

Sunwoo Kim

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PhD student in Intelligent Systems Engineering of Indiana University Bloomington. Passionate about machine learning and deep learning solutions for signal processing challenges. My focus lies in studying and modifying machine learning algorithms to solve problems in a more efficient manner.

Research

- **Signals and AI Group in Engineering (SAIGE)** **Bloomington, IN**
Prof. Minje Kim *August 2017–Current*
Researching machine learning algorithms for source separation and network compression for efficient inference systems. Delved into recurrent neural networks (RNN) with gated recurrent units for speech denoising and audio enhancement, and quantized into bitwise system for efficiency. Currently exploring an efficient unsupervised solution for the source separation task using probabilistic latent semantic indexing with locality sensitive hashing methods.
- **National Center for Supercomputing Applications** **Urbana, IL**
Prof. Shaowen Wang *May 2015–May 2016*
Collaborated with researchers to create various CyberGIS applications. Performed parallel terrain analysis and predictive ecosystem mapping. Created an interactive web application to display Twitter activity.

Projects

- **Locality Sensitive Hashing for Bitwise Source Separation**
'In Submission'
 - Designed an iteration-free bitwise source separation algorithm based on Winner-Take-All hash codes
- **Efficient Probabilistic Latent Semantic Indexing with Winner-Take-All Hashing**
'In Progress'
 - Applying Winner-Take-All (WTA) Hashing on probabilistic latent semantic indexing to compress the overall complexity while preserving the quality of the audio denoising model
 - Implementing Expectation Maximization procedure in WTA hashed space and theoretically proving the accuracy bounds of the algorithm
- **Incremental Binarization On Recurrent Neural Networks For Single-Channel Source Separation**
'ICASSP 2019'
 - Modeled Bitwise Gated Recurrent Unit (BGRU) network with quantized feedforward procedure using binarized values and bitwise operations
 - Transferred pretrained weights from a real-valued network for initializing BGRU
 - Incrementally binarized pretrained weights to preserve the quality of the source separation system
 - Showed through experiments that the proposed model can outperform a real-valued fully connected network with fewer number of weights

Education

- **Indiana University Bloomington** **Bloomington, IN**
PhD Intelligent Systems Engineering, Minor: Computer Science 2021
GPA: 3.9
- **University of Illinois at Urbana-Champaign** **Urbana, IL**
BS Physics, Minor: Computer Science 2016
GPA: 3.3

Teaching

- **Machine Learning for Signal Processing** **Bloomington, IN**
Associate Instructor Fall 2017, Fall 2018
- **Deep Learning Systems** **Bloomington, IN**
Associate Instructor Spring 2018
- **Software Engineering** **Bloomington, IN**
Associate Instructor Fall 2016, Spring 2017

Technical and Personal skills

- **Programming:** Python, TeX, C++, Java, R, MATLAB
- **Libraries:** Tensorflow, PyTorch, Keras
- **Languages:** Fluent in Korean and English. Able to understand basic Chinese (Mandarin).