Chair: Tracy Christofero | **GC#6: Course Addition**

Request for Graduate Course Addition

1. Prepare one paper copy with all signatures and supporting material and forward to the Graduate Council Chair.
2. E-mail one identical PDF copy to the Graduate Council Chair. If attachments included, please merge into a single file.
3. ***The Graduate Council cannot process this application until it has received both the PDF copy and the signed hard copy.***

College: Medicine | Dept/Division: Department of Clinic | Alpha Designator/Number: CTS 612 | (●) Graded ( ) CR/NC

Contact Person: Alfred Cecchetti, PhD, MSc, MSc IS | Phone: 304-691-1585

NEW COURSE DATA:

New Course Title: Introduction To Clinical Machine Learning

Alpha Designator/Number: C T S 6 1 2

Title Abbreviation: I n t r o C l i n M a c h i n e L e a r n

(Limit of 25 characters and spaces)

Course Catalog Description: (Limit of 30 words)

This course is designed for those who are interested in using machine learning with a focus on translational research. This course explores different machine learning algorithms, its benefits and limitations.

Co-requisite(s): none | First Term to be Offered: Summer 2019

Prerequisite(s): none | Credit Hours: 3

Course(s) being deleted in place of this addition (*must submit course deletion form*): none

Signatures: if disapproved at any level, do not sign. Return to previous signer with recommendation attached.

Dept. Chair/Division Head _____	Date _____
Registrar _____	Date _____
College Curriculum Chair _____	Date _____
Graduate Council Chair _____	Date _____

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College: Medicine | Department/Division: Department of Clinical and T | Alpha Designator/Number: CTS 612

Provide complete information regarding the new course addition for each topic listed below. Before routing this form, a complete syllabus also must be attached addressing the items listed on the first page of this form.

1. FACULTY: Identify by name the faculty in your department/division who may teach this course.

Alfred A Cecchetti, PhD, MSc, MSc IS

2. DUPLICATION: If a question of possible duplication occurs, attach a copy of the correspondence sent to the appropriate department(s) describing the proposal. Enter "***Not Applicable***" if not applicable.

This course is unique since it focuses on machine learning for specific translational use cases that draw from the Marshall Clinical Data Warehouse. Current course offerings are not translational (animal and human) research oriented.

3. REQUIRED COURSE: If this course will be required by another deparment(s), identify it/them by name. Enter "***Not Applicable***" if not applicable.

Not Applicable

4. AGREEMENTS: If there are any agreements required to provide clinical experiences, attach the details and the signed agreement. Enter "***Not Applicable***" if not applicable.

Not Applicable

5. ADDITIONAL RESOURCE REQUIREMENTS: If your department requires additional faculty, equipment, or specialized materials to teach this course, attach an estimate of the time and money required to secure these items. (Note: Approval of this form does not imply approval for additional resources.) Enter "***Not Applicable***" if not applicable.

Not Applicable

6. COURSE OBJECTIVES: (May be submitted as a separate document)

Translational research is concerned with bringing bioscience research discoveries into patient care. Translational studies aim to accelerate research findings from bench (biological or mathematical using animal as well as human vectors) to bedside and into widespread clinical practice. Students in our courses will learn 1) the language of the medical researcher (e. g. , ICD9/10, LOINC, CPT, Animal NCIT , etc.), 2) how to organize/visualize data from the electronic medical record as well as other unstructured sources (animal or human) to define the clinical properties of many diseases, 3) the close association of informatics with global communication, security and privacy issues, and 4) how to analyze that data using models that classify, predict and perform “what if” analysis.

7. COURSE OUTLINE (May be submitted as a separate document)

Event Description
Lecture 1 Introduction and Basic Concepts
Lecture 2 Supervised Learning Setup. Linear Regression.
Lecture 3 Weighted Least Squares. Logistic Regression. Netwon's Method
Lecture 4 Perceptron. Exponential Family. Generalized Linear Models.
Lecture 5 Gaussian Discriminant Analysis. Naive Bayes.
Lecture 6 Laplace Smoothing. Support Vector Machines.
Lecture 7 Support Vector Machines. Kernels.
Lecture 8 Bias-Variance tradeoff. Regularization and model/feature selection.
Lecture 9 Tree Ensembles.
Lecture 10 Neural Networks: Basics
MIDTERM
Lecture 11 Neural Networks: Training
Lecture 12 Practical Advice for ML projects
Lecture 13 K-means. Mixture of Gaussians. Expectation Maximization.
Lecture 14 Factor Analysis.
Lecture 15 Principal Component Analysis. Independent Component Analysis.
Lecture 16 Graphics
Lecture 17 Advanced R
Lecture 18 ICD9/10, LOINC, CPT, Animal NCIT
Lecture 19 Advanced SQL
Lecture 20 Optional topic.
FINAL

8. SAMPLE TEXT(S) WITH AUTHOR(S) AND PUBLICATION DATES (May be submitted as a separate document)

Lantz, B. (2013). Machine learning with R. Packt Publishing Ltd.

9. EXAMPLE OF INSTRUCTIONAL METHODS (Lecture, lab, internship)

Lecture

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10. EXAMPLE EVALUATION METHODS (CHAPTER, MIDTERM, FINAL, PROJECTS, ETC.)

