

Course Rubric CMSC 636

Course Title Artificial Neural Networks and Deep Learning Syllabus

Catalog listing:	CMSC 636
Course Level:	Graduate
Prerequisites:	Graduate student standing in computer science or acceptance into accelerated B.S. to M.S. program in computer science
Instructor:	Milos Manic, Ph.D.
Office:	ERB 2328
Phone:	804-827-3999
email:	mmanic@vcu.edu
Classroom:	Zoom
Class website:	Blackboard
Office Hours:	TBD

1.0 – Overview (Catalog Course Description):

Semester course; 3 lecture hours. 3 credits. Enrollment restricted to students with graduate standing in computer science. The course will assume undergraduate-level background in programming, algorithms, linear algebra, calculus, statistics and probability.

Topics ranging from fundamental learning rules, functional, cascade correlational, recurrent and gradient descent networks, to neocognitron, softmax, deep convolutional networks, autoencoders and pretrained deep learning (restricted Boltzmann machines). Students will be required to work in teams on a class paper. (from <http://bulletin.vcu.edu/azcourses/cmssc/>)

2.0 – Course Structure:

Lecture hours/week –	3
Lab hours/week –	0

3.0 – Course Goals

Upon successful completion of this course, the student will be able to:

- Identify problems in image/text recognition/controls applications in energy, security, medical, transportation, and robotics that can be solved using covered techniques
- Select appropriate neural and deep learning techniques

- Apply covered techniques to real world problems

4.0 – Major Topics Covered:

- Definitions and history of neural networks
- Neuro architectures as necessary building blocks for the DL techniques
- Traditional neural networks, learning rules
- Recurrent Networks and Back Propagation, associative memories
- Deep Learning & Neocognitron
- Deep Convolutional Neural Networks, feature extraction,
- Deep Belief Networks, Restricted Boltzman Machines, Autoencoders
- Training of Deep Neural Networks
- Applications and examples (Google, image/speech recognition, NLP)

5.0 – Textbook(s):

Goodfellow, Y. Bengio, A. Courville, Deep Learning, MIT, 2016,
<http://www.deeplearningbook.org/>

Li Deng, Dong Yu, Deep Learning, Methods and Applications, Foundations and Trends in Signal Processing, Vol. 7, Nos. 3-4 (2013) 197-387, 7:3-4, c 2014,
<http://research.microsoft.com/apps/pubs/default.aspx?id=209355>

On traditional neural networks (various books will do): Simon Haykin, "Neural Networks: A Comprehensive Foundation", any edition of the "Neural Networks and Learning Machines" (Nov, 2008), Publisher: Prentice Hall; Format: Hardcover, ISBN-10: 0131471392 ISBN-13: 9780131471399

Purchasing of a textbook is NOT required.

6.0 – Class Schedule:

- Lecture: T R, 03:30am-4:45am, Zoom

7.0 – Evaluation:

General Instructions:

- A (90 - 100) %
- B (80 - 89) %
- C (70 - 79) %
- D (60 - 69) %
- F (0 -59)

Grading:

Category	% weight
Homework assignments	40
Exams	35
Class paper	15
In class presentations and class activity	10

Technology Support

Engineering & VCU Resources:

- **Personal Computer Requirement:** For our current system requirements and recommendations, see: <https://egr.vcu.edu/admissions/accepted/computer-recommendations/>
- **Remote Access to Public Lab computers:** To provide remote access, we use the Citrix App2Go environment to provide full and exclusive control over "the next available" computer in the lab. See this link for more details: <https://wiki.vcu.edu/x/Oa0tBg>
- **VCU provides a lot of software available for students to download to their personal computers.** For a list of software and the specifics for each, see: <https://ts.vcu.edu/software-center/>. In particular, [Microsoft Office](#) is available free to students.
- **VCU is transitioning to Canvas.** See the Canvas Student Guide at this link: <https://community.canvaslms.com/t5/Student-Guide/tkb-p/student>
- **For IT help in the College of Engineering,** see our Wikipedia for "student" help at: <https://wiki.vcu.edu/display/EGRITHELP>
- **VCU's Technology Services (TS) provides support for "central IT" services.** If you have a technical issue with any of the following services, please submit a ticket with VCU Technology Services at <https://itsupport.vcu.edu/> or call (804) 828-2227. VCU TS maintains and supports these services and will be able to provide assistance to you.
 - VCU Cisco VPN
 - 2Factor or Dual Authentication (DUO)
 - Blackboard/Canvas
 - Gmail or other Google Apps
 - Zoom videoconferencing
 - VCU App2Go (Application server)
 - Resetting VCU password
- **For IT issues related to College of Engineering teaching and research, email egrfixit@vcu.edu**
- **For loaner Chromebooks for emergency purposes:** See this link for more details: <https://vcutsmpc.getconnect2.com/>

Additional syllabus details available on Blackboard.