Department of Computer Science and Engineering
National Institute of Technology Calicut

NIT Campus (PO), Calicut-673601, India

DCC Meeting Minutes

Date: 10/02/2021 **Time: 12:20 PM** **Venue/Mode: Online**

Agenda Items:

1. **Elective courses proposed in the M.Tech curriculum of CSED by Dr. Pournami P.N and Dr. Jayaraj P.B**
2. **DCC approval for internships of the MCA final semester students for Project (CS3099D).**
3. **Change in the policy for CGPA to percentage conversion and conditions for First Class and Distinction, presented by student representative Mr. Sonaal Pathlai Pradeep.**
4. **Change in the duration of the MCA programme from 3 Years to 2 years, presented by the HOD, CSED.**

The DCC meeting started online at 12:20 PM. The Chairperson welcomed all the members to the meeting.

Agenda Item 1: Elective courses proposed in the M.Tech curriculum of CSED by Dr. Pournami P. N and Dr. Jayaraj P.B

Three elective courses were proposed to be included in the CSED M.Tech curriculum by Dr. Pournami P. N and Dr. Jayaraj P. B. Those are listed below:

1. Introduction to Deep Learning (CS6194D)
2. Topics in Deep Learning (CS6286D)
3. AI in Healthcare (CS6287D)

The review comments from the external experts and the compliance report on the suggestions were presented before the DCC meeting. The DCC resolved to approve the proposal for the first two courses (CS6194D and CS6286D). The DCC suggested that the third course may be modified by incorporating all the comments from the members and ratified in the next DCC meeting.

The details of the syllabus, the review comments and the compliance report are enclosed in Annexure A.1, Annexure A.2 and Annexure A.3.

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K. Murali Krishnan
HOD CSED

Agenda Item 2: DCC approval for internships of the MCA final semester students for their final semester Project (CS3099D).

Dr. Jay Prakash presented the agenda item and after discussion, DCC approved the requests from the following MCA final semester students for internship for their final semester Project CS3099D as per the details below.

SL. No	Student Name	Roll number	Company Name	NITC Mentor (internal guide)
1	Tushar Gupta	M180499CA	Radisys	Dr. Subashini R
2	Shivank Shukla	M180257CA	CISCO	Dr. Pranesh Das
3	Laxmi Vishvkarma	M180570CA	Quantiphi	Dr. Sreenu Naik Bhukya
4	Abhilasha Sharma	M180275CA	CISCO	Dr. Jay Prakash
5	Sumit Yadav	M180252CA	Aryaka Networks	Dr. Hiran V Nath
6	Siddhartha Agarwal	M180258CA	Aryaka Networks	Dr. Priya Chandran
7	Prachi Soni	M180256CA	Delhivery	Dr. Arun Raj Kumar
8	Subhash Kumar Gupta	M180263CA	Delhivery	Dr. Pranesh Das
9	Chetan Sharma	M180264CA	Cerner	Dr. Srinivasa TM
10	Raju kumar	M180270CA	Appventurez	Dr. Anil Pinapati
11	Kapil Gautam	M180283CA	Amdocs	Dr. Jay Prakash

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12	Pulkit vajpayee	M180267CA	CVDocket	Dr. Subashini R
13	Kapil Kumar Chhipa	M180265CA	KLA Tencor	Dr. Subashini R
14	Niesh Kumar Gupta	M180253CA	Amdocs	Dr. Raju Hazari
15	Aman Singh	M180271CA	Amdocs	Dr. Gopakumar G
16	Juhi kumari	M180277CA	CISCO	Dr. Sreenu Naik Bhukya
17	Mani Kumar Singh	M180268CA	Quantiphi	Dr. Sreenu Naik Bhukya
18	Shrishti Sharma	M180521CA	Amdocs	Dr. Gopakumar G
19	Soumya Parashar	M180260CA	Cisco	Dr. Raju Hazari
20	Ramswarup Kulhary	M180249CA	CISCO	Dr. Raju Hazari

Agenda Item 3: Change in the policy for CGPA to percentage conversion and conditions for First Class and Distinction

The student representative Mr. Sonaal Pathlai Pradeep presented the agenda item in the DCC along with all the necessary and supporting documents. DCC observed that most of the NITs and many IITs have a more lenient CGPA to Percentage conversion rule.

