FACULTAD DE CIENCIAS E INGENIERÍA

TEMAS AVANZADOS EN COMPUTACIÓN

2020-1

I. INFORMACIÓN GENERAL

CURSO	TEMAS AVANZADOS EN COMPUTACIÓN
CLAVE	INF389
CRÉDITOS	3
HORAS DE DICTADO	CLASE: 3 Semanal EXAMEN:
HORARIO	TODOS
PROFESORES	IVAN ANSELMO SIPIRAN MENDOZA

II. PLANES CURRICULARES DONDE SE DICTA EL CURSO

ESPECIALIDAD	ETAPA	NIVEL	CARÁCTER	REQUISITOS
INGENIERÍA INFORMÁTICA	PREGRADO EN FACULTAD	0	ELECTIVO	INF245 INGENIERÍA DE SOFTWARE [04]

Tipos de requisito

04 = Haber cursado o cursar simultaneamente

05 = Haber aprobado o cursar simultaneamente

06 = Promedio de notas no menor de 08

07 = Haber aprobado el curso

III. DESCRIPCIÓN DEL CURSO

The course presents the concepts and techniques used to apply deep neural networks in applications such as computer vision and natural language processing. The organization of the course allows guiding students into the field of deep learning, starting from key concepts, such as learning algorithms and backpropagation, to advanced topics such as autoencoders and generative models. The course is practical; therefore, the emphasis is in the efficient implementation of algorithms taught in lectures, with the support of high-level frameworks such as TensorFlow and Pytorch. At the end of the course, students will be in the capacity of programming application in high-level computer vision and natural language processing.

Background of deep learning and neural networks. Learning algorithms: backpropagation and gradient descent. Training strategies: regularization, data augmentation, early stopping. Convolutional neural networks and applications. Recurrent neural networks and applications. Real-world case studies.

IV. SUMILLA

Sumilla variada. Este curso se ha previsto para ser implementado de acuerdo a nuevas tendencias en este campo y que puede variar en el tiempo.

V. OBJETIVOS

- Introduce the research, analysis and application of deep learning techniques.
- Develop abilities of implementation and application of tools for analytics and deep learning in real world problems.
- Gain experience in the development of applications, self-study and research in the field of deep learning.

These objectives contribute to the achievement of the following six program results:

- Apply the knowledge related to mathematics, science and engineering.
- Design systems, components or processes that satisfy the given requirements.
- Identify, formulate and solve engineering problems.
- Recognize the necessity and is committed to learning throughout life.
- Use techniques, strategies and modern engineering tools to solve engineering problems.
- Apply the knowledge of programming languages, modelling of information systems, construction of software with quality and management of technological resources.

VI. PROGRAMA ANALÍTICO

CAPÍTULO 1 INTRODUCTION (3 horas)

Introduction and objectives of the course. Vectors and Matrices. Introduction of deep learning. Main applications.

CAPÍTULO 2 BACKGROUND OF DEEP LEARNING (3 horas)

Linear regression, gradient descent and logistic regression. Neural network functionality. Backpropagation. Introduction to deep learning frameworks: Tensorflow, Pytorch.

CAPÍTULO 3 DEEP LEARNING AND REGULARIZATION (3 horas)

Regularization methods to avoid overfitting during training: data augmentation, weight decay, dropout.

CAPÍTULO 4 CONVOLUTIONAL NEURAL NETWORKS (15 horas)

Convolution and feature maps. CNN architectures. Applications: image classification, object detection, image segmentation.

CAPÍTULO 5 RECURRENT NEURAL NETWORKS (6 horas)

Recurrent networks and applications. Long short-term memory. Natural language processing.

CAPÍTULO 6 ADVANCED TECHNIQUES (12 horas)

Large-scale deep learning. Autoencoders and representation learning. Generative adversarial networks.

VII. METODOLOGÍA

The course is based on lectures with emphasis in the implementation of the topics covered in class through examples programmed with Python and frameworks Tensorflow and Pytorch.

VIII. EVALUACIÓN

Sistema de evaluación

N°	Codigo	Tipo de Evaluación	Cant. Eval.	Forma de aplicar los pesos	Pesos	Cant. Eval. Eliminables	Consideraciones adicionales	Observaciones
1	Ta	Tarea académica	1	Por Evaluación	Ta1=2			
2	Ex	Examen	2	Por Evaluación	Ex1=2 Ex2=3			

Fórmula para el cálculo de la nota final

(2Ta1 + 2Ex1 + 3Ex2) / 7

Aproximación de la nota final No definido

Consideraciones adicionales

This course applies the evaluation modality 2

TA = academic activities designed by the professor. The activities can be monographies, presentations on class, special works, reports, readings, seminars, participation in class, etc. The grade obtained by the student will be assigned as a unique grade TA.

IX. BIBLIOGRAFÍA

Referencia obligatoria

- Libro
  Goodfellow, I., Bengio, Y., Courville, A.
  2016
  Deep Learning
  MIT Press, 2016
  https://www.deeplearningbook.org

Referencia complementaria

- Libro
  Buduma, N., Locascio, N.
  2017
  Fundamentals of Deep Learning: Next-generation Machine Learning Intelligence Algorithms.
  O'Reilly Media, 2017
- Libro
  Nielsen, M.
  2015
  Neural Networks and Deep Learning
  Determination Press, 2015

X. POLÍTICA CONTRA EL PLAGIO

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