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Using Students’ Course Evaluations and Machine Learning to Examine Inclusivity and Accessibility

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Learning Goals

Understand the **machine learning analysis approach** to categorize and summarize text

Consider **student perspectives on inclusive teaching practices**

Identify **implementation opportunities** at home institutions
Redesigning Course Surveys

**Course Evaluations**

- Term Begins
- Week 10
- Finals Week

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Small, **consistent bias** against female instructors

**Question-dependent** – more vague, more ”room for bias”

They way the numbers are used = quantifauxcation.

*Precise rankings with flawed measures... (Stark 2015)*
Redesigning Course Surveys

Student Experience Surveys

Term Begins

Week 10 Final Week

Eliminate Numerical Ratings

Ask Questions about Student Learning Experience
Redesigned Student Experience Survey

• Organization
• Quality of the course materials
• Instructor communication
• Assignments or projects
• Inclusiveness
• Accessibility
• Relevance of the course content
• Clarity of assignment instructions and grading
• Feedback
• Active learning
• Challenge in this course
• Support from the instructor
• Student interaction

Most beneficial for your learning?

Most in need of improvement for your learning?
Most Selected Teaching Practices

Most Beneficial for my Learning

- Active Learning: 8.0
- Support from the Instructor: 19.0
- Relevance: 7.8
- Quality of Materials: 12.3
- Organization: 7.4
- Level of Challenge: 5.7
- Student Interactions: 7.4
- Inclusiveness: 8.6
- Feedback: 4.3
- Clarity of Instructions: 5.2
- Assignments & Projects: 1.6
- Accessibility: 5.0
- Instructor Communication: 2.6
- None of these elements: 2.6

Most in Need of Improvement for my Learning

- Active Learning: 4.6
- Support from the Instructor: 3.5
- Relevance: 3.6
- Quality of Materials: 5.4
- Organization: 5.5
- Level of Challenge: 8.1
- Student Interactions: 6.3
- Inclusiveness: 1.8
- Feedback: 6.8
- Clarity of Instructions: 10.2
- Assignments & Projects: 8.0
- Accessibility: 2.0
- Instructor Communication: 3.8
- None of these elements: 30.5

~200,000 student comments
How do students describe each teaching practice?

Data Sources

- 5-25k written comments
- 13 teaching practices

Analysis Approaches

- Thematic Analysis: Days/Weeks...
- Common Words: Minutes
- Topic Modelling & Human Interpretation: Hours
<table>
<thead>
<tr>
<th>What is Topic Modelling?</th>
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<tbody>
<tr>
<td>Text Processing</td>
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<tr>
<td>Human Understandable</td>
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<tr>
<td>Data Summarization</td>
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</table>
What is Topic Modelling?

Individual **words** combine to make **topics**

Textual data is simplified

- Cost
- Buy
- Tuition
- Free
Implementing a Topic Model

Preparing Text  Model Fitting  Interpretation
Text Cleaning & Word Removal

Purpose: Remove parts of text that aren't interesting

Example: "The teacher (Dave)" → "teacher dave"
Lemmatization

Purpose
Combine all forms of the same word

Example
"I'm about to be"
→"I be about be"
Latent Dirichlet Allocation (LDA)

Models documents as a mixture of topics

Topics are distributions of words

6 Topics

- class
- topic
- discussion
- question
- lecture
- answer
- voice
- conversation

- work
- help
- group
- project
- different
- conduct
- student
- need

- question
- hard
- ask
- class
- know
- grade
- reading
- interact

- nice
- course
- material
- difficult
- learning
- active
- test
- interesting

- student
- feel
- include
- class
- support
- day
- view
- thought
Latent Dirichlet Allocation (LDA)

Models documents as a mixture of topics
Topics are distributions of words

Topic Breakdown of all "Inclusiveness" comments
Promises

- Harnesses **messy data**, like **text**
- **Automates** repetitive tasks

Concerns

- Might the algorithm be **biased or inequitable**?
- How much **transparency** will be offered?

Machine Learning
Implementing a Topic Model
Hybrid Approach

Preparing Text  Model Fitting  Interpretation
Topic Interpretation & Theme Synthesis

Read topic word lists for context

- class
- topic
- discussion
- question
- lecture
- answer
- voice
- conversation

Sample comments from each topic

Look for meaningless word patterns
“*I feel*” statements

Identify homonyms
“I *mean*” vs “is *mean*”

Different meanings based on context
“*class work*” vs “*couldn’t attend because of work*”

Class conversations, discussions voices, answering questions..
How do students describe inclusive teaching practices?

