

# Sunwoo Kim

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Third year PhD student in Intelligent Systems Engineering of Indiana University Bloomington. Passionate about machine learning algorithms in various applications, with strong coding and interpersonal skills for working in a team and successfully finishing a project.

## Research

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- **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. Dived into recurrent neural networks (RNN) with gated recurrent units for speech denoising and audio enhancement, and quantized into bitwise system for efficiency. Currently exploring attention models on RNNs and winner-take-all hashing implementation of non-negative matrix factorization for source separation.
- **National Center for Supercomputing Applications** **Urbana, IL**  
*Prof. Shaowen Wang* *May 2015–May 2016*  
Worked 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

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- **Incremental Binarization On Recurrent Neural Networks For Single-Channel Source Separation:** 'ICASSP 2019 Submission (Under Review)'  
The Bitwise Gated Recurrent Unit (BGRU) network aims to perform the source separation task with minimal computational cost. RNNs are hard to train and heavy in space and time complexity. The BGRU model quantizes the feedforward procedure with binarized values and bitwise operations. The network is initialized with pretrained real-valued weights and incrementally binarized to preserve the quality of the source separation system. Experiments show that the BGRU model can outperform a real-valued fully connected network with fewer number of weights.

## Education

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- **Indiana University Bloomington** **Bloomington, IN**  
*PhD Intelligent Systems Engineering, Minor: Computer Science* *2016–2021*
- **University of Illinois at Urbana-Champaign** **Urbana, IL**  
*BS Physics, Minor: Computer Science* *2012–2016*

## Technical and Personal skills

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