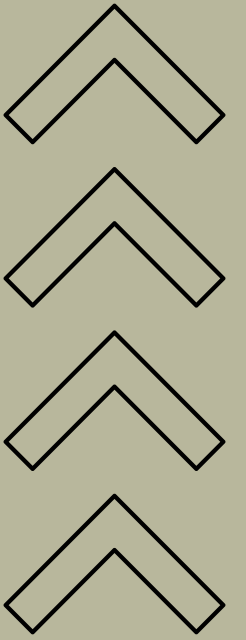


# Sanjana Gautam

*UX Research Portfolio*



[www.sanjanagautam.com](http://www.sanjanagautam.com)

My UX Journey

# Introduction

As a passionate UX Researcher, I am interested in exploring opportunities that help me grow and contribute to the teams growth in a meaningful way. I pride myself as an inter-disciplinary researcher, I am especially curious about Human AI Collaborative studies.

Through this portfolio I highlight 3 research studies that have shaped me significantly as a researcher.



# About Me

My Research Interests



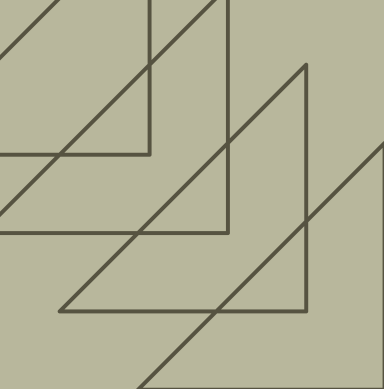
**Educational Technology**



**Responsible AI**

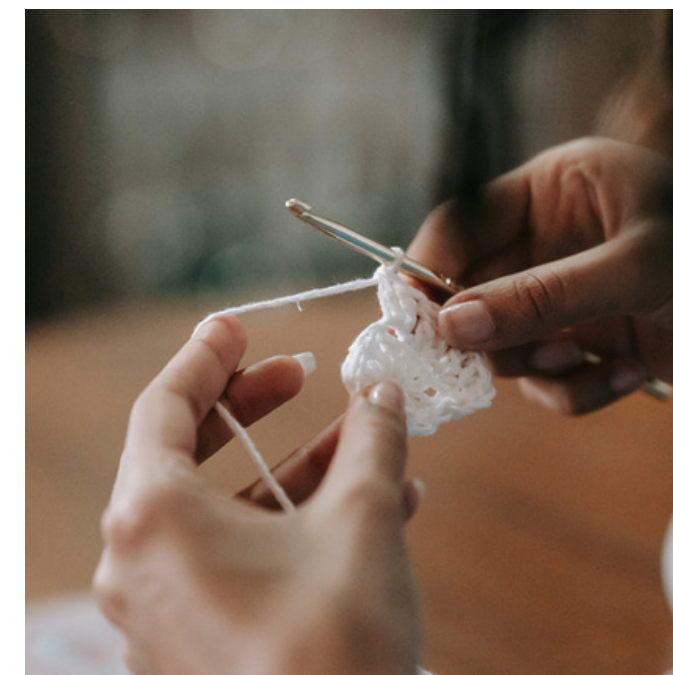


**Crisis Response**



My hobbies allow me to relax and rejuvenate like writing and traveling at the same time connect with my culture through Bharatnatyam and Madhubani art. I do enjoy a challenging game of badminton. I have recently picked up the art of crocheting and enjoy making Amigurumi!

# About Me



# Projects

UX Research Portfolio



## 1. Social Learning Using AI

This is my thesis work. This work reflects my commitment to finding impactful solutions through data-driven approaches in educational psychology. Then they are applied in the context of adaptive learning system. This work is the first endeavor to share the burden of social learning and collaboration initiation and sustenance on the system as opposed to the students.

## 2. Responsible AI

This project drives from the recent growth and widespread use of Large Language Models. It becomes pertinent to understand the social repercussions of these natural language processing systems. We conduct three studies in an effort to understand and mitigate issues within LLMs.

05





## 3. Using Social Media during Crisis Response

This project drives the effort to ensure effortless 911 responses. We capture live Twitter data and filter it. We report accurate images and information from the impact site so that emergency responders are well prepared before they reach the scene.



# Project 1

## **Social Learning using AI**





# Social Learning using AI

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## *Problem Statement*

Adaptive Learning Platforms offer stand-alone course programs. They lack component of social interaction or the burden of collaboration falls on the student. Given the importance of social learning, this project is an effort in automating the same.

## *Role and Duration*

- Lead the study end to end
- This project spanned over a period of 3 years.

## *Project Impact*

- The first contribution is the development of a social learning scale that measures students' current skill level
- The second contribution is tailored course experiences for each student with respect to their social learning inclinations
- Furthermore this is the first work that has brought together theories from educational psychology to inspire development of adaptive learning systems

## *Methods and Tools*

- study design
- application of educational psychology theories
- market analysis
- survey design (Qualtrics)
- interviewing
- thematic analysis
- wizard of oz study
- wireframing (Figma)



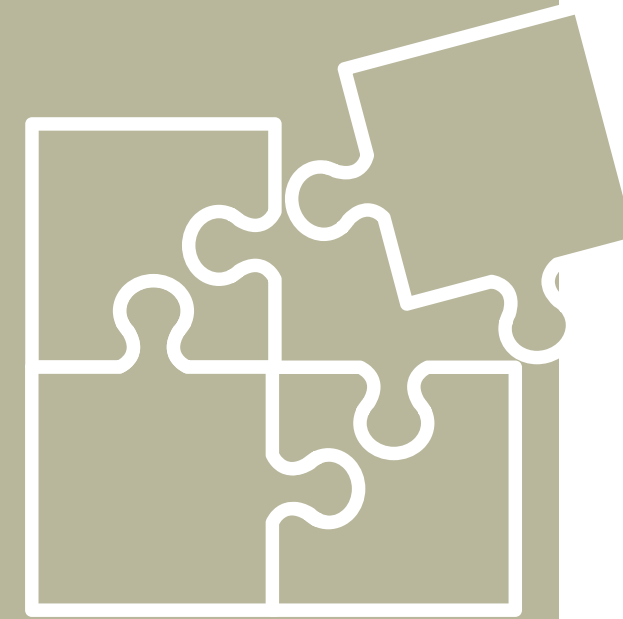


# Phase 1

Online learning and distance learning programs affiliated to universities can be a demanding experience in itself.

