The MOOC revolution: Status and next steps

Andrew Ng
Stanford University & Coursera
Courses from Top Universities

18 of the top 25 US Universities (ARWU rankings)

49 top universities from 20 countries

9 other partners (teacher professional development)
108 Partners
612 Courses
6.5 million Students
In-video quizzes
% initialize J_vals to a matrix of 0's
J_vals = zeros(length(theta0_vals), length(theta1_vals));

% Fill out J_vals
for i = 1:length(theta0_vals)
    for j = 1:length(theta1_vals)
        t = [theta0_vals(i); theta1_vals(j)];
        J_vals(i,j) = computeCost(x, y, t);
    end
end
Who discovered the theory of general relativity?

Albert Einstein

What is the derivative of \( \frac{\sin(x)}{x} \) w.r.t. \( x \)?

\[
\frac{x \cos(x) - \sin(x)}{x^2}
\]

Your submission is equivalent to:

\[
\frac{x \cos(x) - \sin(x)}{x^2}
\]

---

Image code:

```javascript
image = new SimpleImage("puzzle-copper.png");
for (pixel: image) {
    // your code here
    pixel.setRed(0);
    pixel.setGreen(pixel.getGreen() * 10);
    pixel.setBlue(pixel.getBlue() * 10);
}
print(image);
```

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<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Units sold</td>
<td>20,000</td>
<td>30,000</td>
</tr>
<tr>
<td>3</td>
<td>Revenue</td>
<td>400,000</td>
<td>600,000</td>
</tr>
<tr>
<td>4</td>
<td>COGS</td>
<td>100,000</td>
<td>150,000</td>
</tr>
<tr>
<td>5</td>
<td>Ad spend</td>
<td>30,000</td>
<td>40,000</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Distributor model</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Sales People</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9</td>
<td>Dist. per sales person</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>
Share and run code in the browser
Game integration (National Taiwan University)
Coursera App Platform

Third-party integration
Your Final Project for this course is to take the concepts we have explored each week and create a resource that you can incorporate into your teaching. The project outline below has been structured to allow you to tailor the content to the context in which you teach so that it can be most useful. The goal of this final project assignment is to give you an opportunity to practice and be creative with the concepts from the class in a forum where you can share ideas and get feedback from your peers. The peer assessment process will also give you the opportunity to see the ideas that others come up with. Be creative! This is your chance to apply the course concepts to real-world situations.

Your assignment is to select an artwork that you would like to use as the starting point for an inquiry based lesson in your classroom.

Format: Please provide the following information in the order that it is presented below:

1. Subject Area
2. Intended grade level range
3. Artwork Selection (please use the "Upload an Image" button or insert a link to the image)
4. Artwork Title
5. Artist
6. Date
7. Materials

Evaluation/feedback on the above work

Does the activity relate to the artwork?
Are the instructions/prompts clear?
Is the activity developmentally appropriate?
Creative, open-ended homework via peer grading

Ramaswamy Venkatachalam
Gujarat, India

Aranzazu Hurtado Ruiz
Madrid, Spain

Paul Mendoza
Manila, Philippines
Day of Compassion Award

In August and September of 2013, students from over 200 countries took the world’s first Social Psychology *MOOC* (massive open online course). The class was offered by Wesleyan University, hosted by Coursera.org, and drew more than 250,000 students, making it the largest synchronous university course ever given.

The final assignment of the course, “The Day of Compassion,” asked students to live 24 hours as compassionately as possible and to analyze the experience of social psychology. Roughly 700 students received a perfect score on the assignment, a class then voted on which of these students deserved a Day of Compassion Award given by the Stanford University Center for Compassion and Altruism Research and Education (CCARE).

In 2014, the grand prize winner will be flown on an expense-paid trip to Stanford University when he visits that area. In addition, CCARE will donate $1,000 to any prosocial nonprofit organization chosen by the grand prize winner to support projects chosen by each of the ten students who received Honorable Mention. Here are some pages related to the assignment:

Balesh Jindal, a physician and artist who lives in a rural area near New Delhi, India, won the grand prize for finding a way to address the problem of sexual violence toward girls in her community. During the Day of Compassion, Balesh visited a local school that has more than 2,000 female students ranging from 4 to 17 years old and belonging to a relatively low socioeconomic class. The school divided students by age into five groups of 350-400 girls, and Balesh taught each group about inappropriate touching and how to report incidents of abuse. These talks uncovered multiple cases of abuse by neighbors, brothers, cousins, and even fathers. After the Day of Compassion, Balesh invited the mothers of abused girls to her nearby clinic for free counseling, and she decided to set aside one day each week to help these girls and to work on reducing child sexual abuse.

