Sungyong Seo

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Research Statement

My research focuses on incorporating prior knowledge (especially physics-based knowledge) within data-driven models or learning process as an inductive bias, thereby achieving efficient learning from few samples or sparse observations and making the model easier to understand for scientists and non-machine-learning experts.

Professional Experience

Google Cloud AI **Sunnyvale, CA**
Software Engineer *June 2021 – Current*
- Improve Vertex AI Search & Conversation quality by better understanding of structural information in documents.
- Lead Cloud AI Recommendation model learning on TPU.
- Develop customized recommendations models to deliver expert-level model quality with minimal time and money spent.

Google Cloud AI **Sunnyvale, CA (Remote)**
Research Intern (Mentor: Sercan O. Arik) *May 2020 – Feb. 2021*
- Guided data-driven models with rules, by utilizing a novel architecture that allows learning jointly from data and rules.

Center for Data Science (CDS) at New York University **New York, NY**
Visiting Researcher (Mentor: Kyunghyun Cho) *Jul. 2019 - Jan. 2020*
- Worked on equivariant dual graph networks for spatiotemporal prediction with missing values.

Yahoo! Research **New York, NY**
Research Intern (Mentor: Changwei Hu and Yifan Hu) *May 2018 - Aug. 2018*
- Developed a deep structural model for analyzing and forecasting correlated multivariate time-series.

Visa Research **Foster City, CA**
Research Intern (Mentor: Jing Huang) *Jun. 2016 - Aug. 2016*
- Developed recommendation systems utilizing reviews on products based on attention CNN.

Publications

Conferences

- **Sungyong Seo**, Sercan O Arik, Jinsung Yoon, Xiang Zhang, Kihyuk Sohn, Tomas Pfister, Controlling Neural Networks with Rule Representations, *Neural Information Processing Systems (NeurIPS) 2021.*
- **Sungyong Seo**, Chuizheng Meng, Sirisha Rambhatla, Yan Liu, Physics-aware Spatiotemporal Modules with Auxiliary Tasks for Meta-Learning, *International Joint Conference on Artificial Intelligence (IJCAI) 2021.*
- Karishma Sharma, Xinran He, **Sungyong Seo**, Yan Liu, Network Inference from a Mixture of Diffusion Models for Fake News Mitigation, *International AAAI Conference on Web and Social Media (ICWSM) 2021.*
- **Sungyong Seo***, Chuizheng Meng*, Yan Liu, Physics-aware Difference Graph Networks for Sparsely-Observed Dynamics, *International Conference on Learning Representations (ICLR) 2020.*
- Changwei Hu, Yifan Hu, **Sungyong Seo**, A Deep Structural Model for Analyzing Correlated Multivariate Time Series, *IEEE International Conference on Machine Learning and Applications (ICMLA) 2019.*
- Ashok Deb, Anuja Majmundar, **Sungyong Seo**, Akira Matsui, Rajat Tandon, Shen Yan, Jon-Patrick Allem, Emilio Ferrara, Social Bots for Online Public Health Interventions, *IEEE/ACM International Conference on Advances in Social Networks Analysis and Mining (ASONAM) 2018.*
- **Sungong Seo**, Arash Mohegh, George Ban-Weiss, Yan Liu, Automatically Inferring Data Quality for Spatiotemporal Forecasting, *International Conference on Learning Representations (ICLR) 2018* and *NeurIPS Workshop on Deep Learning for Physical Sciences 2017.*

- **Sungong Seo**, Hau Chan, P. Jeffrey Brantingham, Jorja Leap, Phebe Vayanos, Milind Tambe, Yan Liu, Partially Generative Neural Networks for Gang Crime Classification with Partial Information, *AAAI/ACM Conference on AI, Ethics, and Society (AIES) 2018.* (Oral presentation)
- **Sungyong Seo***, Natali Ruchansky*, Yan Liu, CSI: A Hybrid Deep Model for Fake News Detection, *International Conference on Information and Knowledge Management (CIKM) 2017.*
- **Sungyong Seo**, Jing Huang, Hao Yang, Yan Liu, Interpretable Convolutional Neural Networks with Dual Local and Global Attention for Review Rating Prediction, *ACM Conference on Recommender Systems (RecSys) 2017.*

Workshops & Preprints

- Karishma Sharma, Chuizheng Meng, **Sungyong Seo**, Sirisha Rambhatla, Yan Liu, Covid-19 on Social Media: Analyzing Misinformation in Twitter Conversations, *arXiv preprint 2020.*
- **Sungyong Seo**, Yan Liu, Differentiable Physics-informed Graph Networks, *ICLR Workshop on Representation Learning on Graphs and Manifolds 2019*, *AAAI Spring Symposium on Combining Artificial Intelligence and Machine Learning with Physics Sciences (AAAI-MLPS) 2021.*
- **Sungyong Seo**, Jiachen Zhang, George Ban-Weiss, Yan Liu, Data-driven Temporal Attribution Discovery of Temperature Dynamics based on Attention Networks, *Climate Informatics (CI) 2019.*
- **Sungyong Seo**, Arash Mohegh, George Ban-Weiss, Yan Liu, Graph Convolutional Autoencoder with Recurrent Neural Networks for Spatiotemporal Forecasting, *Climate Informatics (CI) 2017.*
- **Sungyong Seo**, Jing Huang, Hao Yang, Yan Liu, Representation Learning of Users and Items for Review Rating Prediction Using Attention-based Convolutional Neural Network, *SDM Workshop on Machine Learning for Recommender Systems 2017.*

Education

University of Southern California **Aug. 2015 – June 2021**
PhD, Computer Science
Advisor: Prof. Yan Liu
Thesis: Physics-aware Graph Networks for Spatiotemporal Physical Systems

University of Michigan **Aug. 2012 – Dec. 2013**
Master of Science, Electrical Engineering
Advisor: Prof. Jay Guo

Seoul National University **Mar. 2005 – Feb. 2012**
Bachelor of Science, Electrical and Computer Engineering, Minor in Physics
Graduated with honors

Computer Skills

Programming Languages: Python, C++, Matlab, Javascript
Deep learning tools: Tensorflow (TFX), PyTorch, PyTorch Geometric, Deep Graph Library (DGL)

Honors and Awards

ICLR Travel Award	2018, 2020
NIPS DLPS Workshop Travel Support	Dec. 2017
SIGIR Travel Award, US NSF and SIGWEB Travel Award (CIKM)	Nov. 2017
Travel Fellowship Award to Climate Informatics Workshop	Sep. 2017
USC Annenberg Graduate Fellowship	Aug. 2015 - Dec. 2019
Departmental Fellowship from Electrical Engineering	Jan. 2014 - Apr. 2014
Temasek Foundatdion - NTU LEaRN Scholarship	Jan. 2008 - May 2008
National Science and Technology Scholarship	Mar. 2005 - Dec. 2010