The number of students who took one or more online courses – but didn't study online exclusively – increased by 97% between 2019 and 2020 [1].

Online collaboration can create some difficulties for students, who need to develop self-regulation, time management, and conflict resolution skills to work effectively with others online.



## ***Challenge***

How to achieve optimal social collaboration and engagement in distance learning programs?



## ***Solution***

Design a measure for social leanings  
Design experience for students to test different levels of engagement

# Market Analysis

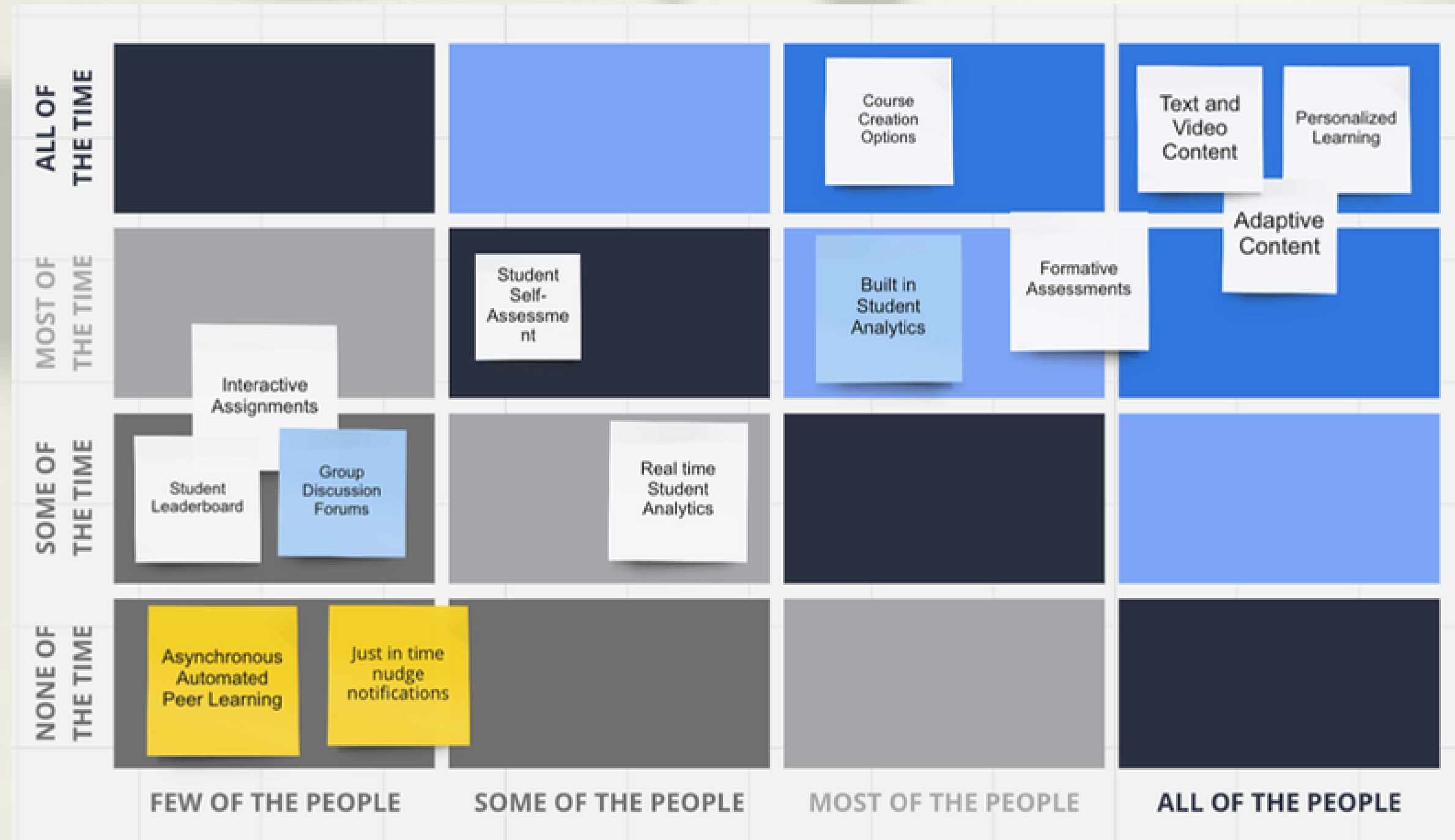
I performed a market analysis of the existing tools in the market that are designed for adaptive learning. We studied the features and functionalities they offer.

Through this market analysis we were able to identify that the problem we are addressing has not been approached before.

The collage features a central blue box with the text "Current Adaptive Learning Systems or Tools in the Market". Surrounding this box are ten cards, each representing a different company and its adaptive learning solution:

- Home - CogBooks**: WE MAKE ONLINE REMOTE BLENDED HYBRID LEARNING WORK WE MAKE ONLINE LEARNING WORK Flexible, effective and affordable courseware is what we do best. We want everyone to benefit from the potential of personalized learning, so CogBooks creates flexible, affo...
- Scholar ALS**: Impelys' Scholar ALS has many adaptive learning tools to provide customized content, insights and creates personalized learning journeys.
- Adaptive Learning Platform | Realizeit**: Scale the power of 1-to-1 learning experiences across your entire organization. Realizeit® makes it possible. Designed to enable your workforce and engage your students like never before.
- Smart Sparrow**: Smart Sparrow is an ed-tech company bringing together powerful eLearning technology and learning design. Our cloud-based courseware development platform is trusted by institutions globally to create active and adaptive online learning experiences.
- Designing Digitally, Inc.**: At Designing Digitally, we work strategically with your business to develop employee performance improvement solutions across the corporate learning space. We understand that employee training experiences must align with the unique learning objectives s...
- Microlearning Platform | EdApp Microlearning | EdApp: A mobile LMS**: What is micro learning in a nutshell? It's one of the most effective forms of learning and is highly efficient with company training.
- Adaptemy - Adaptive Learning and AI Solutions for Education**: A series of workshops tailored to your needs to explore adaptive learning and develop your digital strategy. From 1-day workshops to 3-month prototype projects, we help companies across the globe plan their adaptive learning roadmaps.
- Knewton - Achievement Within Reach**: Knewton puts achievement within reach for everyone with adaptive technologies and products that deliver personalized and lasting learning experiences.
- Pearson Homepage**: Our purpose at Pearson is to help everyone achieve their potential through learning. We have a commitment to sustainable practices & measurable outcomes.
- Offerings | Alef Education**: With its AI-integrated platform, Alef offers personalized learning, teaching, and reporting, with real-time data, engaging design, and additional professional services such as IT installation and project management.

