



**San Jose State University**

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**From the Selected Works of Vishnu Pendyala**

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July 21, 2023

# Effectively Teaching AI/ML to Diverse Student Populations

Vishnu Pendyala, *San Jose State University*



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Available at: <https://works.bepress.com/vishnu-pendyala/45/>



# Effectively Teaching AI/ML to Diverse Student Populations

Vishnu S. Pendyala, PhD

*To cite this presentation: Pendyala, V.S. (2023) "Effectively Teaching AI/ML to Diverse Student Populations," PPT Presentation. Indo Universal Collaboration for Engineering Education (IUCEE) Global Webinar*

Video Recording: Recording: <https://www.youtube.com/watch?v=eDU-naj3yWA>

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# Agenda

Challenges and opportunities
Diversity figures and facts
Student feedback
<b>Strategies</b> <ul style="list-style-type: none"> <li>• Analogies</li> <li>• Equity oriented pedagogy</li> <li>• CLO and rubric based assignments</li> <li>• Flipped classes</li> <li>• Study Groups, Research components</li> <li>• Inspiration and motivation, personal brand building</li> <li>• Interaction with industry SMEs</li> <li>• Immersive learning: Augmented Reality</li> <li>• Other tools: Jamboard, ChatGPT, weekly takeaways</li> </ul>

## Challenges

Subject	Student	Diversity	Administrative
<ul style="list-style-type: none"> <li>• Explosive growth of tools and techniques</li> <li>• Rapid obsolescence</li> <li>• Difficult concepts grounded in math</li> </ul>	<ul style="list-style-type: none"> <li>• Weak academic background</li> <li>• Unreliable transcripts, claims</li> <li>• Need for (L)earning</li> </ul>	<ul style="list-style-type: none"> <li>• Language issues</li> <li>• Aptitudes and attitudes</li> <li>• Conflicting preferences</li> </ul>	<ul style="list-style-type: none"> <li>• Long review times</li> <li>• Cohort modality</li> <li>• Time availability</li> </ul>

# Opportunities

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## Subject

- Exciting speaking forums
- Publication avenues
- Job satisfaction

## Student

- Research made fun
- Aligns with their general knowledge
- Genuine interest to learn

## Diversity

- Group synergy
- Varied perspectives
- Scope for creativity, innovation, and productivity

## Administrative

- Funding potential
- Much wanted on committees
- Academic freedom



## Student Diversity

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*Some statistics*



**The California  
State University**

## Vishnu Srinivas's Course Equity Portal

Spring 2019 – Spring 2022

By our records, you've taught

# 489 students



over the past 4 years.

Let's see how diverse your students are...

# 9%

## Pell Grant Recipients

### What This Means

Pell grants are need-based financial aid from the federal government. Receipt of a Pell grant is a widely-used indicator for students in higher-ed who come from economically-challenged households.