From Knowledge to Action
Information storage

The problem summary:
How is the information stored in our brain? As in computers we use potentials, or magnetization for example to make an array of binary code (1 or 0), what is the analogous in the brain?

Steps to reply:
- We have ways to test real-time, parallel, active and stored memories. Memory is not just a passive storage, where information is permanent and unchanged.

Reply by student 1:

The problem summary:
How is the information stored in our brain? As in computers we use potentials, or magnetization for example to make an array of binary code (1 or 0), what is the analogous in the brain?

Steps to reply:
- We have ways to test real-time, parallel, active and stored memories. Memory is not just a passive storage, where information is permanent and unchanged.

Reply by student 2:

The problem summary:
How is the information stored in our brain? As in computers we use potentials, or magnetization for example to make an array of binary code (1 or 0), what is the analogous in the brain?

Steps to reply:
- We have ways to test real-time, parallel, active and stored memories. Memory is not just a passive storage, where information is permanent and unchanged.

Reply by student 3:

The problem summary:
How is the information stored in our brain? As in computers we use potentials, or magnetization for example to make an array of binary code (1 or 0), what is the analogous in the brain?

Steps to reply:
- We have ways to test real-time, parallel, active and stored memories. Memory is not just a passive storage, where information is permanent and unchanged.

Anonymous:

I've already worked a lot on this before starting with this course (nonetheless I learned a lot of details in the course). One of the most interesting papers I found is that information is represented feature based http://www.cs.rochester.edu/users/faculty/dana/tanifuji.pdf. I've already tried around building some small information processing algorithms based on this. If you are interested we could probably talk a bit about it.

Reply by student 4:

The problem summary:
How is the information stored in our brain? As in computers we use potentials, or magnetization for example to make an array of binary code (1 or 0), what is the analogous in the brain?

Steps to reply:
- We have ways to test real-time, parallel, active and stored memories. Memory is not just a passive storage, where information is permanent and unchanged.

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<table>
<thead>
<tr>
<th>Course Title</th>
<th>Instructor(s)</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-learning and Digital Cultures</td>
<td>Jeremy Knox, Sian Bayne, Hamish Macleod, Jen Ross, Christine Sinclair</td>
<td>Jan 28th 2013</td>
</tr>
<tr>
<td>Introduction to Philosophy</td>
<td>Dave Ward, Duncan Pritchard, Michela Massimi, Sullin Lavelle, Matthew Chrisman, Allan Hazlett, Alasdair Richmond</td>
<td>Jan 28th 2013</td>
</tr>
<tr>
<td>The Social Context of Mental Health and Illness</td>
<td>Charmaine Williams</td>
<td>Jan 28th 2013</td>
</tr>
<tr>
<td>Critical Thinking in Global Challenges</td>
<td>Celine Caquineau, Mayank Dutta</td>
<td>Jan 28th 2013</td>
</tr>
<tr>
<td>Introduction to Computer Networks</td>
<td>Arvind Krishnamurthy, David Wetherall, John Zaharijan</td>
<td>Jan 28th 2013</td>
</tr>
<tr>
<td>Grow to Greatness: Smart Growth for Private Businesses, Part I</td>
<td>Edward D. Hess</td>
<td>Jan 28th 2013</td>
</tr>
</tbody>
</table>

Courses offered:

- **Mathematics**: 6%
- **Science**: 30%
- **Business**: 13%
- **Information Technology**: 23%
- **Arts and Humanities**: 28%
Global community of learners

- North America: 36.5%
- Europe: 32%
- Asia: 17%
- South America: 3.3%
- Africa: 8.8%
- Oceania: 2.5%
Coursera makes studying easier for me. I could sit at home and learn like I’m at school, no distractions just me, my head phones and my books. … I could earn certificates … without spending a dime to get to my local school. It helps me a lot since my mom is in the hospital and financially, I cannot afford to attend school.  (Amanda, Dominica)
>75% have a Bachelor's degree

Most students 20 to 39 years old

Student demographics
Courses in multiple languages

Andrew Ng
Mobile app
Earn a Verified Certificate.