The DCC proposed to recommend the following:

1. The CGPA to percentage conversion formula may be changed from the existing formula ((CGPA-0.5) x 10)% to the formula (CGPA x 10)%, as followed in other major institutions.

2. A student securing an overall CGPA of 6.0 (6.0 <= CGPA < 7.5) may be considered for award of the degree with "first class" and a student with CGPA 7.5 (CGPA>=7.5) may be considered for award of the degree with "first class with distinction".

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The DCC directed the HOD to submit this recommendation to BoAC for consideration.

Agenda Item No. 4: Change in the duration of the MCA programme from 3 Years to 2 years.

The HOD presented the agenda item along with AICTE letter and references. The DCC unanimously resolved to recommend reduction in the duration of the the MCA programme from 3 Years to 2 Years.

The meeting came to a close at 1:00 PM

K. Murali Krishnan 25/2/2021

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Annexure A.1 : Detailed Syllabus of CS6194D and CS6286D

Introduction to Deep Learning (CS6194D)

Prerequisite: NIL

L	T	P	C
3	0	2	4

Total hours: (39 T + 26 P)

Course Outcomes:

CO1: Define basics of neural networks and learning rules of deep neural networks.

CO2: Demonstrate methods of building stable representations for high-dimensional data, such as images and text using case studies.

CO3: Analyze major deep learning algorithms and their applications to solve real world problems.

Module 1: (10 T + 7 P Hours)

Biologically inspired computing, historical context, Perceptron Learning rule, Backpropagation, Multi-layer Perceptron model, Activation Functions – Sigmoid, Tanh, ReLU, Leaky ReLu, Loss functions, Optimization: Stochastic gradient descent, Training Neural Networks, weight initialization, batch normalization, generalisation, overfitting, hyper parameter optimization, parameter updates, model ensembles, dropout, Variance, Bias.

Module 2: (10 T + 7 P Hours)

Convolutional Neural Networks: introduction, history, architectures, convolution layer, pooling layer, fully connected layer, Conv Net, Case study of ImageNet challenge -LeNet, AlexNet, VGG, GoogLeNet, ResNet, InceptionNet, EfficientNet etc., Model and training Visualizations, Error analysis, Regularization Techniques, Data Augmentation – zooming, rotation, cropping, blurring, noise addition, self-supervision techniques, Transfer Learning, freezing the input layers, fine tuning output layers, Representation Learning.

Module 3: (10 T + 6 P Hours)

Image Localisation, Image segmentation, masks, Image segmentation architectures – Unet, VNet, UNet++, Object Detection – Region Proposal Networks, Objection Detection architectures RCNN, Fast and Faster RCNNs, Mask R CNN, YOLO, BiFPN layers, Centre Net, EfficientDet, Case study – RoI cropping in CT images and Cervical Images.

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Module 4: (9 T + 6 P Hours)

Sequential models, Recurrent Neural Networks, Long Short Term Memory, Gated Recurrent Units, NLP based Applications, Identifying missing words in a paragraph, text summarization, Introduction to Statistical Speech Recognition, Language modelling, RNN based Language modelling, CNNs for Speech, Creating AI oriented voice applications like Alexa.

Deep Learning Hardware and Software, CPUs, GPUs, GPU architectures – Pascal, Volta, Turing & Ampere, Data Parallelism in GPU, Kernels – vector addition, vector multiplication, matrix addition, matrix multiplication, TPUs, Frameworks for Deep Learning - PyTorch, TensorFlow, TensorBoard, Nvidia DGX machines for DL applications.