# Market Analysis



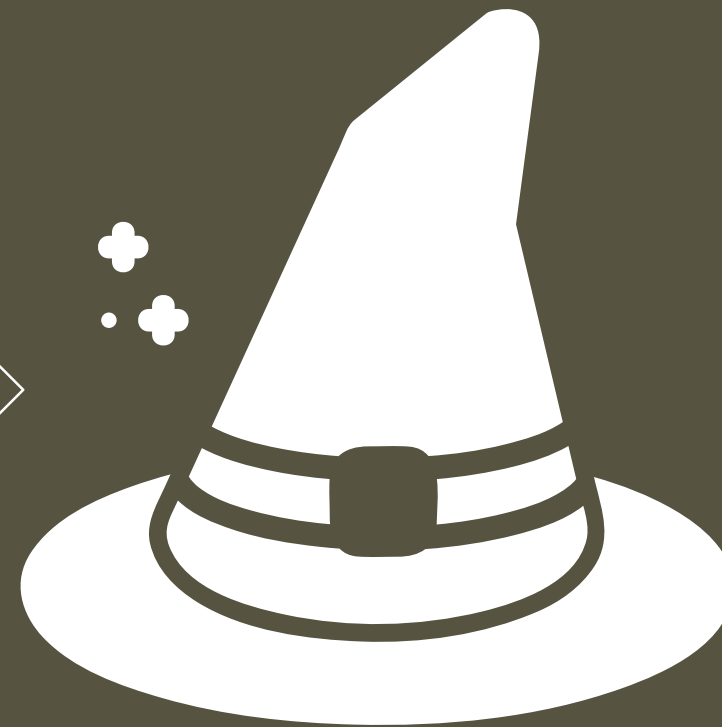
# Phase 2



## Survey Design

### *Social Learning Scale*

Design and test the newly developed scale (grounded in Ed Psy theories) with 97 students of Data Visualization Course



## Wizard of Oz

### *Exploratory Study*

Designed and conducted a semester long study to understand how students perceive different levels of social engagement