# 3%

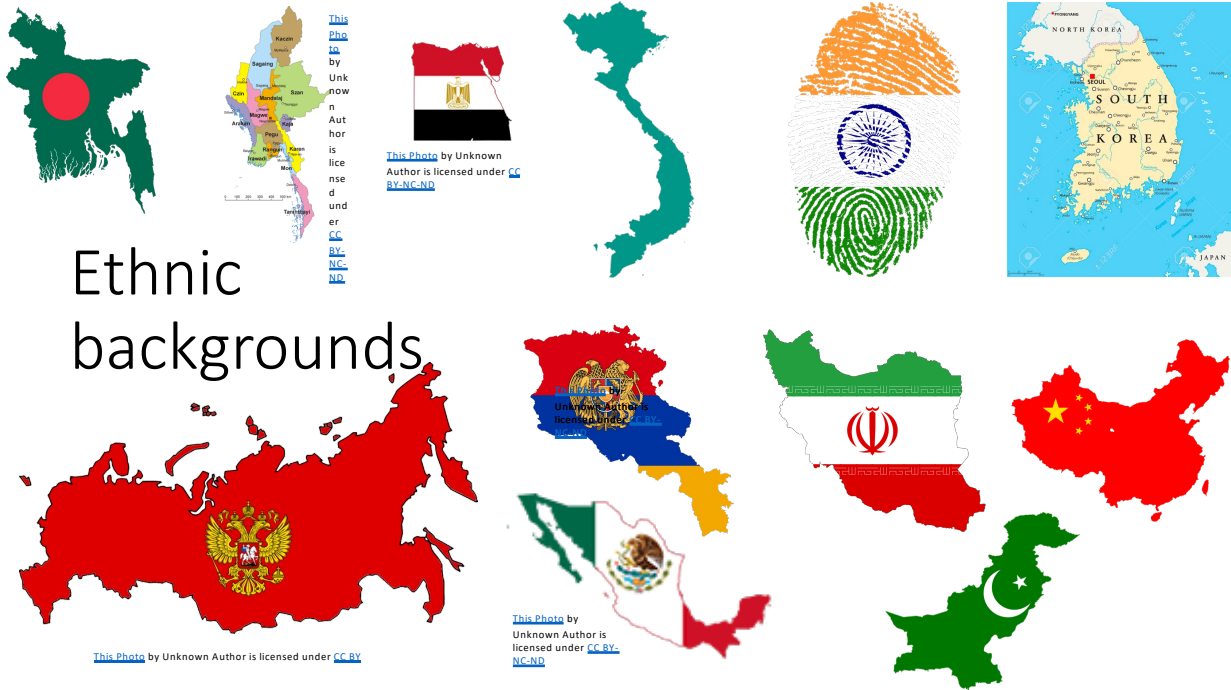
## Underrepresented Minorities (URM)

### What This Means

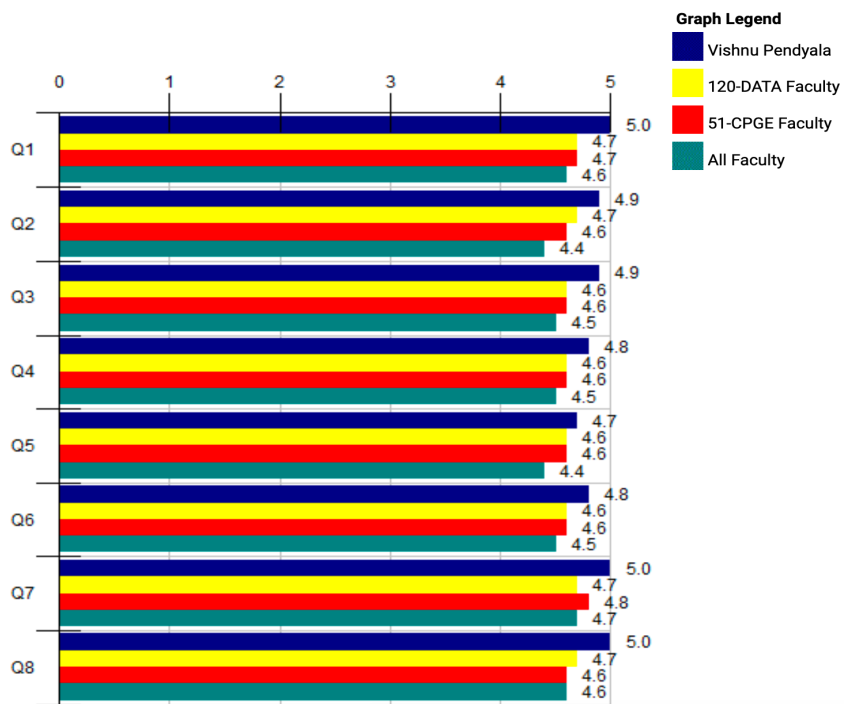
Underrepresented Minorities (URM) includes US citizens/residents who are

