WEEKLY READING SCHEDULE (Tentative):

For only one reference for individual weeks, it's a must-read. For multiple reference within each week, you should at least read the one highlighted in red, typically the very first one, though you're encouraged to read all of them. If you have problem to access the papers, please let me know.

1. **Course introduction**. Course logistics, overview, history of neural networks, and what is deep learning. Reading: Chapter 4 from Machine Learning: ANN

2. **Introduction to Neural Networks (Shallow models**). Feedforward neural networks, Backpropagation
Reading: Chapter 6 of the Deep Learning Book : Deep Feedforward Networks

3. **What are Convolutional Neural Networks (CNN, deep models**)? Convolution, Non-Linearity (ReLU), Pooling and Classification.
Reading: Chapter 9 of the Deep Learning Book : Convolutional Networks

4. **Deep Learning with MATLAB/Python/ Jupyter Notebook**. Deep learning software and CNN architectures.

Theory

1) LeCun et al. Deep learning, *Nature*, 2015, https://www.nature.com/articles/nature14539
2) Abadi et al. TensorFlow: A system for large-scale machine learning, 2016 https://arxiv.org/abs/1605.08695
3) Schmidhuber, Deep learning in neural networks: An overview, *Neural Networks* 61 (2015) 85–117, https://www.sciencedirect.com/science/article/pii/S0893608014002135

Application in Biomedicine

1) Esteva et al., A guide to deep learning in healthcare, *Nature Medicine*, 2019. https://doi.org/10.1038/s41591-018-0316-z
2) Wainberg et al., Deep learning in biomedicine, *Nature Biotechnology*, 9:829-838, 2018. doi:10.1038/nbt.4233
3) Ching et al. Opportunities and obstacles for deep learning in biology and medicine, *J. R. Soc. Interface* 15: 20170387. 2018. http://dx.doi.org/10.1098/rsif.2017.0387

5. **Deep neural networks in computational neuroscience**

1) Kietzmann et al. Deep Neural Networks in Computational Neuroscience, 2017 https://www.biorxiv.org/content/early/2017/05/04/133504
2) Yamins & DiCarlo, Using goal-driven deep learning models to understand sensory cortex, *Nature Neuroscience*, 2016. https://www.nature.com/articles/nn.4244
3) Kriegeskorte, Deep neural networks: a new framework for modeling biological vision and brain information processing, *Annual Review of Vision Science* 1, 417-446, https://www.annualreviews.org/doi/abs/10.1146/annurev-vision-082114-035447

6. **Deep learning for computational biology**

Review

1) Angermueller et al. Deep learning for computational biology, *Molecular Systems Biology* (2016) 12, 878, http://msb.embopress.org/content/12/7/878

Protein structure

2) Wang et al. Protein secondary structure prediction using deep convolutional neural fields, https://arxiv.org/pdf/1512.00843.pdf

Gene expression data

3) Gupta et al. Learning structure in gene expression data using deep architectures, with an application to gene clustering. https://www.biorxiv.org/content/biorxiv/early/2015/11/16/031906.full.pdf

Pharmacogenomics

1) Ramsundar et al, Massively Multitask Networks for Drug Discovery, https://arxiv.org/pdf/1502.02072v1.pdf
2) Wallach et al. AtomNet: A Deep Convolutional Neural Network for Bioactivity Prediction in Structure-based Drug Discovery. https://arxiv.org/pdf/1510.02855.pdf
3) Kearnes et al. Molecular Graph Convolutions: Moving Beyond Fingerprints. https://arxiv.org/pdf/1603.00856.pdf
4) Gomez-Bombarelli et al. Automatic chemical design using a data-driven continuous representation of molecules. https://arxiv.org/pdf/1610.02415v1.pdf

7. **Deep learning for medical imaging and electronic medical records /clinical data**

Medical imaging

1) Kermany et al. Identifying Medical Diagnoses and Treatable Diseases by Image-Based Deep Learning, *Cell*, 2018. http://www.cell.com/cell/fulltext/S0092-8674(18)30154-5
2) Esteva et al. 2017, Skin cancer classification with deep learning, https://www.nature.com/articles/nature21056
3) Ardila et al. End-to-end lung cancer screening with three-dimensional deep learning on low-dose chest computed tomography. https://www.nature.com/articles/s41591-019-0447-x
4) Kamnitsas eg al. Efficient Multi-Scale 3D CNN with Fully Connected CRF for Accurate Brain Lesion Segmentation, 2017. https://arxiv.org/abs/1603.05959

Electronic medical records /clinical data

1) Liang et al. Evaluation and accurate diagnoses of pediatric diseases using artificial intelligence. Nature Medicine, 2019. https://doi.org/10.1038/s41591-018-0335-9
2) Rotmensch et al. Learning a Health Knowledge Graph from Electronic Medical Records, Scientific Reports, 2017. https://www.nature.com/articles/s41598-017-05778-z.pdf
3) Miotto et al. Deep Patient: An Unsupervised Representation to Predict the Future of Patients from the Electronic Health Records, Scientific Reports, 2016. http://www.nature.com/articles/srep26094
4) Rajkomar et al. Scalable and accurate deep learning with electronic health records. 2018. https://arxiv.org/abs/1801.07860

8. **Deep learning in EEG/MEG/fMRI analysis**: brain mapping and decoding
   1) Takagi and Nishimoto. High-resolution image reconstruction with latent diffusion models from human brain activity. CVPR 2023. https://sites.google.com/view/stablediffusion-with-brain/
   2) Khaligh-Razavi et al. Deep Supervised, but Not Unsupervised, Models May Explain IT Cortical Representation, 2014 http://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1003915
   3) Schirrmeister et al. Deep learning with convolutional neural networks for EEG decoding and visualization, 2017, https://arxiv.org/abs/1703.05051
   4) Cichy et al. Dynamics of scene representations in the human brain revealed by magnetoencephalography and deep neural networks (MEG), *NeuroImage*, 2017. https://www.sciencedirect.com/science/article/pii/S1053811916300076

9. **Large language models (GPT-3/4, ChatGPT) in digital health and predictive medicine**
   1) Zhao et al. A Survey of Large Language Models, 2023, https://arxiv.org/abs/2303.18223
   2) Cao et al. A Comprehensive Survey of AI-Generated Content (AIGC): A History of Generative AI from GAN to ChatGPT. 2023. https://arxiv.org/abs/2303.04226
   3) Kung et al. Performance of ChatGPT on USMLE: Potential for AI-assisted medical education using large language models. PLOS Digit Health 2(2): e0000198, 2023. https://doi.org/10.1371/journal.pdig.0000198
   4) Agbavor and Liang. Predicting dementia from spontaneous speech using large language models. PLOS Digit Health 1(12): e0000168, 2022. https://doi.org/10.1371/journal.pdig.0000168

10. **Student spotlight talks, conclusions**.