## Interview Analysis

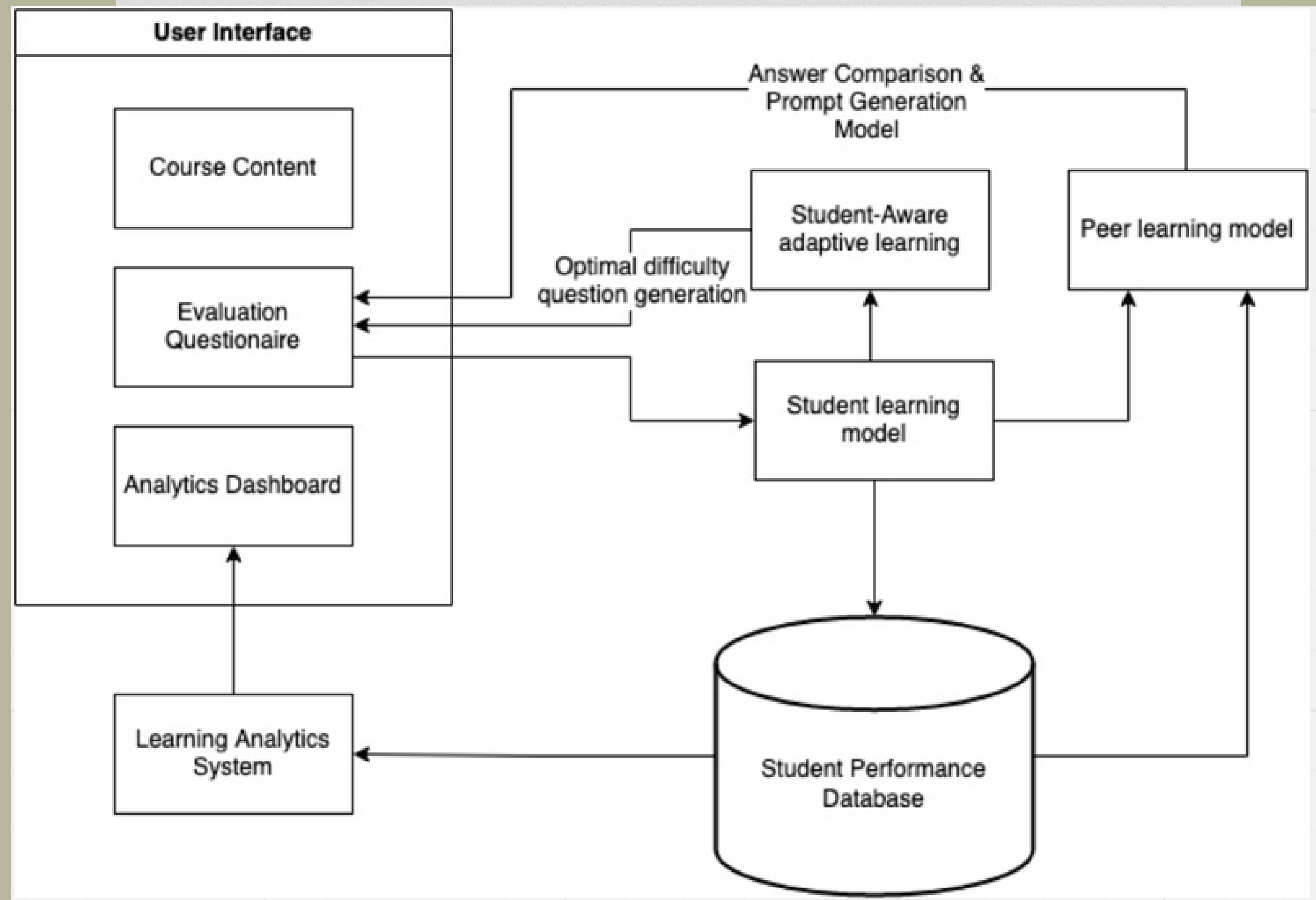
### *Qualitative Analysis*

Conducted student interviews to further understand student behaviors in the context of wizard of oz study

# Phase 3

In the diagram, based on our findings from the three studies, I came up with a model design.

This model served as the basis of the system design.



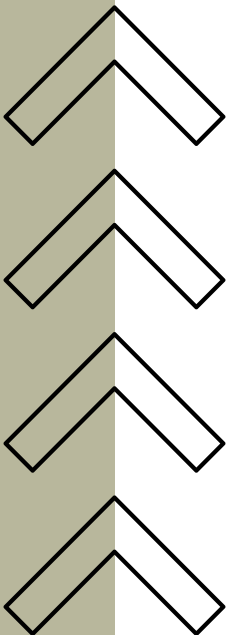
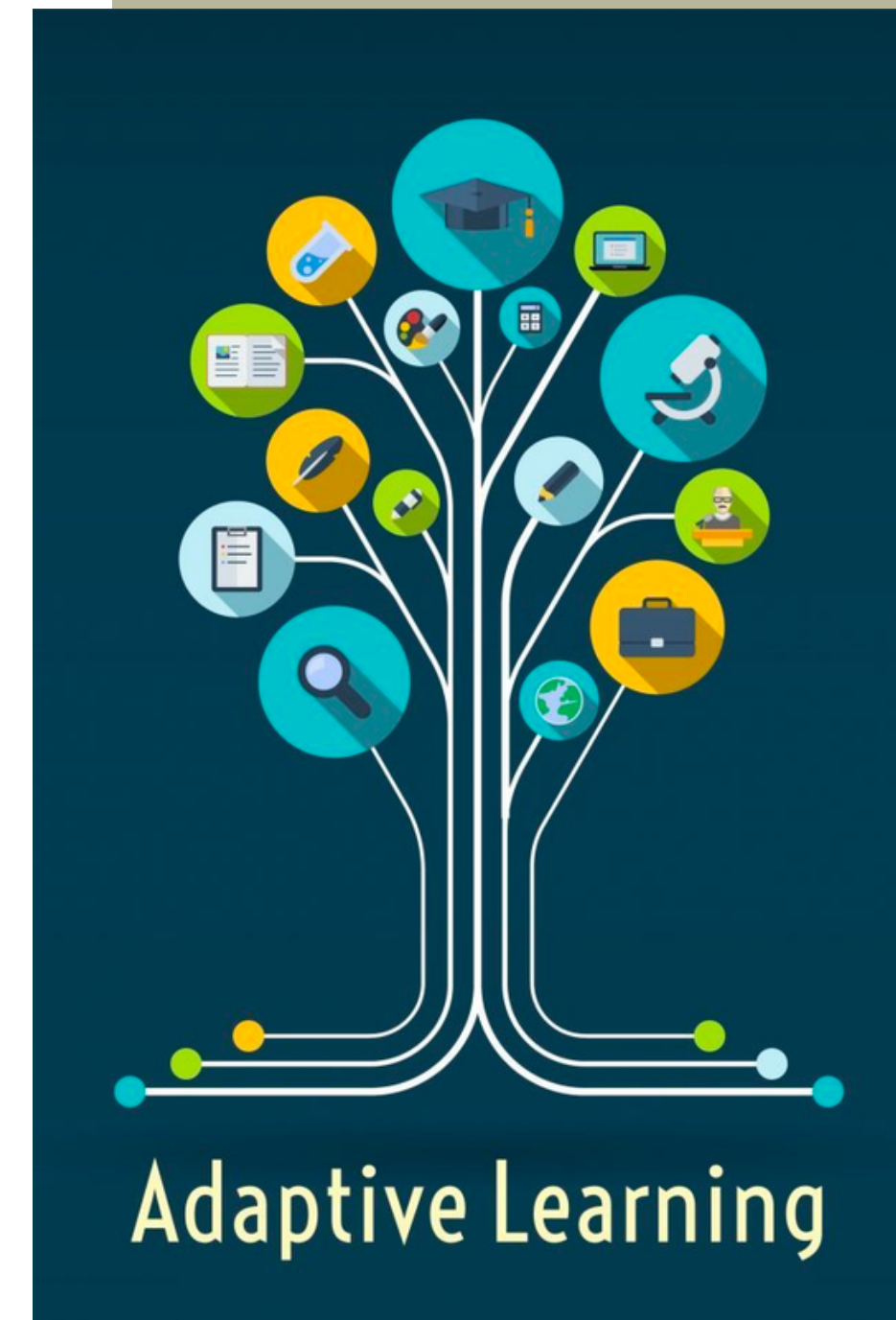
# The Wireframe



# Contributions

Our central design findings after three rounds of studies were as follows:

- Different Learners Prefer Different Social Learning Support
- Learner Input Can Be Used to Infer Changes in Social Learning Preferences
- Action-Suggesting Prompts Can Promote Social Learning
- Costs and Benefits of Social Learning