What specifically about the inclusiveness of the course helped your learning?
What specific change in the inclusiveness of the course would help your learning?

From your experience, what teaching practices do you think are inclusive or exclusive?
How do students describe inclusive teaching practices?

What specifically about the inclusiveness of the course helped your learning?

What specific change in the inclusiveness of the course would help your learning?

Student Voices  Diversifying content  Using inclusive language  Understanding student needs  Choice and Relevance
How do students describe inclusive teaching practices?

What specifically about the inclusiveness of the course helped your learning?

What specific change in the inclusiveness of the course would help your learning?

Student Voices  Diversifying content  Using inclusive language  Understanding student needs  Choice and Relevance
“I liked how we all were encouraged to speak in the class and that our opinions mattered.”

“although I'm not super comfortable talking in front of a class she made me feel comfortable and able to contribute!”
“Give students the opportunity to speak up by encouraging those with louder voices to have others heard.”

“I think the professor does try to make all discussion inclusive but ends up not always being the case when certain students dominate the conversation”
**Inclusiveness**

<table>
<thead>
<tr>
<th>Student Voices</th>
<th>Diversifying content</th>
<th>Using inclusive language</th>
<th>Understanding student needs</th>
<th>Choice and Relevance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Students comfortable speaking in class</strong></td>
<td><strong>Welcome more voices/mitigate dominating students</strong></td>
<td><strong>Specific facilitation recommendations</strong></td>
<td></td>
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</table>

“I think it would be helpful if the instructor set some standards for constructive and respectful discussion, especially in terms of acknowledging the life experiences of underrepresented groups in class...”

“She never attacks anyone's opinions, and she is great at hearing someone out and then condensing what they've said in an accurate way so everyone can better understand.”
“I was terrified of asking questions because I was afraid of being ridiculed by even thinking of asking a question you didn't deem worthy.”

“It was almost embarrassing to answer his questions if you didn't 100% understand the topic at hand...”
“As one of the two women of color in this class, I appreciate [the instructor’s] effort to address racial issues in [class content]. “

“Being Native American, I felt more invested in this class when everyone discussed the impacts that [topic] has had on Indigenous people...”
"We need class materials written by black, indigenous and/or people of color. We need more guest speakers that come from intersectional identities."

"I felt that the course could use more diversity in speakers."

"Try to get some guest speakers of color."
“Being a non-binary person it would have been nice to see more gender-inclusive language”

“Out of all my classes, I felt the most welcomed and respected here. I'm pretty sure everyone always used the correct pronouns (I'm trans) and I even had one instance of another student calling someone out for mis-gendering me.”
“In response to our needs, she adapted the course syllabus and modified some course expectations to ensure that (a) we continue to receive a quality education, and (b) we could maximize our learning in our changing context.”

“It would be beneficial to my learning if you said the exact same feedback, but in a more understanding way that acknowledges that you've been in our shoes at some point in your education...
“Material tried to apply to many types of individuals and their goals for future practice (i.e. ethics, job search).”

“Because we each have to present on the readings as well as our projects, it really includes people and their interests in giving them the freedom to choose what they want to report on that interests them the most.”
Accessibility
LMS Organization
Instructor Flexibility
Accommodations
Affordability
Auditory Accessibility

Support from the Instructor
Learning Skills, Study Strategies
Understanding student needs and flexibility
Availability: office hours, rapid responses, study sessions
Uncover difficulties, answering questions
Using student voices to define teaching practices

Workshops & Consultations

Practitioner Guides

Sharing Back to Students

Tools Used

Preparing Text  Model Fitting  Interpretation

Python – for process implementation

Azure – for computing resources

Code Available on GitHub
### Benefits & Limitations

<table>
<thead>
<tr>
<th>Efficient &amp; Scalable</th>
<th>Question specificity helps</th>
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<tr>
<td>Objective Topics</td>
<td>Doesn’t provide exact response %</td>
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<tr>
<td></td>
<td>Not completely automated</td>
</tr>
<tr>
<td></td>
<td>(best as a hybrid analysis)</td>
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Many implementation opportunities...

What are other underused text-based datasets on your campus?
Learning Goals

Understand the **machine learning analysis approach** to categorize and summarize text

Consider **student perspectives on inclusive teaching practices**

Identify **implementation opportunities** at home institutions
Implementation opportunities: Text-rich data sets on your campus?

What's needed to implement this approach?

Student Experience Survey Redesign?

Academic Data Analytics
Practitioner Guides & Methods

Revising UO Teaching Evaluation
Survey, Process & Resources