Your Work, Your Identity
Link your coursework securely to your real identity using your photo ID and unique typing pattern.

Earn a Verified Certificate
Earn official recognition from Duke University and Coursera for your accomplishment with a verifiable electronic certificate.

Share Your Success
Share your course records with employers, educational institutions, or anyone else through a unique, secure URL.
Duke UNIVERSITY

APRIL 09, 2013

Jacob Lyles

has successfully completed with distinction

Introduction to Genetics and Evolution

an online non-credit course offered by Duke University through Coursera

Verify at coursera.org/verify/THCCX215F8

Coursera has confirmed the identity of this individual and their participation in the course.

Signature Track

Andrew Ng
Student Motivations: Plans for verified certificate

- List on my resume/CV: 76.6%
- Show my qualifications in a new field: 66.0%
- As motivation to finish my course: 57.4%
- Advance my qualifications in my current field: 44.7%
- List on my LinkedIn profile: 42.6%
- Assist in a career change: 38.3%
- Assist in a new job search: 38.3%
- Print a paper copy: 38.3%
- Present to my employer: 19.1%
- Present to my school: 12.8%
Coursera Specializations

1. Cryptography
   - Upcoming Session: Sep 15th 2014
   - Duration: 8 weeks
   - Introduction and Motivation
     - Classical Encryption Schemes
     - Principles of Modern Cryptography
   - Perfect Secrecy and Its Limitations
   - Private-Key Encryption

2. Software Security
3. Usable Security
4. Hardware Security
5. Capstone Project

Data Science
Johns Hopkins University

Mobile Cloud Computing with Android
UMD & Vanderbilt

Challenges in Global Affairs
Leiden & UNIGE

Foundations of Teaching for Learning
Commonwealth Education Trust

Modern Musician
Berklee College of Music

Systems Biology
Icahn School of Medicine at Mount Sinai
Specialization Certificate

has been presented to

Jane Learner

on July 6, 2014 for successfully completing

Data Science

a non-credit series authorized by Johns Hopkins University through Coursera
First lectures posted

STATISTICS & ANALYTICS
Data: Learn how students learn

Andrew Ng
function [theta, J_history] = gradientDescent(X, y, theta, alpha, num_iters)
%GRADIENTDESCENT Performs gradient descent to learn theta
% theta = GRADIENTDESCENT(X, y, theta, alpha, num_iters) updates theta by
% taking num_iters gradient steps with learning rate alpha

m = length(y); % number of training examples
J_history = zeros(num_iters, 1);

for iter = 1:num_iters
    theta = theta - alpha * 1/m * (X' * (X * theta - y));
    J_history(iter) = computeCost(X, y, theta);
end
Wrong answers submitted for machine learning class programming assignment
function [theta, J_history] = gradientDescent(X, y, theta, alpha, num_iters)
    m = length(y);
    J_history = zeros(num_iters, 1);
    for iter = 1:num_iters
        hypo = X*theta;
        newMat = hypo - y;
        trans1 = (X(:,1))';
        newMat1 = trans1 * newMat;
        temp1 = sum(newMat1);
        temp1 = (temp1 * alpha) / m;
        A = [temp1];
        theta(1) = theta(1) - A;
        trans2 = (X(:,2))';
        newMat2 = trans2 * newMat;
        temp2 = sum(newMat2);
        temp2 = (temp2 * alpha) / m;
        B = [temp2];
        theta(2) = theta(2) - B;
        J_history(iter) = computeCost(X, y, theta);
    end
    theta(1) = theta(1);
    theta(2) = theta(2);
end
The mind is not a vessel that needs filling, but wood that needs igniting.

—Plutarch

from Ian Kidd's translation of Essays
The Best of Both Worlds: Flipped Classroom

- High-quality online content
- Produced locally or adopted from another institution.
- Peer Instruction
- Small group problem solving
- Mentoring/Coaching

Andrew Ng
"Improved Learning in a Large-Enrollment Physics Class."
Education for Everyone