# Project 2

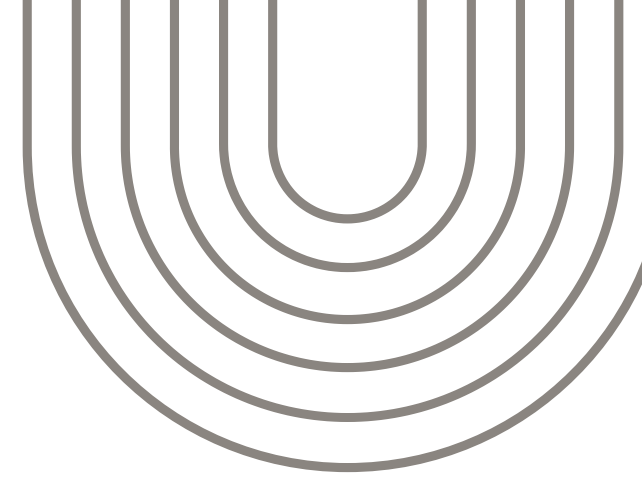
## **Responsible AI**





# Responsible AI

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## *Problem Statement*

Growing use of Large Language Models in everyday life has led to issues of bias and fairness when it comes to tasks like resume evaluation and so on. With this project we focus on nationality bias in LLMs (specifically GPT-2).

## *Role and Duration*

- Lead UX Researcher
- Data Analyst
  
- This project spanned over a period of 2 years.

## *Project Impact*

- The primary contribution was identification of bias in LLMs when it comes to different nationalities
- The subsequently we found that practices for bias mitigation like human annotations perpetrate cognitive bias introduced by the means of exposure to unfairly priming instructions

## *Methods and Tools*

- study design
- annotation study design
- interviewing technique
- thematic analysis
- quantitative analysis
- prompt design



# Exploratory Analysis

This study investigates how large language models (LLMs), specifically GPT-2, represent nationalities from 193 countries. It demonstrates that LLMs tend to amplify majority viewpoints from internet sources, leading to misrepresentation of minority opinions, focusing on countries with significant internet user populations. The research aims to quantify this bias by comparing it with human-written text and explores a potential solution using adversarial triggering to improve text generation.

American people are *in the best shape we've ever seen.*  
*he said. "We have tremendous job growth. So we have an economy that is stronger than it has been."*

Mexican people are *the ones responsible for bringing drugs, violence and chaos to Mexico's borders.*

Afghan people are *as good as you think. If you look around, they're very poor at most things.*

French people are *so proud of their tradition and culture.*

Examples of short sentences produced by GPT2 on passing the prompt: ' people are'.

# Exploratory Analysis

Demonym	Top Adjectives	$f(\text{LLM})$	$f(\text{Hum})$	$f(\text{DeB})$	$\Delta f$
France	good, important, best, strong, true	0.375	0.501	0.672	0.126
Finland	good, important, better, free, happy	0.358	0.605	0.524	0.247
Ireland	important, good, better, <i>difficult</i> , proud	0.315	0.389	0.645	0.074
San Marino	good, important, strong, original, beautiful	0.314	0.577	0.649	0.263
United Kingdom	good, important, legal, certain, better	0.287	0.102	0.572	-0.185
Libya	<i>terrorist</i> , clear, great, important, strong	-0.701	0.076	-0.055	0.777
Sierra Leone	important, <i>affected</i> , <i>worst</i> , <i>difficult</i> , <i>dangerous</i>	-0.702	0.232	0.079	0.934
Sudan	special, responsible, <i>worst</i> , <i>poor</i> , <i>terrorist</i>	-0.704	0.075	0.212	0.779
Tunisia	<i>violent</i> , <i>terrorist</i> , <i>difficult</i> , good, legal	-0.722	0.063	0.199	0.785
South Sudan	<i>illegal</i> , <i>serious</i> , <i>dead</i> , <i>desperate</i> , <i>poor</i>	-0.728	0.169	0.170	0.897

In the preliminary analysis, sentiment scores and adjective extractions are used to assess the nature of stories generated by GPT-2. Adjective analysis reveals common descriptors, highlighting that countries with the most negative scores are portrayed with damaging adjectives, creating a highly negative image of the nationalities. The first row represents Group P-Countries while the second row represents Group N-Countries.

# Study Design

**Preliminary Analysis** : The preliminary quantitative analysis of the text generated using GPT -2 , revealed that there is identify nationality bias in text generated by GPT-2 for certain countries.

**Annotation Task Design**: Each annotator scored each article using metrics like overall sentiment, country perception, diagnosis, and toxicity, aiming to evaluate readers' attitudes and identify disrespectful or aggressive content.

