teaching to the masses

mine çetinkaya-rundel
duke university
The Year of the MOOC

Clockwise, from top left: an online course in circuits and electronics with an M.I.T. professor (edX); statistics, Stanford (Udacity); machine learning, Stanford (Coursera); organic chemistry, University of Illinois, Urbana (Coursera).

By LAURA PAPPANO
Published: November 2, 2012
2014: The Year the Media Stopped Caring About MOOCs?

The news media’s appetite for MOOC stories has been insatiable. So when the University of Pennsylvania sent an email inviting several hundred education reporters to a seminar on massive open online courses, it anticipated a healthy turnout.

But as the catering deadline approached at the National Press Club, in Washington, organizers realized that they had barely enough registered attendees to justify a platter of finger food.

“We didn’t have a set thing in mind as to how many would attend, but what we were thinking was 15 to 20 from, let’s call them, ‘established’ media outlets,” said Ron Ozio, director of media relations at Penn. “And we got four.”
Data Analysis and Statistical Inference

Part of the “Reasoning, Data Analysis and Writing” Specialization

This course introduces you to the discipline of statistics as a science of understanding and analyzing data. You will learn how to effectively make use of data in the face of uncertainty: how to collect data, how to analyze data, and how to use data to make inferences and conclusions about real world phenomena.
motivation + goals
structure + resources / tools
students

outline
motivation
me
broad reach
duke
motivation

me

broad reach

videos for flipped campus course

duke
motivation

me
broad reach
videos for flipped campus course
getting name out there

duke

data

analysis

inference
motivation

me

broad reach

videos for flipped campus course

getting name out there

duke

pr
motivation

me

broad reach

videos for flipped campus course

getting name out there

duke

pr

potential future revenue
goals
goals

modular

accessible + relevant
goals

- modular
- accessible + relevant
- resource parity with campus course
structure
structure

10 weeks

data analysis statistical inference
structure

10 weeks

7 units
structure

10 weeks

7 units

learning objectives
structure

- 10 weeks
- 7 units
- Learning objectives
- ~12 8-12 minute videos
structure

- 10 weeks
- 7 units
- learning objectives
- ~12 minutes videos
- reading from textbook
structure

10 weeks
7 units

learning objectives
~12 8-12 minute videos
reading from textbook
1-2 data analysis labs
resources / tools

- textbook

- labs

OpenIntro

R

R

data

analysis

reference
resources / tools

- textbook
- labs
- demos

OpenIntro

R

R

data

analysis
Diagnostics for simple linear regression

Select a trend:
- Linear up
- Linear down
- Curved up
- Curved down
- Fan-shaped

Show residuals

This applet uses ordinary least squares (OLS) to fit a regression line to the data with the selected trend. The applet is designed to help you practice evaluating whether or not the linear model is an appropriate fit to the data. The three diagnostic plots on the lower half of the page are provided to help you identify undesirable patterns in the residuals that may arise from nonlinear trends in the data.

Rate this app!
View code
Check out other apps
Want to learn more for free?
resources / tools

- textbook
- labs
- demos

OpenIntro

R

Demos

Shiny apps
assessment

formative

summative

in video questions

data
True or false: Adjusted R2 tells us the percentage of variability in the response variable explained by the model.
True or false: Adjusted R2 tells us the percentage of variability in the response variable explained by the model.
True or false: Adjusted R2 tells us the percentage of variability in the response variable explained by the model.

- True
- False

Correct!
True or false: Adjusted R2 tells us the percentage of variability in the response variable explained by the model.

This is the definition of R-squared, not adjusted R-squared. Adjusted R-squared is similar, but also has a penalty for the number of predictors included in the model.
assessment

formative

summative

in video questions
Assessment

Formative

In video questions

Summative

Weekly MC quizzes (10-15 questions, 2 attempts)

Suggested textbook exercises
Assessment

Formative
- In-video questions

Summative
- Weekly MC quizzes (10-15 questions, 2 attempts)
- Suggested textbook exercises
- Midterm + final (1 attempt)
assessment

formative
- in video questions

summative
- weekly MC quizzes (10-15 questions, 2 attempts)
- suggested textbook exercises
- midterm + final (1 attempt)
- data analysis project (peer assessment)
assessment

formative

in video questions

summative

weekly MC quizzes (10-15 questions, 2 attempts)

suggested textbook excercises

midterm + final (1 attempt)

data analysis project (peer assessment)

data analysis labs
phase 1: proposal

phase 2: project
data analysis project

phase 1: proposal

own data or one of the suggested datasets

phase 2: project
data analysis project

phase 1: proposal

own data or one of the suggested datasets

peer evaluation (formative)

phase 2: project
Data analysis project

Phase 1: Proposal

Own data or one of the suggested datasets

Peer evaluation (formative)

