



**Mookyung Cheon, PhD**

Principal Investigator

DEMENTIA GROUP  
Korea Brain Research Institute (KBRI)

Office : 4-1  
Tel : +82-53-980-8434  
Fax : +82-53-980-8399  
E-mail : mkcheon@kbri.re.kr  
[http://www.kbri.re.kr/new/pages\\_lab/sub/page.html?mc=3142](http://www.kbri.re.kr/new/pages_lab/sub/page.html?mc=3142)

## Bioinformatics and computational simulation for neuroscience

In the big data era, bioinformatics and microscopic image data for neuroscience have been accumulated rapidly. Integrated approach is essential in complex and collective big data analysis and is expected to lead to a new breakthrough. As a convergence study of microscopic images and the deep learning methods, we have developed the new retrieval algorithms for neuron morphologies by the deep learning techniques (AutoEncoder or CAE) and applied to the flycircuit connectome data. Our approach will be extended to apply for the whole deposited neurons of various species in the neuromorpho.org website. As a convergence study of bioinformatics and the deep learning methods, we have exploited the available RNA-seq data for AD model mice. From the raw data of the public DB websites and the collaborators, we have built the gene expression platform with more than 1,000 samples of bulk RNA-seq for mouse brains. The generative adversarial network(GAN) deep learning is applied to visualize sample clustering and simulate gene expression between two different phenotypes.

Aim	Convergence study of AI deep learning and bioinformatics		
Tool	Deep learning + Genomics + Molecular dynamics		
TARGET	<p><b>Morphological neuron retrieval</b></p>	<p><b>RNA-seq &amp; GAN deep learning for AD</b></p>	<p><b>Molecular dynamics for Aβ aggregation</b></p>

## Curriculum Vitae

2016~Present : Principal Investigator, KBRI  
 2009~2016 : Research Professor, Creative Research Initiative Center for Proteome Biophysics, DGIST (2013~2016), Pusan Nat'l University (2009~2012), KOREA  
 2007~2009 : Postdoctoral Fellow, Chemical and Biomolecular Engineering, North Carolina State University, USA  
 2005~2007 : Postdoctoral Fellow, Chemistry, University of Cambridge, UK  
 2003~2005 : Postdoctoral Fellow, National Research Laboratory for Computational Proteomics and Biophysics, Pusan Nat'l University, Korea

## Academic Credential

2001 : Ph.D., Physics, Pusan Nat'l Univ.  
 1996 : M.S., Physics, Pusan Nat'l Univ.  
 1994 : B.S., Physics, Pusan Nat'l Univ.

## Memberships

2016~Present : Member, Korean Society for Brain and Neuroscience  
 2012~Present : Member, Biophysical Society

## Research keywords

Morphological Neuron retrieval, RNA-seq for AD model mouse, Oligomerization of A $\beta$  peptide.

## Key techniques

AutoEncoder deep learning, Generative adversarial deep learning, RNA-seq, Molecular dynamics.

## Research Interests/Topics

- Morphological neuron retrieval by feature extraction and deep learning.
- RNA-seq for AD model mice and simulation of gene expression by GAN deep learning.
- Molecular dynamics for oligomerization of A $\beta$  peptide.

## Research Publications (selected)

- **Cheon M**, Kang M, Chang I. Polymorphism of fibrillar structures depending on the size of assembled A $\beta$  17–42 peptides. *Scientific Reports*, 6:38196, 2016.
- **Cheon M**, Kim C, Chang I. Uncovering Multi Loci-Ordering by Algebraic Property of Laplacian Matrix and its Fiedler Vector. *Bioinformatics*, 32: 801-807, 2016.
- **Cheon M**, Hall KH, Chang I. Structural Conversion of A $\beta$ 17–42 Peptides from Disordered Oligomers to U-Shape Protofilaments via Multiple Kinetic Pathways. *PLoS Comp Biol.*, 11:e1004258, 2015.
- **Cheon M**, Chang I, Hall CK. Spontaneous Formation of Twisted A $\beta$ 16–22 Fibrils in Large-Scale Molecular-Dynamics Simulations. *Biophysical Journal*, 101:2493-2501, 2011.
- **Cheon M**, Chang I, Mohanty S, Luheshi LM, Dobson CM, Vendruscolo M, Favrin G. Structural reorganisation and potential toxicity of oligomeric species formed during the assembly of amyloid fibrils. *PLoS Comp Biol.*, 3:1727, 2007. (Commented by ALZFORUM)