References

1. Y. Bengio, I. Goodfellow and A. Courville, *Deep Learning,* MIT Press, 2016.
2. Raul Rojas, *Neural Networks: A Systematic Introduction*, Springer, 1996
3. Geoffrey E. Hinton, *Neural network architectures for artificial intelligence*, American Association for Artificial Intelligence Menlo Park, 1988, ISBN:0-929280-15-6.
4. Adrian Rosebrock, *Deep Learning for Computer Vision with Python*, E-Book, 1st Edition, September 2017.
5. Gilbert Strang, *Linear Algebra and Learning from Data,* Wellesley-Cambridge Press; 5th Edition, 2016

Topics in Deep Learning (CS6286D)

Prerequisite: CS6194D Introduction to Deep Learning

L	T	P	C
3	0	2	4

Total hours: (39 T + 26 P)

Course Outcomes:

CO1: Define learning rules of deep neural networks and learn recent advancements for improving deep neural networks

CO2: Demonstrate recent advances in Generative Adversarial Networks (GANs) and Variational Auto-encoders with case studies.

CO3: Analyse recent advances in reinforcement learning and sequence modelling with case studies

CO4: Formulate solutions to real world problems using deep learning techniques.

Module 1: **(10 T + 7 P Hours)**

Introduction to deep learning, Neural Network Basics, Deep Learning Intuition, Shallow Neural Network, Deep Neural Networks, Improving Deep Neural Networks: Hyper parameter tuning, Regularization and Optimization, Variance, Bias, CNN, Transfer Learning, Data Augmentation, Recurrent Neural Networks, LSTM, GRU

Module 2: **(10 T + 7 P Hours)**

Theory of Generative modelling, Auto Encoders, Variational AutoEncoder(VAE), Deionising AutoEncoders (DAE), Generative Adversarial Networks (GAN), Generators, Discriminators, Loss functions, stability of training GANs, WGAN, Conditional GAN, CycleGAN, Style GAN, Graphic Convolution Neural Networks(GCN).

Module 3: **(10 T + 6 P Hours)**

Reinforcement Learning, Problem Setup, Vanilla Policy gradients, REINFORCE, Introduction to Model based RL, Model Free RL, On-policy Algorithms, Off-Policy Algorithms, Q Learning, Extensions of Q Learning, Limitations of Q Learning, and Introduction to Deep Q Learning, Deep Q Learning Based on Images, Applications - training self-driving cars and robotic arms.

Module 4 : **(9 T + 6 P Hours)**

Transformer model: Introduction of Attention Mechanism, Queries, Keys, and Values of Attention Network, Self-Attention and Positional Encodings, Attention-Based Sequence Encoder, Coupling the Sequence Encoder and Decoder, Cross Attention in the Sequence-to-Sequence Model, Multi-Head Attention, The Complete Transformer Network, BERT based models, Nemo, Self-supervision techniques, masked language modelling, autoregressive modelling.

References

1. Y. Bengio, I. Goodfellow and A. Courville, *Deep Learning,* MIT Press, 2016.
2. Raul Rojas, *Neural Networks: A Systematic Introduction*, Springer, 1996
3. Geoffrey E. Hinton, *Neural network architectures for artificial intelligence*, American Association for Artificial Intelligence Menlo Park, 1988, ISBN:0-929280-15-6.
4. Adrian Rosebrock, *Deep Learning for Computer Vision with Python*, E-Book, 1st Edition, September 2017.
5. Gilbert Strang, *Linear Algebra and Learning from Data,* Wellesley-Cambridge Press, 5th Edition, 2016

Annexure A.2

Review Comments

I. CS6194D Introduction to Deep Learning

1. ***Dr. Ayush Jaiswal, Ph. D in Computer Science from University of Southern California, USA (Applied Scientist, Amazon Alexa AI Natural Understanding)***

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Overall, the content is strong and the course would be great value additions. Please consider my comments as suggestions for improvements.

The overall course objectives are good in introducing the field of deep learning to students. Regarding the course content overall, I would recommend to focus less on covering a large number of architectures and more on actually diving deep into some of the most recent or prominent ones while also including those architectures in practical sessions. Additionally, it is unclear from the syllabus but it should not be required for students to memorize network architectures.

