

E9: 309 Advanced Deep Learning

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Schedule - **MW - 330-5pm (Microsoft Teams)**
<http://leap.ee.iisc.ac.in/sriram/teaching/ADL2020/>

What's the course about.

* Machine learning

→ Branch of artificial intelligence that deals with algorithms to learn from the data.

✓ Solutions to several problems

- Classification

- Prediction/Regression

- Generation

→ Supervised versus Unsupervised versus Reinforcement



What's the course about.

* Deep Learning

- ✓ Branch of machine learning that deals with the use of deep neural architectures for solving machine learning problems.
 - ★ Deep - anything that is beyond 1 layer of processing (shallow)
 - Involves hierarchical data processing.
- ✓ Inroads in several applications and applicability to wide variety of data
- ✓ Is widely used in academia and industry.



What's the course about.

- * This course

- ✓ Advanced deep learning.

- ★ Sequence modeling

- ★ Representation learning

- ★ Unsupervised learning

- ★ New architectures

- ✓ Applications to various data domains



More details.

- * **Visual and Time Series Modeling:** Semantic Models, Recurrent neural models and LSTM models, Encoder-decoder models, Attention models.
- * **Unsupervised Learning:** Restricted Boltzmann Machines, Variational Autoencoders, Generative Adversarial Networks.
- * **Representation Learning, Causality And Explainability:** t-SNE visualization, Hierarchical Representation, semantic embeddings, gradient and perturbation analysis, Topics in Explainable learning, Structural causal models.
- * **New Architectures:** Capsule networks, End-to-end models, Transformer Networks.
- * **Applications:** Applications in in NLP, Speech, Image/Video domains in all modules.



Who can take the course

* Requisites (graduate level)

→ Linear Algebra/Matrix Theory

→ Random Process/Stochastic Models & Applications/Probability

→ Basic Machine Learning/Pattern Recognition

* Preferred

→ Background in Python programming

→ Familiarity with Torch/Tensorflow.



References

- * Class slides

- Class notes

- * References

- “Deep Learning”, I. Goodfellow, Y. Bengio, A. Courville, MIT Press, 2016.

- Papers online

- * Lecture material (in PDF chapter format)

- Disclaimer — May not be comprehensive



Schedule (Tentative)

- * **Visual and Time Series Modeling:** [3 weeks]
 - ✓ First mid-term project
- * **Unsupervised Learning:** [5 weeks]
 - ✓ Mid-term Exam
- * **Representation Learning, Causality And Explainability:** [6 weeks]
 - ✓ Second mid-term project
- * **New Architectures:** [4 weeks]
 - ✓ Third mid-term project and final exam.



Grading

- * 3 monthly research projects from three different domains (Speech/Audio, Text, Images/Videos, Biomedical, Financial, Chemical/Physical Sciences/Mathematical Sciences)

 - ✓ 60%

- * Midterm exam

 - ✓ 10%

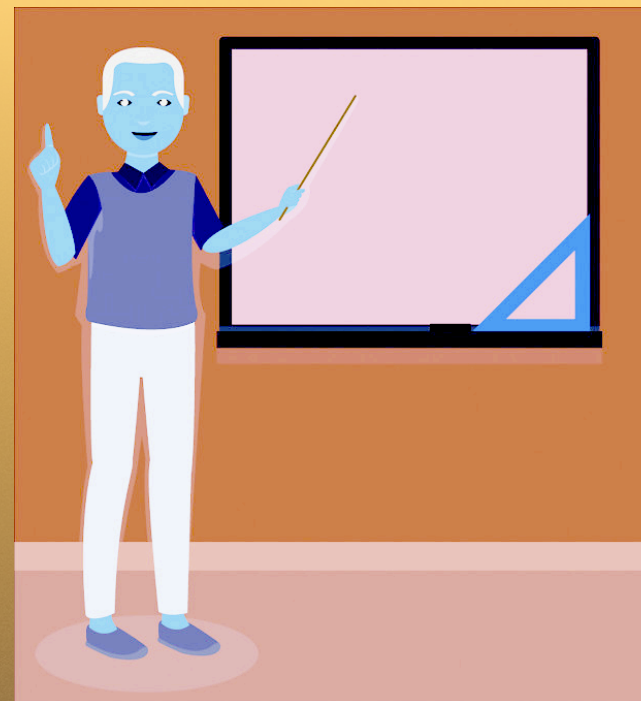
- * Final exam

 - ✓ 30%



Content delivery.