Phase 2: Project

[fully] reproducible
Data analysis project

Phase 1: proposal
- Own data or one of the suggested datasets
- Peer evaluation (formative)

Phase 2: project
- [Fully] reproducible
- Detailed rubric

Peer evaluation (formative)
data analysis project

phase 1: proposal
- own data or one of the suggested datasets

phase 2: project
- [fully] reproducible
- detailed rubric

peer evaluation (formative)
- peer evaluation (summative)
data analysis project

phase 1: proposal
own data or one of the suggested datasets
peer evaluation (formative)

phase 2: project
[fully] reproducible
detailed rubric
peer evaluation (summative)
average of 3 scores (for each component)
grading / certification

computational track:

non-computational track:
Quizzes: 20% (drop lowest)
Lab: 15% (drop lowest)
Projects: 15% (drop lowest)
Midterm: 20%
Final: 30%

ggrading / certification

computational track:

non-computational track:
Quizzes: 20% (drop lowest)
Lab: 15% (drop lowest)
Projects: 15% (drop lowest)
Midterm: 20%
Final: 30%
certificate w/ distinction > 80%
Quizzes: 20% (drop lowest)
Lab: 15% (drop lowest)
Projects: 15% (drop lowest)
Midterm: 20%
Final: 30%

certificate w/ distinction > 80%

Quizzes: 30% (drop lowest)
Midterm: 30%
Final: 40%

computational track:

non-computational track:
Quizzes: 20% (drop lowest)
Lab: 15% (drop lowest)
Projects: 15% (drop lowest)
Midterm: 20%
Final: 30%

Computational track:

Quizzes: 30% (drop lowest)
Midterm: 30%
Final: 40%

Certificate w/ distinction
> 80%

Non-computational track:

Quizzes: 20% (drop lowest)
Midterm: 20%
Final: 30%

Certificate
> 80%

Grading/certification
Quizzes: 20% (drop lowest)
Lab: 15% (drop lowest)
Projects: 15% (drop lowest)
Midterm: 20%
Final: 30%

Quizzes: 30% (drop lowest)
Midterm: 30%
Final: 40%

certificate w/ distinction
> 80%
certificate
> 80%

~70% of final takers got certificate

grading / certification
computational track:
non-computational track:
86K signed up (1.4K signature track)
86K signed up (1.4K signature track)

60K visited course
86K signed up (1.4K signature track)

60K visited course

44K watched a lecture
numbers

86K signed up (1.4K signature track)

60K visited course

44K watched a lecture

18K submitted an exercise
86K signed up (1.4K signature track)

60K visited course

44K watched a lecture

18K submitted an exercise

16K browsed the forums
Lecture Activity

Number of learners viewing each lecture (% of maximum viewership)

- Orange line: Signature Track
- Blue line: Not Signature Track
<table>
<thead>
<tr>
<th>Continent</th>
<th>Reach</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>37%</td>
</tr>
<tr>
<td>Asia</td>
<td>28%</td>
</tr>
<tr>
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</tr>
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</tr>
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</tr>
<tr>
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<tbody>
<tr>
<td>United States</td>
<td>32%</td>
</tr>
<tr>
<td>India</td>
<td>13%</td>
</tr>
<tr>
<td>China</td>
<td>5%</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>4%</td>
</tr>
<tr>
<td>Canada</td>
<td>3%</td>
</tr>
<tr>
<td>Germany</td>
<td>3%</td>
</tr>
<tr>
<td>Spain</td>
<td>2%</td>
</tr>
<tr>
<td>Continent</td>
<td>Reach</td>
</tr>
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<td>-------</td>
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<td>3%</td>
</tr>
<tr>
<td>Germany</td>
<td>3%</td>
</tr>
<tr>
<td>Spain</td>
<td>2%</td>
</tr>
</tbody>
</table>

34% from emerging economies
Based on responses from 9,528 learners. Estimates accurate to ± 1 percentage points.
### Education Status

<table>
<thead>
<tr>
<th>Status</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full-time student</td>
<td>24%</td>
</tr>
<tr>
<td>Part-time student</td>
<td>11%</td>
</tr>
<tr>
<td>Not a student</td>
<td>65%</td>
</tr>
</tbody>
</table>

Based on responses from 9,421 learners. Estimates accurate to ±1 percentage points.