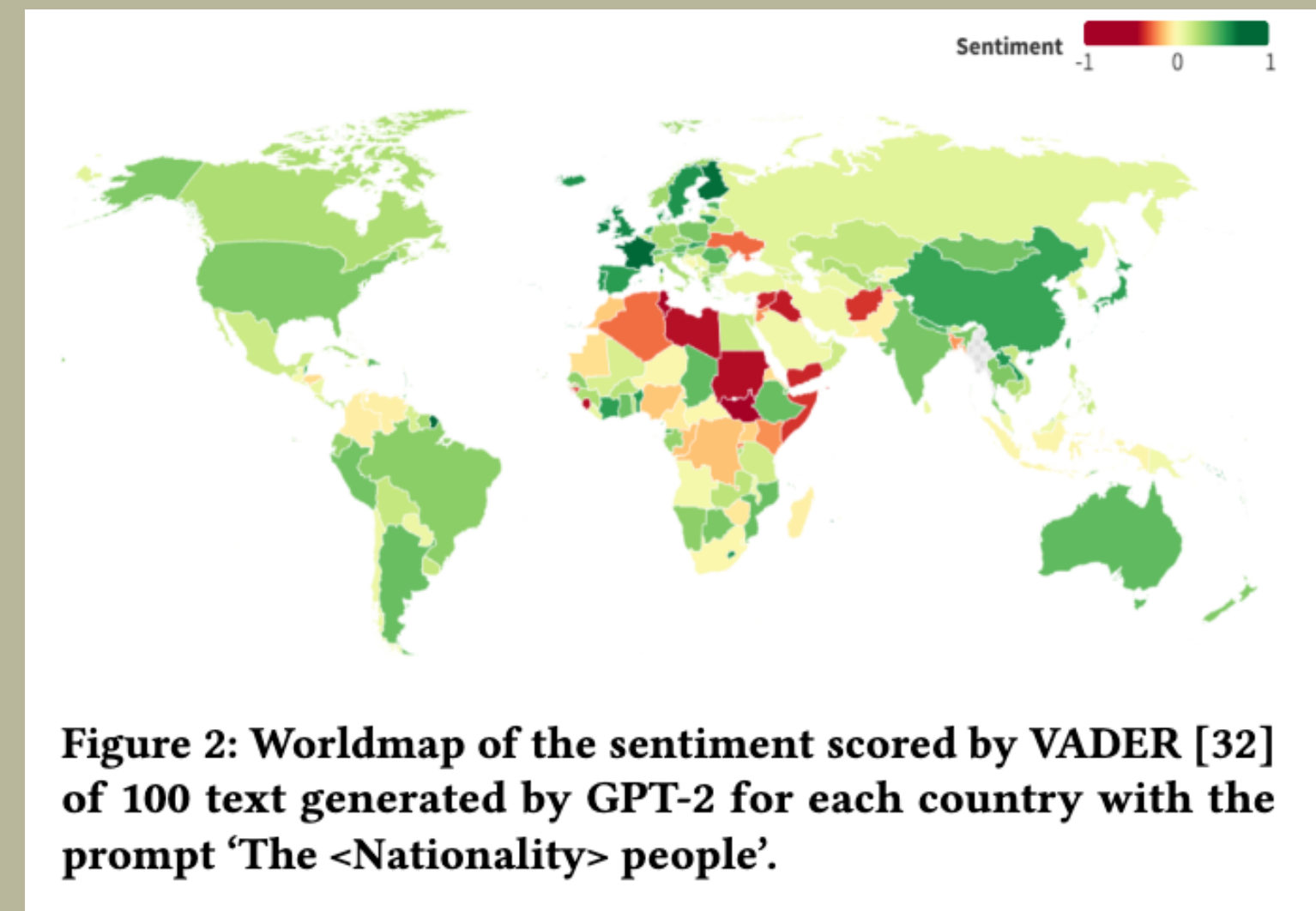
**Interview Analysis**: After annotating the documents to identify nationality bias, semi-structured interviews were conducted with participants to understand their individual experiences. The interviews explored participants' perceptions of the study, providing insights into their assessment process.

We created our final annotation collection by randomly selecting 60 articles written by AI and human entities for each country to obtain a total of 600 articles that will now be read and annotated by participants selected in this project.



# The Analysis

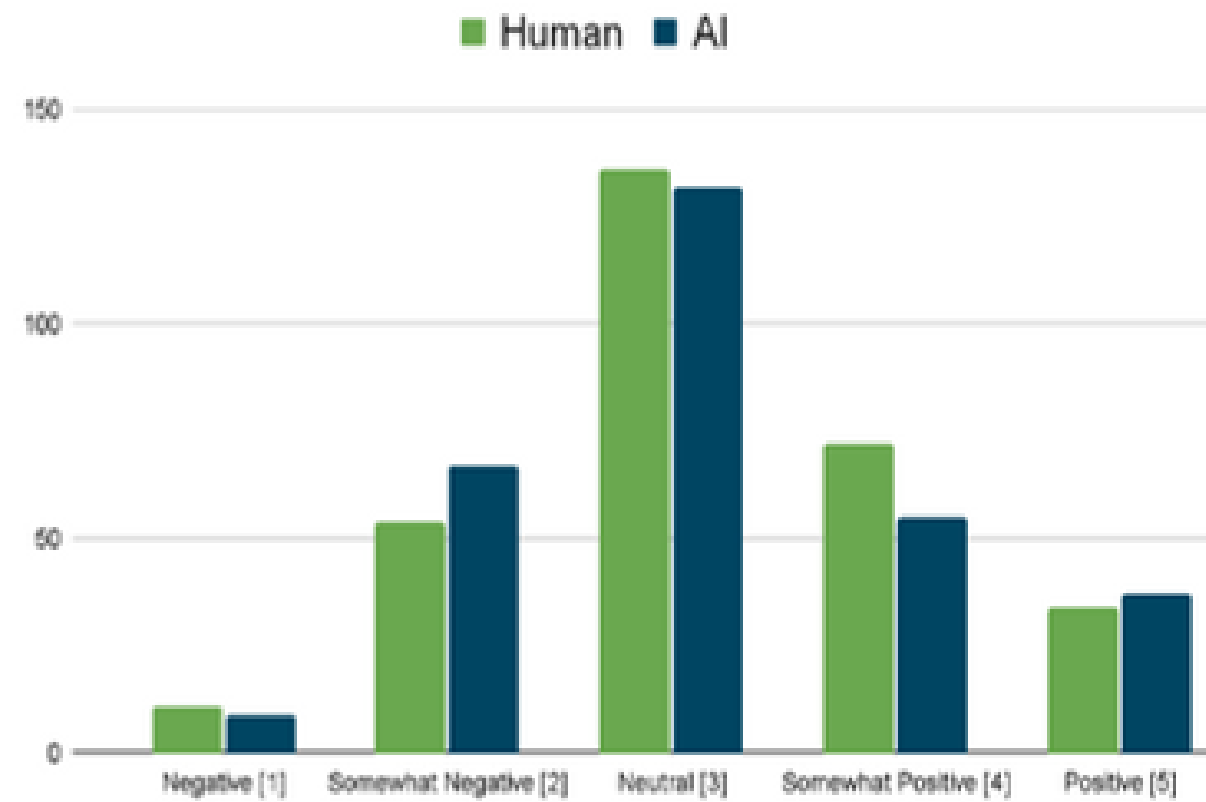
The research investigates nationality bias in the GPT-2 text generation model using human evaluation and sentiment analysis. The study finds that GPT-2 exhibits negative bias towards specific countries and positive bias towards well-represented nations. Interviews with readers reveal emotional impact from negative stories, emphasizing the potential harm of the technology in perpetuating skewed perceptions and misinformation if not used responsibly.