They should instead be required to understand the working and purpose of parts of those networks such that they are able to analyze and provide critique on network architectures by the end of the course.

Similarly, the focus should not be on introducing a large number of deep learning frameworks (PyTorch, TensorFLow, etc.) and rather on practically using some of the most prominent ones, e.g., Keras+TensorFlow and PyTorch. The course could also be improved by adding topics like training convergence, error analysis, model visualization and training visualization tools like TensorBoard.

Another possible improvement is to have a project-like assignment for each module, where students could possibly compete on a challenge task, e.g., achieving the highest accuracy on a test set that is only available to the course instructors.

Finally, 50% of the current syllabus is dedicated to Computer Vision applications. Some of that content could be replaced by Speech applications or more general deep learning concepts like teacher-student learning.

2. *Dr. Aditya Bhaskara, Ph. D in Computer Science from Princeton University (Assistant Professor in School of Computing, University of Utah, USA)*

The course gives a comprehensive introduction to deep learning (DL). The background needed seems to be quite minimal, and students end up learning about both theoretical and practical aspects of modern DL. Interleaving the implementation aspects with the theory is also a good idea. I expect that students will find the course really useful!

Specific suggestions:

- highlighting the notions of generalization and overfit

- introducing "Representation Learning" in Module 2 along with self supervision and transfer.

- consider also including the book "Linear Algebra and Learning from Data" (Gilbert Strang, 2019) as a reference.

II. CS6286D Topics in Deep Learning

Review Comments

1. ***Dr. Ayush Jaiswal, Ph. D in Computer Science from University of Southern California, USA (Applied Scientist, Amazon Alexa AI Natural Understanding)***

Overall, the content is strong and the course would be great value additions. Please consider my comments as suggestions for improvements.

The first module covers deep learning basics, which is a good refresher, but it might be even better to cut it out and add "Introduction to Deep Learning" as a prerequisite. This would provide more room for covering advanced topics in deep learning. Additionally, in the current setup, the quick glance over deep learning basics in Module 1 might not be sufficient for a good understanding of content in the following modules, further reinforcing the idea that "Introduction to Deep Learning" should be a prerequisite for this course.

Module 2 should start with the theory of generative modeling, followed by variational autoencoders (VAEs) and then finally generative adversarial networks (GANs). This is because VAEs and GANs are two approaches for generative modeling and VAEs are historically older than GANs. Furthermore, instead of covering a large number of VAE and GAN architectures, more attention should be given to the fundamental theory behind them and covering a few recent/prominent architectures in a more analytical way.

Module 2 contains topics such as object detection and edge computing, which do not align with course objectives. The two halves of each of modules 3 and 4 are not cohesive. It might be better to split them into smaller modules.

The course could be improved further by including a course project where students could pick one of the topics covered in the course, read recent papers in that field, and implement the model from one of those papers. Finally, the document could be improved by fixing some typing errors.

2. ***Dr. Aditya Bhaskara, Ph. D in Computer Science from Princeton University (Assistant Professor in School of Computing, University of Utah, USA)***

This more advanced course chooses to focus on three topics: generative adversarial nets (GANs), Reinforcement learning, and deep learning for NLP and speech. The list of topics is quite ambitious, and I feel even if three of the four modules can be covered within the duration of the semester, it will be a very valuable experience for students.

Specific suggestions:

- decide on which framework will be used for demonstrating the concepts (TensorFlow/PyTorch)

- do consider replacing the current module 4 with the second part of module 3 (Transformer, NLP)

- add specific applications for the reinforcement learning segment.

Annexure A.3

Compliance Report

I. CS6194D Introduction to Deep Learning **1. Dr. Ayush Jaiswal** a) The overall course objectives are good in introducing the field of deep learning to students. Regarding the course content overall, I would recommend to focus less on covering a large number of architectures and more on actually diving deep into some of the most recent or prominent ones while also including those architectures in practical sessions. Additionally, it is unclear from the syllabus but it should not be required for students to memorize network architectures.	As this is a 4 credit course, there will be case studies questions for the students to acquire practical knowledge about various neural network architectures and their structural differences.