MIDTERM 50%
FINAL 50%

11. ADDITIONAL GRADUATE REQUIREMENTS IF LISTED AS AN UNDERGRADUATE/GRADUATE COURSE

None

12. PROVIDE COMPLETE BIBLIOGRAPHY (May be submitted as a separate document)

Mezghani, D. B. A., Boujelbene, S. Z., & Ellouze, N. (2010). Evaluation of SVM kernels and conventional machine learning algorithms for speaker identification. International journal of Hybrid information technology, 3(3), 23-34.

Xia, Y., & Wang, J. (2004). A one-layer recurrent neural network for support vector machine learning. IEEE Transactions on Systems, Man, and Cybernetics, Part B (Cybernetics), 34(2), 1261-1269.

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Please insert in the text box below your course summary information for the Graduate Council agenda. Please enter the information exactly in this way (including headings):

Department:
Course Number and Title:
Catalog Description:
Prerequisites:
First Term Offered:
Credit Hours:

Department: Department of Clinical and Translational Sciences (DCTS)
Course Number and Title: CTS 612 Introduction To Clinical Machine Learning
Catalog Description: This course is designed for those who are interested in using machine learning with a focus on translational research. This course explores different machine learning algorithms, its benefits and limitations.
Prerequisites: None
First Term Offered: Summer 2019
Credit Hours: 3

MARSHALL UNIVERSITY
Joan C. Edwards School of Medicine

CTS 612 Introduction to Clinical Machine Learning
Marshall University, School of Medicine
Summer 2019

General Information:

Professor: Alfred Cecchetti, PhD, MSc, MSc IS
Phone: 304-691-1585
Email: cecchetti@marshall.edu
Office: 281 TGRI, ECCC 2nd Floor
Lecture: TBA

Course Description: This course is designed for those who are interested in using machine learning with a focus on translational medical research, which is concerned with bringing bioscience research discoveries into patient care. This course explores the characteristic of its methods, its benefits and limitations. Explain and describe different learning algorithms. Machine learning journal club is optional.

Credit Hours: 3

Course Focus

Translational research is concerned with bringing bioscience research discoveries into patient care. Translational studies aim to accelerate research findings from bench (biological or mathematical using animal as well as human vectors) to bedside and into widespread clinical practice. This course will focus on using historical and current data within algorithms that are used to predict outcomes of diseases and conditions.

Text and Materials:

Lecture notes, PowerPoint

Software:

Microsoft SQL Server (free version – developer addition)
Microsoft SQL Server Management Studio (free version)
R (free version)
Docker Community Edition for Mac (free)

Program Outcomes:

Students in our courses will learn

1. The language of the medical researcher (e. g., ICD9/10, LOINC, CPT, Animal NCIT, etc.),
2. How to organize/visualize data from the electronic medical record as well as other unstructured sources (animal or human) to define the clinical properties of many diseases,
3. The close association of informatics with global communication, security and privacy issues, and
4. How to analyze that data using models that classify, predict and perform “what if” analysis.

Topical Outline:

1. Introduction

2. Basic R programming
3. Data Warehouse
4. Basic SQL
5. Basic Tableau
6. Discussion of machine Learning models
7. Project presentation

Policies:

Attendance Policy: Attendance is required, notification through email or in the classroom should be at least 24 hours in advance.

Grading policy: All missing assignments are graded with zero, late assignments will have a penalty. If submitted after due date will be considered missing if they are not submitted by the following session (one week).

91% - 100% A
81% - 90 % B
71% - 80 % C
61% - 70 % D
51 % - 60% F

Grade Weights:

Exam 1 100 points,
Exam 2 100 points,
Exam 3 100 points,
Exam 4 100 points,
Project 100 points

Exams and Assignments: There will be four exams. A project will be discussed and assigned to the students.

Exam Makeup Policy: Make-up exams will be given only in the case of a documented emergency or with approval from the instructor at least 24 hours prior to the exam. Make-up exams may be different from the original exam.

Classroom and Lab Behavior: The use of mobile devices (making calls, texting, emailing, etc.) is not permitted during class and lab times. You may leave your phone on vibrate or silence mode in order to receive emergency calls.

Academic Integrity: All students are expected to present and represent their own original work and properly credit sources used in preparation of their own original work. Discussion of programming assignments and helping each other with debugging is permissible but copying from others or the internet is not permissible.

Harassment Policy: The University strongly disapprove and expressly prohibit any form of harassment or discrimination based on race, color, national origin, ancestry, religion, sex, age, sexual orientation, disability, veteran status, marital status or any other characteristic protected by applicable federal, state or local laws.

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ADA Policy: If a student wishes to be identified as having a physical, mental, or learning disability, that may or may not require reasonable accommodation(s), he/she must register with the Office of Accessibility. These registered students should identify themselves to their instructors and provide a written statement from the Accessibility Office that indicates the appropriate accommodations. The process of a student self-proclaiming the need for accommodation should occur as early in the semester as possible.

FERPA: The University is committed to fully respecting and protecting the rights of students under the Family Educational Rights and Privacy Act (FERPA). These rights generally include the right to inspect, review and seek amendment to the student's education records and the right to provide written consent before personally identifiable information from education records is disclosed. Under FERPA, students have the right to file a complaint with the US Department of Education concerning alleged failures to comply with FERPA.