virtual, 12-16 July 2021
2. *Uncertainty-aware Neural Networks For Medical Image Analysis*, INFORMS annual meeting, Seattle, Washington, 20-23 Oct. 2019
3. *Stochastic Adaptive Cubic Regularization with Negative Curvature for Nonconvex Optimization*, INFORMS annual meeting, Seattle, Washington, 20-23 Oct. 2019
4. *Diagnosis of Alzheimer's disease with deep learning*, Hanyang University, 4 Jul. 2016
5. *A filtered Sequential Approximate Optimization Algorithm based on Dual Subproblems using an Enhanced Two-point Diagonal Quadratic Approximation for Structural Optimization*, 12th AIAA Aviation Technology, Integration, and Operations (ATIO) Conference and 14th AIAA/ISSMO Multidisciplinary Analysis and Optimization Conference, Indianapolis, Indiana, 17-19 Sep. 2012
6. *Development of External Module for Stress-based Topology Optimization using Commercial CAE Software Package*, The 7th China-Japan-Korea Joint Symposium on Optimization of Structural and Mechanical Systems, Huangshan, China, 18-21 Jun. 2012
7. *A New Convex Separable Approximation based on Two-point Diagonal Quadratic Approximation for Large-scale Structural Design Optimization*, 9th World Congress on Structural and Multidisciplinary Optimization, Shizuoka, Japan, 13-17 Jun. 2011
8. *Dual Optimization Approach based on Two-point Diagonal Quadratic Approximation*, The Korean Society of Mechanical Engineer 2010 Fall Conference Korean, Jeju, South Korea, 03-05 Nov. 2010
9. *Optimization for Optical Performances of LCD/BLU Using Pseudo Sensitivity*, The Korean Society of Mechanical Engineer 2009 Fall Conference Korean, Pyeongchang, South Korea, 04-06 Nov. 2009

Teaching Experiences

- o Teaching Assistant, ESI6346 Decision making under uncertainty, Spring, 2019
- o Teaching Assistant, ESI6552 Systems architecture, Spring, 2019

Professional Activities

Reviewer.....

- o Annals of Mathematics and Artificial Intelligence
- o International Journal of Bioinformatics Research and Applications
- o SN Operations Research Forum
- o Journal of Global Optimization
- o Journal of Optimization Theory and Applications
- o Remote Sensing

Professional Development Activities.....

- o Participant, *INFORMS Doctorate Student Colloquium*, Phoenix, Arizona, November 2-3, 2018

Services.....

- o Student Council Member, *Korean-American Scientists and Engineers Association Gainesville Florida Chapter*, 2018-present

Courses Taken

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| o Applied Probability Methods in Engineering, ESI6325 | o Fundamentals of Mathematical Programming, ESI6420 |
| o Linear Programming & Network Optimization, ESI6417 | o Global Optimization, ESI6492 |
| o Stochastic Modelling and Analysis, ESI6546 | o Numerical Linear Algebra, MAD6406 |
| o Machine Learning for Time Series, EEE6504 | o Fundamentals of Machine Learning, EEL5840 |
| o Introduction to Data Analytics, EIN6905 | o Statistical Methods in Research I, STA6166 |

Computer Skills

- Programming Languages: C/C++(Professional), Python(Professional), MATLAB(Experienced), Java(Experienced), R(Experienced), FORTRAN(Experienced)
- Others: Tensorflow, Pytorch, Theano, Scikit-learn, SQL, Gams, git, Gurobi, L^AT_EX

References

Panos M. Pardalos

Distinguished Professor, Industrial and systems engineering, University of Florida

pardalos@ise.ufl.edu

Hongcheng Liu

Assistant Professor, Industrial and systems engineering, University of Florida

hliu@ise.ufl.edu

Maciej Rysz

Assistant Professor, Information Systems & Analytics, Farmer school of business, Miami University *ryszmw@miamioh.edu*