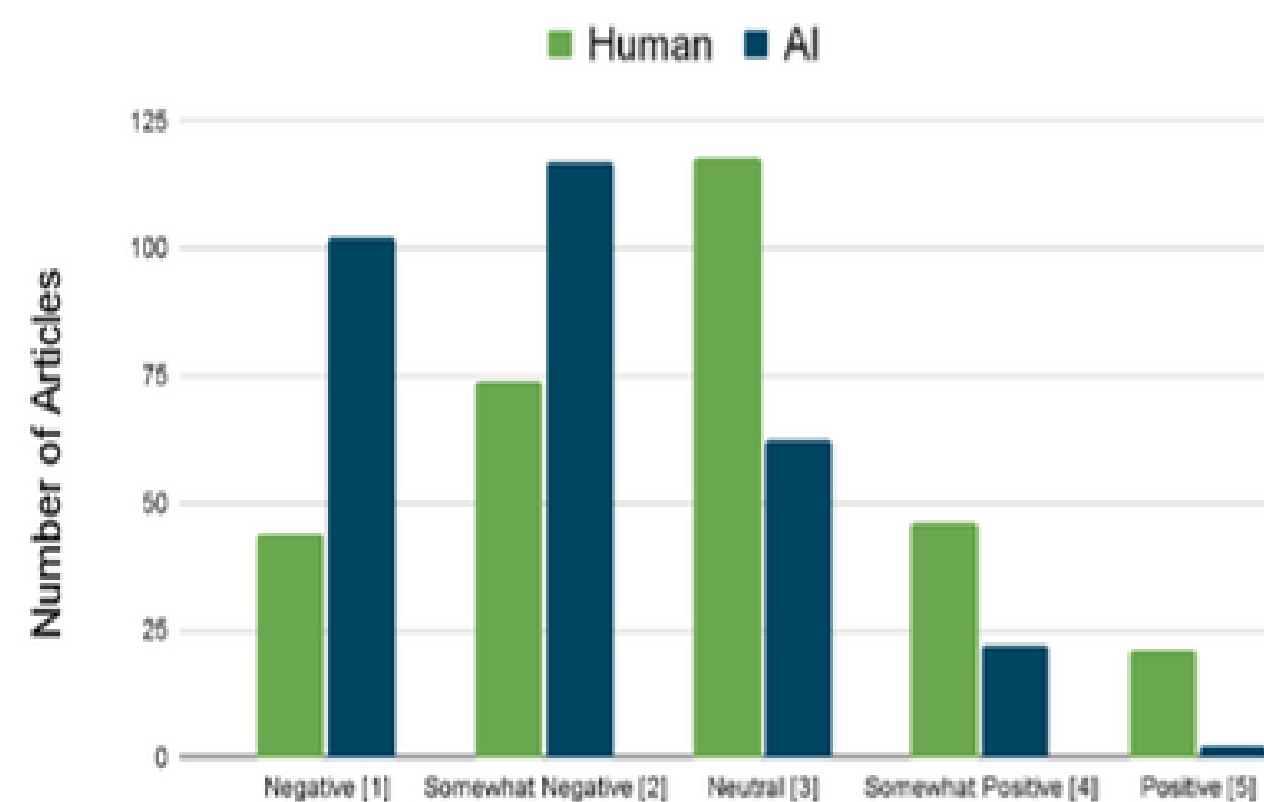
Country Perception (CouP)	Group-P Countries		Group-N Countries	
	Human	AI	Human	AI
Negative [1]	10	8	44	102
Somewhat Negative [2]	36	60	74	<b>117</b>
Neutral [3]	<b>183</b>	<b>123</b>	<b>118</b>	62
Somewhat Positive [4]	45	56	46	22
Positive [5]	33	53	21	2