They should instead be required to understand the working and purpose of parts of those networks such that they are able to analyze and provide critique on network architectures by the end of the course	
b) Similarly, the focus should not be on introducing a large number of deep learning frameworks (PyTorch, TensorFLow, etc.) and rather on practically using some of the most prominent ones, e.g., Keras+TensorFlow and PyTorch. The course could also be improved by adding topics like training convergence, error analysis, model visualization and training visualization tools like TensorBoard	Module 4 is modified to incorporate this comment.
c) Another possible improvement is to have a project-like assignment for each module, where students could possibly compete on a challenge task, e.g., achieving the highest accuracy on a test set that is only available to the course instructors.	Since it is a 4 credit course, this course contains sufficient case studies, practical assignments and a course project component for grade determination.
d) Finally, 50% of the current syllabus is dedicated to Computer Vision applications. Some of that content could be replaced by Speech applications or more general deep learning concepts like teacher-student learning	Speech related topics are added in the 4th module.
2. ***Dr. Aditya Bhaskara***	
a) Highlighting the notions of generalization and overfitting in Module 1	Modified the syllabus to incorporate this suggestion in Module 1.
	Modified the syllabus to incorporate this

b) Introducing "Representation Learning" in Module 2 along with self supervision and transfer	suggestion in Module 2.
c) Consider also including the book "Linear Algebra and Learning from Data" (Gilbert Strang, 2019) as a reference.	This book is included in the course syllabus as one of the Reference books.
II. CS6286D Topics in Deep Learning	
1. **Dr. Ayush Jaiswal**	
1) The first module covers deep learning basics, which is a good refresher, but it might be even better to cut it out and add "Introduction to Deep Learning" as a prerequisite. This would provide more room for covering advanced topics in deep learning. Additionally, in the current setup, the quick glance over deep learning basics in Module 1 might not be sufficient for a good understanding of content in the following modules, further reinforcing the idea that "Introduction to Deep Learning" should be a prerequisite for this course.	Modified the syllabus to incorporate this suggestion in Module 1.
b) Module 2 should start with the theory of generative modeling, followed by variational autoencoders (VAEs) and then finally generative adversarial networks (GANs). This is because VAEs and GANs are two approaches for generative modeling and VAEs are historically older than GANs. Furthermore, instead of covering a large number of VAE and GAN architectures, more attention should be given to the fundamental theory behind them and covering a few	Modified the syllabus to incorporate this suggestion in Module 2.

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recent/prominent architectures in a more analytical way. c) Module 2 contains topics such as object detection and edge computing, which do not align with course objectives. The two halves of each of modules 3 and 4 are not cohesive. It might be better to split them into smaller modules. d)The course could be improved further by including a course project where students could pick one of the topics covered in the course, read recent papers in that field, and implement the model from one of those papers. Finally, the document could be improved by fixing some typing errors. ***2) Dr. Aditya Bhaskara,*** a) This more advanced course chooses to focus on three topics: generative adversarial nets (GANs), Reinforcement learning, and deep learning for NLP and speech. The list of topics is quite ambitious, and I feel even if three of the four modules can be covered within the duration of the semester, it will be a very valuable experience for students. b) decide on which framework will be used for demonstrating the concepts (TensorFlow/PyTorch) c)Do consider replacing the current module 4 with the second part of module 3 (Transformer, NLP)	Modified the syllabus to incorporate this suggestion. The 4 credit subject contains a project component in grade determination. Fixed the typos. The 3rd Module is split into 3rd and 4th modules and relevant topics in the 4th module are retained. As TensorFlow is the most popular framework, it is decided to follow it. Modified the syllabus to incorporate this suggestion.

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d) Add specific applications for the reinforcement learning segment.	Modified the syllabus to incorporate this suggestion and added a few relevant applications.