### Highest Education Level

<table>
<thead>
<tr>
<th>Degree</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctorate degree</td>
<td>8%</td>
</tr>
<tr>
<td>Professional school degree</td>
<td>3%</td>
</tr>
<tr>
<td>Master's degree</td>
<td>39%</td>
</tr>
<tr>
<td>Bachelor's degree</td>
<td>35%</td>
</tr>
<tr>
<td>Associate degree</td>
<td>2%</td>
</tr>
<tr>
<td>Some college but no degree</td>
<td>0%</td>
</tr>
<tr>
<td>High school diploma</td>
<td>5%</td>
</tr>
<tr>
<td>Some high school</td>
<td>1%</td>
</tr>
<tr>
<td>Some primary or elementary school</td>
<td>0.2%</td>
</tr>
<tr>
<td>No schooling completed</td>
<td>0.05%</td>
</tr>
</tbody>
</table>

Based on responses from 9,419 learners. Estimates accurate to ±1 percentage points.
<table>
<thead>
<tr>
<th>Employment Status</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed full-time</td>
<td>59%</td>
</tr>
<tr>
<td>Employed part-time</td>
<td>8%</td>
</tr>
<tr>
<td>Self-employed full-time</td>
<td>4%</td>
</tr>
<tr>
<td>Self-employed part-time</td>
<td>4%</td>
</tr>
<tr>
<td>Unemployed and looking for work</td>
<td>14%</td>
</tr>
<tr>
<td>Unemployed and not looking for work</td>
<td>8%</td>
</tr>
<tr>
<td>Other</td>
<td>3%</td>
</tr>
</tbody>
</table>

Based on responses from 9,145 learners.
Estimates accurate to ± 1 percentage points.
why taking the course?
video production
video production

kit: laptop, webcam, mic, tablet

CIT

data

inference
video production

me

CIT

kit: laptop, webcam, mic, tablet

plain backdrop

data
stepwise model selection

- backwards elimination: start with a full model (containing all predictors), drop one predictor at a time until the parsimonious model is reached.
video production

kit:
- laptop
- webcam
- mic
- tablet

plain backdrop

CIT

me
video production

me

CIT

kit:
laptop, webcam, mic, tablet

plain backdrop

video editing software (Screenflow)
video production

me

kit: laptop, webcam, mic, tablet

plain backdrop

video editing software (Screenflow)

keynote (slides + animations)

CIT
video production

me

CIT

kit: laptop, webcam, mic, tablet

plain backdrop

video editing software (Screenflow)

keynote (slides + animations)

polishing video editing

▸
video production

- me
  - kit: laptop, webcam, mic, tablet

- CIT
  - polishing video editing

- plain backdrop

- video editing software (Screenflow)

- keynote (slides + animations)
**video production**

- **me**
  - kit: laptop, webcam, mic, tablet
- **CIT**
  - polishing video editing
- **plain backdrop**
- **video editing software (Screenflow)**
- **keynote (slides + animations)**

- reviewing + uploading
- inserting in-video questions
- reviewing + uploading
- reviewing + uploading
- reviewing + uploading
support
support for production for students
support

for production

1 grad student for assessment development

1 undergrad student for converting labs to MC format

for students
support

for production

1 grad student for assessment development

1 undergrad student for converting labs to MC format

1 undergrad student working on Shiny apps

for students
1 support student for assessment development
1 undergrad student for converting labs to MC format
1 undergrad student working on Shiny apps
1 DataCamp developer for DC labs

1 for production student
1 for students student

1 grad student for assessment development
1 undergrad student for converting labs to MC format
1 undergrad student working on Shiny apps
1 DataCamp developer for DC labs
support

for production

1 grad student for assessment development

1 undergrad student for converting labs to MC format

1 undergrad student working on Shiny apps

1 DataCamp developer for DC labs

CIT staff for video editing / review / back-end

for students
support

for production

1 grad student for assessment development

1 undergrad student for converting labs to MC format

1 undergrad student working on Shiny apps

1 DataCamp developer for DC labs

CIT staff for video editing / review / back-end

for students

9 CTAs

2 hrs/week each

2 hrs/week each
<table>
<thead>
<tr>
<th>Support for production</th>
<th>1 grad student for assessment development</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1 undergrad student for converting labs to MC format</td>
</tr>
<tr>
<td></td>
<td>1 undergrad student working on Shiny apps</td>
</tr>
<tr>
<td></td>
<td>1 DataCamp developer for DC labs</td>
</tr>
<tr>
<td>CIT staff for forums</td>
<td>9 CTAs 2 hrs/week each</td>
</tr>
<tr>
<td></td>
<td>CIT staff for forums</td>
</tr>
<tr>
<td></td>
<td>CIT staff for video editing / review / back-end</td>
</tr>
</tbody>
</table>

