Seonho Park

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Research Interests

- Uncertainty Quantification, Stochastic Optimization, Bayesian Deep Learning

Education

University of Florida **Gainesville, FL.**
Ph.D. Industrial and Systems Engineering, *Aug. 2017-2021 (expected)*
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

University of Florida **Gainesville, FL.**
M.S. Industrial and Systems Engineering, GPA: 3.93/4.0 *Dec. 2020*

Hanyang University **Seoul, South Korea**
M.S. Mechanical Engineering, GPA: 3.88/4.0 *Feb. 2012*
Thesis: Sequential Approximate Optimization using Dual Subproblems based on Diagonal Quadratic Approximation
Advisor: Dr. Dong-Hoon Choi

Hanyang University **Seoul, South Korea**
B.S. Mechanical Engineering, GPA: 3.81/4.0, summa cum laude *Feb. 2010*

Work Experiences

ERShares **Boston, MA. (work remotely, part-time)**
Senior AI Researcher *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 **Princeton, NJ.**
Medical Imaging Deep Learning Research Intern *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

Research Experiences

Center for Applied Optimization, University of Florida **Gainesville FL.**
Research Assistant *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

QSR Data Challenge Competition Finalist, *Quality, Statistics and Reliability (QSR) Section of INFORMS* **2020**
COVID19 CT Scan images classification competition, top 4 among 50 participants

KSEA-GFC Scholarship, *Korean-American Scientists and Engineers Association* **2020**
Awarded in recognition of outstanding research in STEM area and/or dedicated service for KSEA-GFC

Korean Scholastic Excellence Award, *Herbert Wertheim College of Engineering, University of Florida* **2019**
Awarded in recognition of scholastic excellence in graduate studies

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. *Uncertainty-aware Neural Networks For Medical Image Analysis*, INFORMS annual meeting, Seattle, Washington, 20-23 Oct. 2019
2. *Stochastic Adaptive Cubic Regularization with Negative Curvature for Nonconvex Optimization*, INFORMS annual meeting, Seattle, Washington, 20-23 Oct. 2019
3. *Diagnosis of Alzheimer's disease with deep learning*, Hanyang University, 4 Jul. 2016
4. *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
5. *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

6. *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
7. *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
8. *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

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

Professional Activities

Reviewer

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

Professional Development Activities

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

Services

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

Courses Taken

- Applied Probability Methods in Engineering, ESI6325
- Linear Programming & Network Optimization, ESI6417
- Stochastic Modelling and Analysis, ESI6546
- Machine Learning for Time Series, EEE6504
- Introduction to Data Analytics, EIN6905
- Fundamentals of Methematical Programming, ESI6420
- Global Optimization, ESI6492
- Numerical Linear Algebra, MAD6406
- Fundamentals of Machine Learning, EEL5840
- 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, LaTeX

References

Panos M. Pardalos
Distinguished Professor, Industrial and systems engineering, University of Florida *pardalos@ise.ufl.edu*

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