- Black or African American
- American Indian
- Latinx

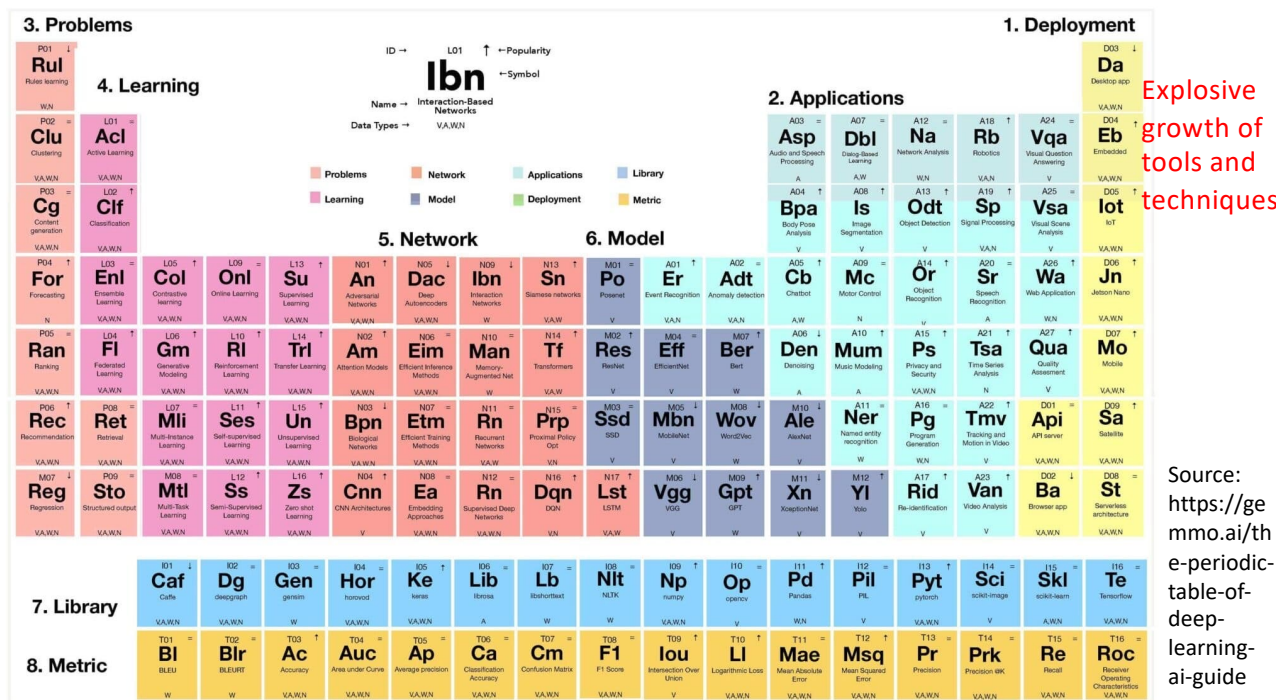
While there are other valid ways to view students' race and ethnicities, this method is consistent with the CSU Graduation Initiative and IPEDS data reporting practices