Theory
and Mathematical
Foundation



Intuition and
Analysis

Implementation
and Understanding



Scheduling concerns ?

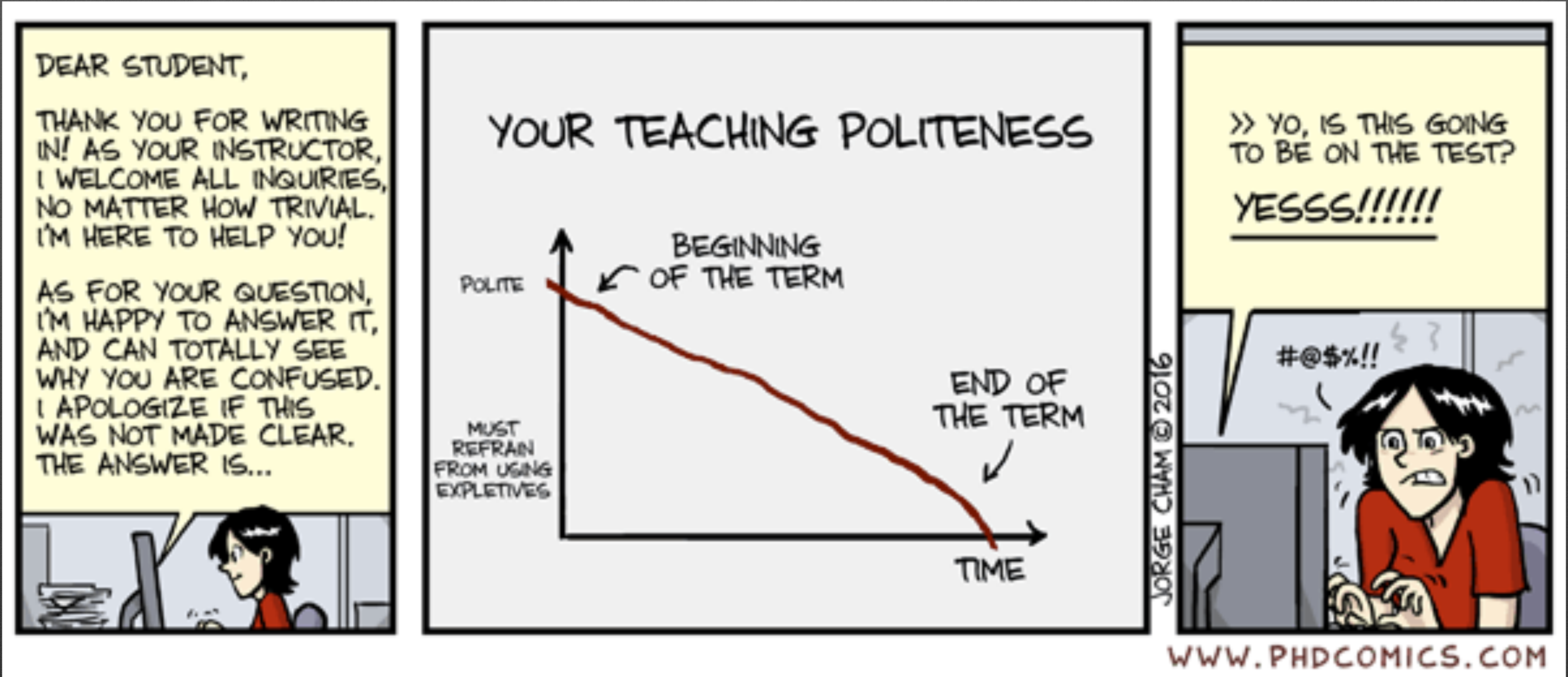
* M-W [3:30 - 5pm]

* M-W [3:00 - 430pm]

* M-W [4:00-530pm]



We are starting a new course - but we are going to have fun!



<http://phdcomics.com/>

