We are...

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Our Team and Mission

The Data Empowered Learning Team explores how data science can bring novel insight to complex problems in the space of teaching and learning in higher education.

We are exploring the use cases of AI in contexts such as:

- Course design & delivery
- Assessment & reflection
- Ideation
- Student success
Institutional Data Analytics

Supporting learning with SIS and LMS data

This includes things such as:

- Modeling LMS engagement
- Retention modeling
- Course dashboards
- Early warning systems
Decibel Analysis for Research in Teaching (DART) is a software tool that analyzes classroom sound to predict with ~90% accuracy the quantity of time spent on Single Voice (e.g. lecture), Multiple Voice (e.g. pair discussion), and No Voice (e.g. clicker, question thinking) activities.

What can DART do?

https://sepaldart.herokuapp.com/
Spectrum

Helping instructors engage in reflective teaching practices with the support of machine learning
Spectrum as a reflective teaching tool

- Provide novel insight into course content
- Help instructors evaluate how they are spending their time in their classroom
- Onboard instructional designers to course content so that they can more effectively work with faculty
Audio Analysis Pipeline

Audio → speech2text → AWS API based service

Google Research’s BERT Language Representation Model

Sentence Embedding

tsne

Cluster

Summarize
Proof of Concept with O.E.R Data

<table>
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<th>Class Number</th>
<th>Class Title</th>
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<tbody>
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<td>4</td>
<td>Molecular Genetics</td>
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<tr>
<td>6</td>
<td>Behavioral Genetics</td>
<td>40</td>
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We used AWS speech2text on 131, 30-second, clips from 3 classes.
Spectrum Demo

Walk-through of a ML-based reflective teaching prototype
What is Spectrum?

Spectrum is a prototype application that explores the use of cutting edge Natural Language Understanding models on transcripts of a course's lectures over a semester. Instructors are generally interested in how effective their teaching is, but currently they have very few channels for actionable feedback. Spectrum aims to serve as a diverse reflective teaching tool by offering many possible uses. Instructors can now assess the distribution of concepts and topics discussed over the course of their semester from a macro-level view.
Future: Spectrum as a student-facing study aid

- Listen to lecture content by topic
- Find lecture content with “idea based” search
- Augment lecture material with open content automatically
Leveraging A.I. for Academic Advising

LIFT Prototype
LIFT at its core.

Using machine learning enables us to personalize insights into how students might perform in specific classes based on how similar students performed in the past.
Building the Model

We trained a decision tree based machine learning model on over 8.6 million institutional records collected since 2005. This institutional data includes transcripts and application data.

From the model we created a UI prototype called LIFT for exploring the relationship between course selection and student outcomes.
Partnership between IT and Academic Advising

- Partnership between Teaching and Learning with Technology and the Division of Undergraduate Studies (DUS)
  - DUS oversees all pre-major freshman and students at Penn State. At University Park (~ 46K total enrollment), each DUS advisor is responsible for 200 - 250 students.

- Awarded an internal grant from Penn State to conduct a pilot study that focuses on the ethical use of analytic tools in academic advising.
Seed Grant Deliverables

1. **Training**: Create training materials for advisers on the ethical use of analytics in advising practices.

2. **Ethical review**: report outlining the ethical considerations and related processes and resources to support AI-enabled advising applications.

3. **Technical review**: report outlining the technical considerations relevant to the creation and assessment of the technologies employed in the grant (machine learning, cloud computing, data availability and usage, etc).
Pilot Study

Examine Advisor use of LIFT during their Academic Review process.

Academic Review occurs in the period of time between semesters when advisors are reviewing student’s academic plan and progress and determining potential interventions.
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Add A Course

Campus: UP: Univ Park
Course: IST 110

View Available Sections

2 Results for IST 110

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<tr>
<th>Credits</th>
<th>Section</th>
<th>Course</th>
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<td>001</td>
<td>IST 110</td>
<td>M W F 10:10 AM - 11:00 AM</td>
<td>David Kitlan</td>
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</table>
Key Considerations

● LIFT is not a crystal ball.
  ○ Advisers are trained to rely on their own expertise when making decisions with LIFT.

● LIFT is not in the wild.
  ○ Advisers only have access during the Academic Review Period.

● LIFT is one additional tool in the adviser toolbox.
  ○ Advisers already have access to all the data provided in LIFT
Lessons Learned

From the Fall 2019 Pilot Study
The Value of LIFT Data

Overall, advisers felt that scores in LIFT aligned with their thoughts surrounding a student’s performance in a given semester.

LIFT helped shed light on situations that were a-typical from the conventionally known ‘difficult’ courses at the University.
Importance of Training

Advisers experienced a large variance in their comfortably using analytic data for decision making purposes.

Scenario based training was an effective means to engage advisors as it provided opportunities for group discussions around operationalizing data-based decisions.
Personalized Advising

LIFT was able to highlight a student that was placed in a math course where they were unlikely to succeed. Despite having an appropriate entrance exam score for this placement, LIFT detected weaker Math SAT scores and high school grades...
Moving the needle...

We are actively working on policies, procedures, and systems to facilitate data science and the insights it can bring to bear.

- The LIFT project operates in a low risk space that enables us to explore issues related to many levels of the organization.

- In addressing these challenges our team is helping our institution think and grow...
Privacy and Ethics
Algorithm Review

- Technical Review Elements

- What Machine Learning technologies and methods does the application use?
- Are these technologies and methods commonly used to solve problems of similar type and scope?
- Was the model developed following common data science and machine learning theory and practice?
Algorithm Review

- Ethics and Bias Elements

- What decisions are being supported by information from this model?
- Based on the information (data and methods) used to develop the system, is the proposed use of the model appropriate?
- Are there differences in average predicted outcomes among groups or accuracy? If so, what would the consequences of these differences in predicted outcomes or accuracy be for these groups?
- Is it appropriate to make adjustments to the model in order to remove bias or to insure fairness. If so, what definition of fairness is most appropriately applied in this context?
Other Considerations

- Ensure you are abiding by FERPA and Institutional Policy
- Understand your institution’s culture of data-informed decision making
- Be ready to change *HOW* you talk about things
- Identify and engage key stakeholders
Privacy Impact Assessment

What is a Privacy Impact Assessment?
Privacy Impact Assessments (PIA) analyze how a unit collects, uses, shares, and maintains identifiable information on behalf of Penn State.

A PIA will help your unit:
1. Conform with applicable legal, regulatory, and policy requirements for privacy
2. Determine the risks and effects of collecting, using, sharing and maintaining identifiable information

When do I need a Privacy Impact Assessment?
A Privacy Impact Assessment is required when a unit:
- Initiates a new project that collects or generates identifiable information or may otherwise have privacy implications
- Develops or procures any new technologies or systems that collect, maintain, or disseminate identifiable information

How do I complete a Privacy Impact Assessment?
You may complete a Privacy Impact Assessment form online. A member of the Privacy & Compliance team will contact you after you submit the form.

https://security.psu.edu/privacy-impact-assessment/
Questions?

delteam@psu.edu

tlt.psu.edu