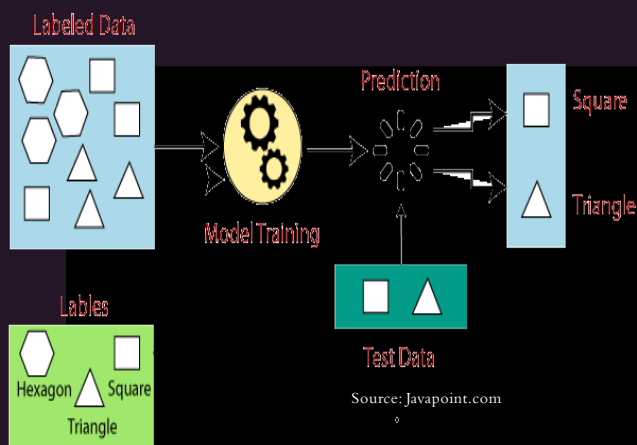


## Unity in diversity: Teaching Evaluation



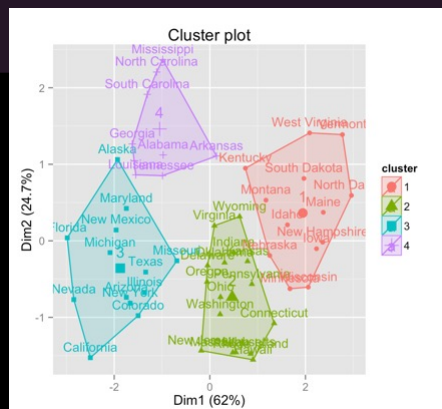






*Supervised  
Learning*

*Parents labeling good  
and bad for children*



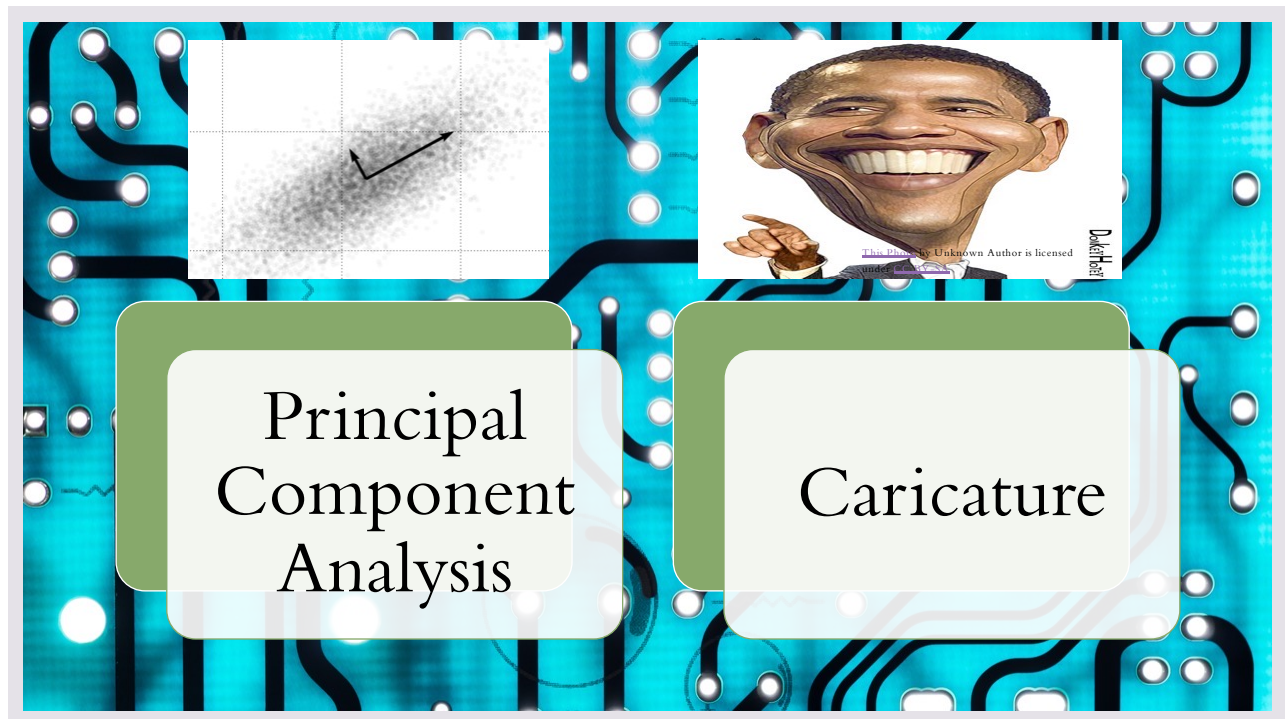
This Photo by Unknown Author is licensed under [CC BY-SA-NC](#).