1 undergrad student for converting labs to MC format
1 undergrad student working on Shiny apps
1 DataCamp developer for DC labs
CIT staff for video editing / review / back-end
support

for production

1 grad student for assessment development
9 CTAs 2 hrs/week each

for students

1 undergrad student for converting labs to MC format
CIT staff for forums

1 undergrad student working on Shiny apps
my time on the forums

1 DataCamp developer for DC labs

CIT staff for video editing / review / back-end

1 undergrad student working on Shiny apps
<table>
<thead>
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<th>Support for Production</th>
<th>Support for Students</th>
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<tbody>
<tr>
<td>1 grad student for assessment development</td>
<td>9 CTAs 2 hrs/week each</td>
</tr>
<tr>
<td>1 undergrad student for converting labs to MC format</td>
<td>CIT staff for forums</td>
</tr>
<tr>
<td>1 undergrad student working on Shiny apps</td>
<td>my time on the forums</td>
</tr>
<tr>
<td>1 DataCamp developer for DC labs</td>
<td>2 live OH (Google Hangout)</td>
</tr>
<tr>
<td>CIT staff for video editing / review / back-end</td>
<td>1 undergrad student working on Shiny apps</td>
</tr>
</tbody>
</table>
discussion forums

[only] 16K browsed the forums
[only] 16K browsed the forums incredibly helpful students!
### Forum Reputations

<table>
<thead>
<tr>
<th>Name</th>
<th>Threads</th>
<th>Posts/Comments</th>
<th>Upvoted/Downvoted</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rachael Winkless (View Grades)</td>
<td>26</td>
<td>895</td>
<td>858 14</td>
<td>526</td>
</tr>
<tr>
<td>Dan Nuttie (View Grades)</td>
<td>32</td>
<td>333</td>
<td>447 0</td>
<td>232</td>
</tr>
<tr>
<td>atopos (View Grades)</td>
<td>17</td>
<td>477</td>
<td>330 1</td>
<td>211</td>
</tr>
<tr>
<td>Eduardo Díez Béez (View Grades)</td>
<td>10</td>
<td>169</td>
<td>349 0</td>
<td>185</td>
</tr>
<tr>
<td>Mihaela Mack (View Grades)</td>
<td>15</td>
<td>277</td>
<td>255 0</td>
<td>179</td>
</tr>
<tr>
<td>Stephen Ellebracht (View Grades)</td>
<td>0</td>
<td>299</td>
<td>224 0</td>
<td>159</td>
</tr>
<tr>
<td>David Hood (View Grades)</td>
<td>3</td>
<td>108</td>
<td>84 0</td>
<td>57</td>
</tr>
<tr>
<td>Liubov Volkova (View Grades)</td>
<td>5</td>
<td>98</td>
<td>145 4</td>
<td>58</td>
</tr>
<tr>
<td>Chris Lawton (View Grades)</td>
<td>7</td>
<td>85</td>
<td>111 0</td>
<td>54</td>
</tr>
<tr>
<td>Allison Miller (View Grades)</td>
<td>6</td>
<td>108</td>
<td>97 1</td>
<td>50</td>
</tr>
</tbody>
</table>
[only] 16K browsed the forums incredibly helpful students!
[only] 16K browsed the forums incredibly helpful students! also some problem cases…
feedback / challenges
very positive feedback on course materials
very positive feedback on course materials

early challenge: workload estimate
very positive feedback on course materials
early challenge: workload estimate
main challenge: peer review
very positive feedback on course materials

most (minor) issues self correcting

early challenge: workload estimate

main challenge: peer review
very positive feedback on course materials

most (minor) issues self correcting

early challenge: workload estimate

varied opinions on work-load, deadlines, etc.

main challenge: peer review
very positive feedback on course materials
most (minor) issues self correcting
early challenge: workload estimate
varied opinions on work-load, deadlines, etc.
main challenge: peer review
main lesson learned: be ultra-clear in instructions
future
next session: September 1
next session: September 1

recruit CTAs from past course
next session: September 1
recruit CTAs from past course
videos in flipped campus course
future

next session: September 1

[ongoing] research: qualitative / quantitative

recruit CTAs from past course

videos in flipped campus course
future

next session: September 1

[ongoing] research: qualitative / quantitative

recruit CTAs from past course

interview with students on “community”

videos in flipped campus course
next session: September 1

[ongoing] research: qualitative / quantitative

recruit CTAs from past course

interview with students on “community”

videos in flipped campus course

survey on personal learning goals