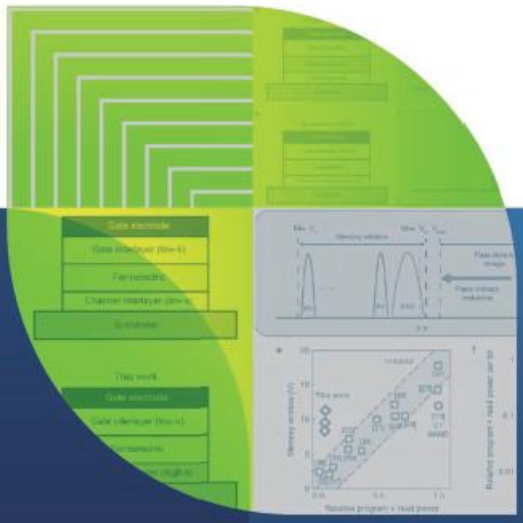
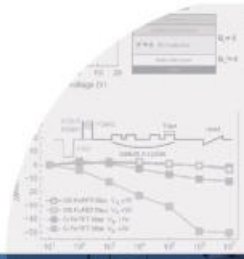
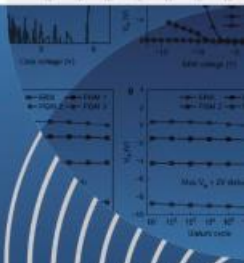
2026 KPS Spring Meeting

# 2026년 봄 학술논문발표회 및 제102회 정기총회


- 2026.4 제44권 제1호
- Bulletin of the Korean Physical Society
- 한국물리학회 회보





**일시** : 2026년 4월 21일(화) ~ 24일(금)

**장소** : 대전컨벤션센터 제1전시장

KPS 한국물리학회 The Korean Physical Society

대전관광공사

대전광역시

한국관광공사 KOREA TOURISM ORGANIZATION

**[I10-st] Complex Systems I**

2026. 04. 23 Thursday 17:00~18:24

Room: 202

좌장: **박혜진** 인하대학교

Chair: PARK Hye Jin (Inha University)

**I10.01** [17:00 - 17:12]

**Discontinuous Transitions in Double-Threshold Watts Model on Hypergraphs with Cardinality Heterogeneity** / KIM Juwon[1], LEE Deok-Sun[*2,3], GOH KWANG-IL[*1] ([1]Department of Physics, Korea University, [2]School of Computational Sciences, KIAS, [3]Center for AI and Natural Sciences, KIAS)

**I10.02** [17:12 - 17:24]

**Role of large groups and hubs in ferromagnetic ordering on heterogeneous hypergraphs** / SON Gangmin[1], BATTISTON Federico[2], LEE Deok-Sun[1,3], GOH KWANG-IL[*4] ([1]School of Computational Sciences, KIAS, [2] Department of Network and Data Science, Central European University, [3]Center for AI and Natural Sciences, KIAS, [4]Korea University)

**I10.03** [17:24 - 17:36]

**Feedback percolation on complex networks** / JANG Hoseung[1], MIN Byungjoon[*2,1] ([1]Advanced-Basic-Convergence Research Institute, Chungbuk National University, [2]Department of Physics, Chungbuk National University)

**I10.04** [17:36 - 17:48]

**Robust Classification under Structural Sparsity in a Hippocampus-Inspired Artificial Neural Network** / KIM Sang-Yoon[1], LIM Woochang[*1] ([1]Department of Science Education, Daegu National University of Education)

**I10.05*** [17:48 - 18:00]

**Gate Control Improves Routing Efficiency for Periodic Traffic** / SONG Hyunwook[1], CHOI Hoyun[2], KAHNG Byungnam[*1] ([1]Department of Energy Engineering, KENTECH, [2]School of Computational Sciences, KIAS)

**I10.06** [18:00 - 18:12]

**A Null-Based Gravity Model for Trade Networks** / LEE Daekyung[*1] ([1]Supply Network Modelling, Supply Chain Intelligence Institute Austria)

**I10.07*** [18:12 - 18:24]

**Anti-correlated Noise Provably Ensures Stable Convergence to Flat Minima** / BAEK Yongjoo[*1],

# Robust Classification under Structural Sparsity in a Hippocampus-Inspired Artificial Neural Network

KIM Sang-Yoon [1], LIM Woochang [*1]

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**Abstract:**

We investigate robustness to structural sparsity in a hippocampus-inspired artificial neural network (OurANN) for image classification. OurANN is composed of functional modules - dentate gyrus (DG), CA3, and CA1 - rather than conventional hidden layers. DG enforces sparse competitive representations, CA3 provides recurrent stabilization, CA1 integrates stabilized activity for readout, and shortcut connections (EC→CA3 and EC→CA1) preserve signal flow under sparse connectivity. As a baseline, we use a conventional multilayer perceptron (CANN) with three feedforward hidden layers whose numbers of units match those of DG, CA3, and CA1. Using the MNIST dataset as a controlled benchmark, we sweep the inter-layer connection probability $p_c$ from 1.0 down to 0.01 and evaluate robustness using global degradation rates and robustness indices, together with local performance metrics. In the dense and moderate regimes ($p_c$ = 1.0 ~ 0.1), OurANN and CANN exhibit nearly identical performance, indicating no intrinsic advantage under weak sparsity. Differences begin to emerge in the sparse regime ($p_c$ = 0.1 ~ 0.05), where OurANN shows slower performance degradation. In the extremely sparse regime ($p_c$ = 0.05 ~ 0.01), OurANN exhibits clear and persistent robustness, while CANN performance rapidly collapses. Although CANN robustness can be partially recovered through brute-force scaling of layer size, achieving robustness comparable to OurANN requires substantially increased parameter redundancy. These results distinguish structured robustness in OurANN, arising from hippocampus-inspired architectural organization, from brute-force scaled robustness in CANN, achieved through parameter expansion.

**Keywords:**

Hippocampus-Inspired ANN, Classifier, Structural Robustness, MNIST