*Self or Un supervised  
Learning of latent  
features*



*Students forming  
groups themselves:  
Clustering*





## For more on this strategy

Pendyala, Vishnu S. "Relating machine learning to the real-world: analogies to enhance learning comprehension." *International Conference on Soft computing and its engineering applications*. Cham: Springer International Publishing, 2021.

## Equity oriented pedagogy

### Closed Captioning

▼ Industry

Patent analysis [Low stakes]  
Due Apr 17 at 11:59pm | 2 pts

[Low stakes assignment] Learn about an ML Researcher's work and get inspired

### Universal Design for Learning Guidelines

### Asynchronous Quizzes

### Canvas course accessibility report

### No student left behind policy



Low Stakes Assignment: Use Hypothesis to annotate  
Due Mar 10 at 5:29pm | 1 pts

## CLO and rubric based assignments

### Term Project Report, Presentation Slides, and Code

✓ Published

Edit



#### Specific Course Learning Outcome:

1. CLO 4 - Create your own data classification, regression, and / or clustering problem and design and implement software solutions by applying machine learning models, methods, and tools learned in the course to complete a course project, preferably related to sustainability. [PLO 1, 2, 3, 4, 5, 6]

# CLO and rubric based assignments

## Term Project Rubric

You've already rated students with this rubric. Any major changes could affect their assessment results.

Criteria	Ratings	Pts
Visualization Includes exploratory analysis (heat maps and other visuals)	This area will be used by the assessor to leave comments related to this criterion.	5 pts
Presentation Skills Includes time management	This area will be used by the assessor to leave comments related to this criterion.	5 pts
Relates to sustainability The work is toward one or more of the 17 SDGs of the United Nations: <a href="https://sdgs.un.org/goals">https://sdgs.un.org/goals</a>		



## Flipped Classes

Can we build a neural network to learn to classify based on the distance in the feature space?

What if we compute the distances in the extracted feature space instead of in the original pixel space or learn a "metric space"?

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really running out of time and thank you for your patience.

Powered by Zoom

## Study groups, research components

⋮
▼ Research

⋮
📄

**Significant Paper Slides**  
 Closed | Due Apr 21 at 5:29pm | 30 pts

⋮
📄

**Significant Paper Blog**  
 Closed | Due Apr 21 at 5:29pm | 5 pts

⋮
💬

**[Low stakes assignment] Learn about an ML Researcher**

Everyone
Student Groups
Study Groups

Self sign-up is enabled for these groups. ?

Groups are limited to **5** members.

## Inspiration, personal brand building

⋮
📄

**Term Project Elevator Pitch Video**  
 Closed | Due May 3 at 11:59pm | 3 pts

⋮
📄

**Term Project Blog**  
 Closed | Due May 3 at 11:59pm | 2 pts

**"vishnu pendyala" - Google Search**

google.com/search?q="vishnu+pendyala"&tbas=0&source=Int&sa=X&ved=2ahUKEwjBzL7WJmAAxVDKEQIHdJPCisQpwV6BAGB...

OldChrome "vishnu pendyala"...


Search: "vishnu pendyala"

Images News Videos Maps SJSU Google scholar Books Shopping Flights All filters Tools


About 3,330 results (0.30 seconds)

### Vishnu Pendyala

Writer



Cisco Blogs



Vishnu Pendyala | LinkedIn

Vishnu Pendyala, San Jose State University, San Jose, California, United States. 3k followers 500+ connections.

San Jose State University

<https://www.sjsu.edu/> | People

Pendyala, Vishnu | People | San Jose State University

Jun 4, 2023 — Email: Preferred: vishnu (dot) pendyala (at) sjsu (dot) edu. Education: PhD, MS, BS in Computer Engineering, MBA in Finance ...

LinkedIn

<https://www.linkedin.com/in/pendyala/>

Vishnu Pendyala

He has traveled widely, covering ~30 states in the US and 23 countries. Articles by Vishnu. Inauguration of the Ministry Of Human... By Vishnu Pendyala.

About

Vishnu Pendyala is a Senior Member of IEEE and of the Computer Society of India (CSI), with over two decades of software experience with industry leaders such as Cisco, Synopsys, Informix (now IBM), and Electronics Corporation of India Limited. ... Google Books

**Books:** Veracity of Big Data: Machine Learning and Other Approaches to Verifying Truthfulness

**Affiliation:** San Jose State University

**Research Interests:** Machine Learning, Semantic Web, Knowledge Representation

## HW3 Group Assignment: Industry insights <sup>AS</sup>

✓ Published

✎ Edit



### Interaction with industry SMEs

CLO 6 - Explain how the industry is using Machine Learning

CLO 7 - Effectively present and communicate knowledge about Machine Learning acquired in the course

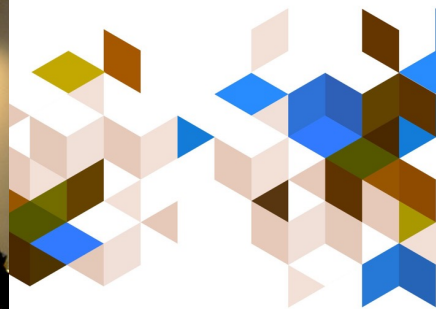
CLO 2 - Explain how appropriate machine learning approaches and techniques can be applied to solve significant problems

**\*\*Submit in groups - one submission per group\*\***

Your submissions should ideally demonstrate how well the above learning objectives have been met.

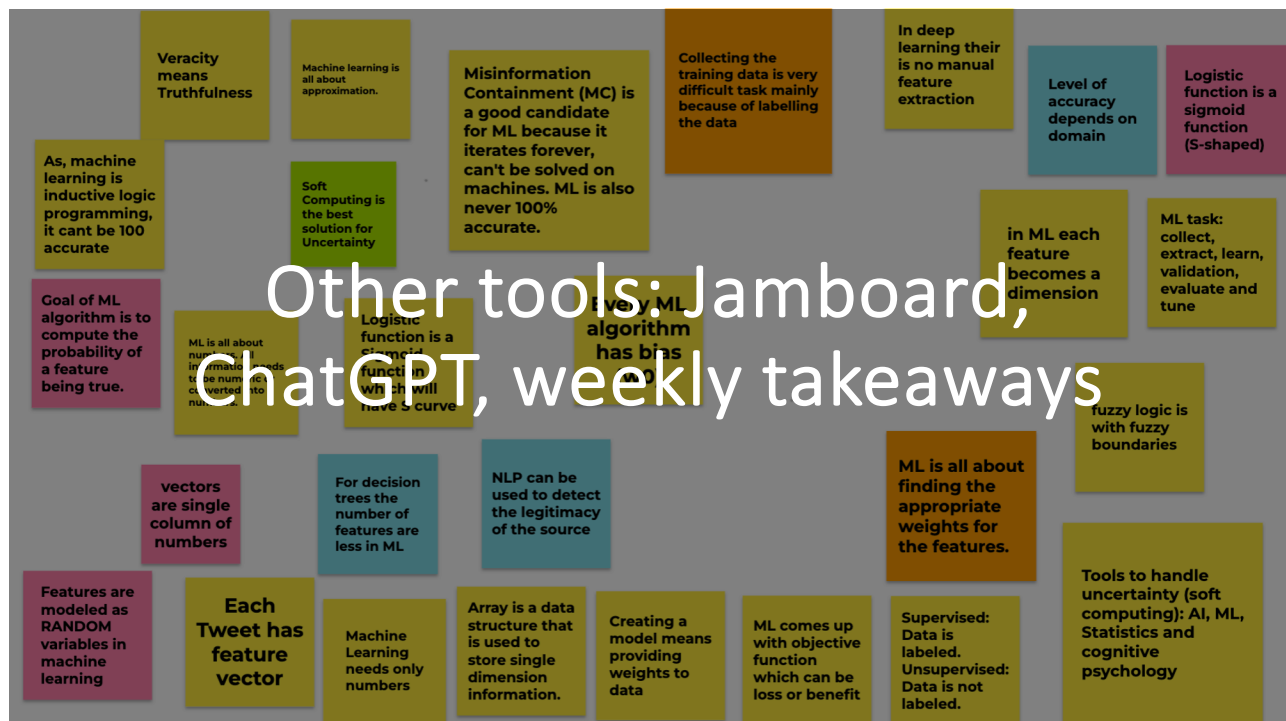
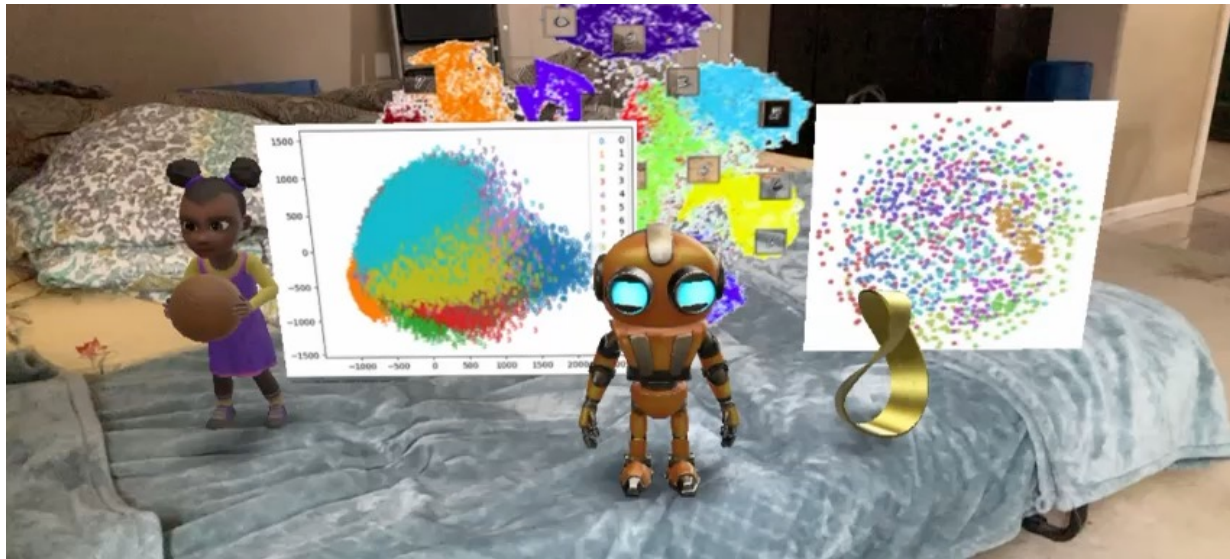
1.a. [15 points]

As a group, reach out to a LinkedIn or other contact or authors of some of the research papers that you read, who are Machine Learning experts currently **working in the industry** and interview them about the course topics to understand how they are used in the industry. Submit your interview in writing. **Remember to include the name and**



Immersive learning: Augmented Reality





## ChatGPT and AI Tools Policy

In case you used ChatGPT or any other AI tools in any way for your assignments (including HW, project, SPP, industry case study, etc), please clearly describe how you used it and delineate the ChatGPT / AI tool generated content. It is important that you attribute any help you receive from external sources.

Please also remember that you cannot share any course material, including HW questions outside the course and that includes with ChatGPT and other AI tools.

Please familiarize yourself with SJSU's Academic-Integrity-Policy:

<https://www.sjsu.edu/studentconduct/docs/SJSU-Academic-Integrity-Policy-F15-7.pdf>

and the Student Conduct Code as defined in the California Code of Regulations, in case you did not already:

<https://www.sjsu.edu/studentconduct/docs/SJSU-Student-Conduct-Code.pdf>