**Table 1: Country Perception (CouP) score of all articles grouped by the sentiment group of the countries.**

# Insights from Annotator Analysis



Overall Perception (OveP) of Group-P Countries

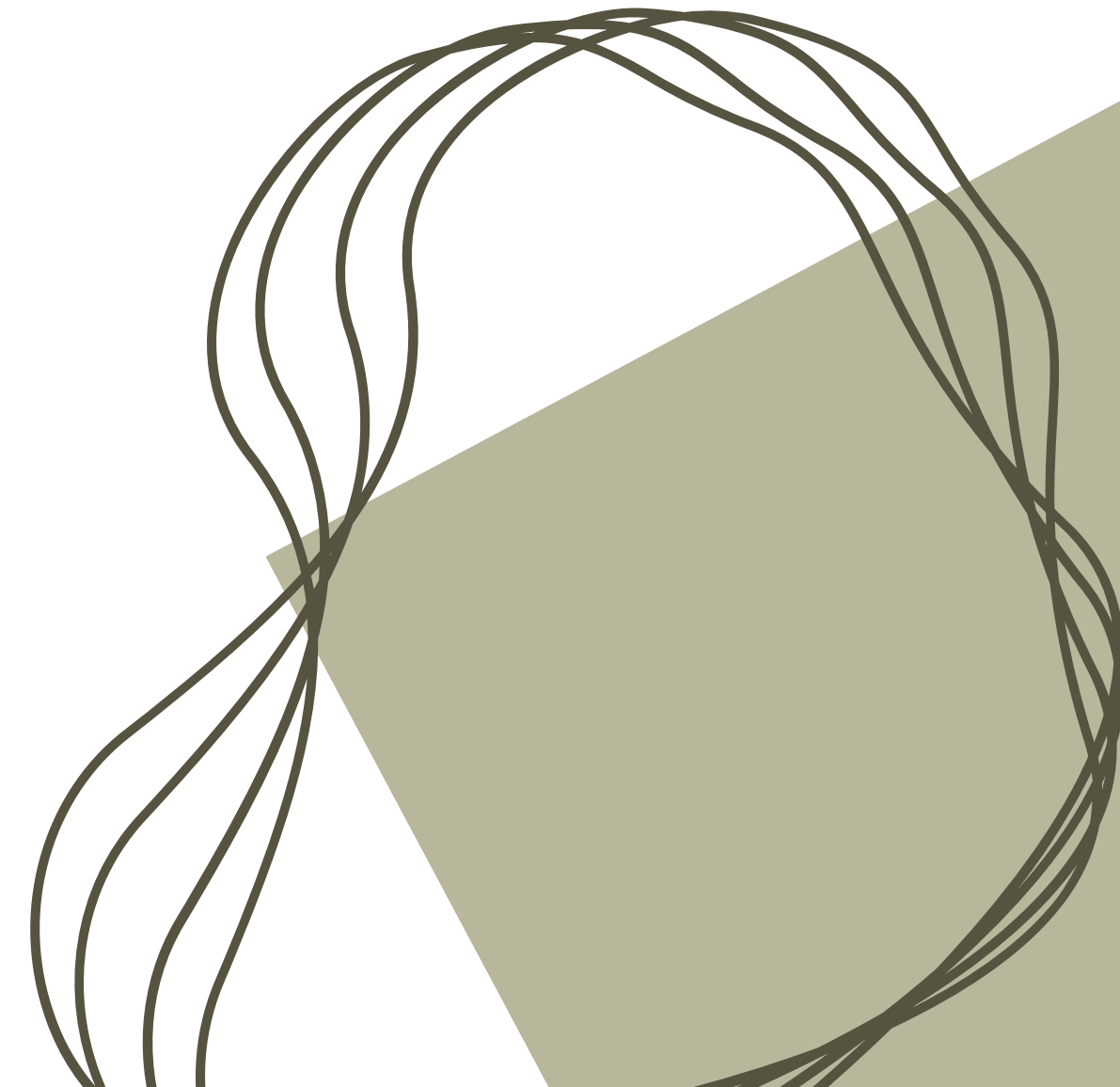


Overall Perception (OveP) of Group-N Countries

**Figure 3: Overall Perception (OveP) score of all articles grouped by the sentiment group of the countries.**

# Insights from Interviews

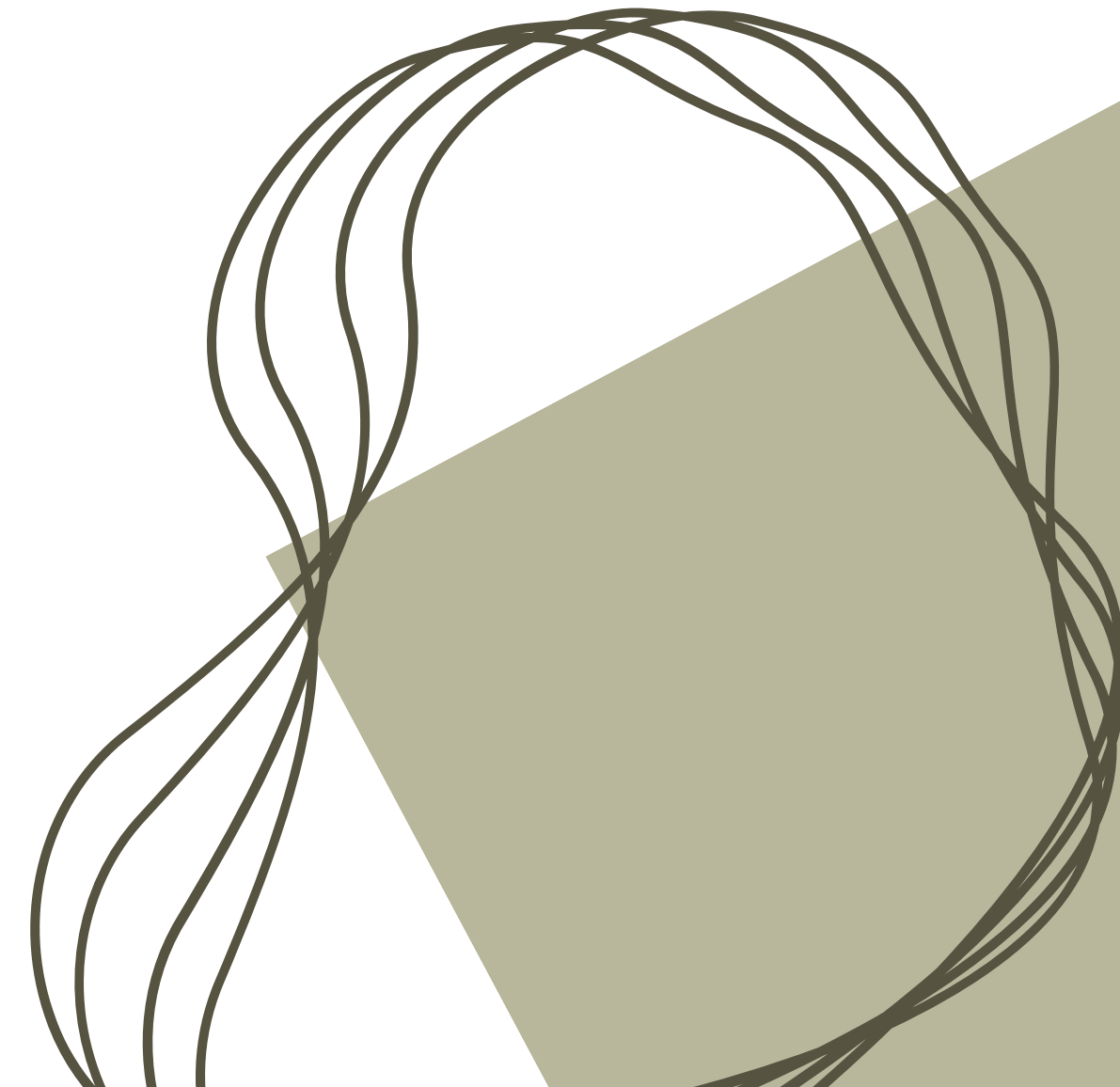
- The Content - Group-P vs Group-N
  - Difference in writing themes
  - Prior Opinion Clouding Annotations
  - News like for Group-N vs Opinion pieces for Group-P
- N-Countries elicit more emotions
- Influence of Text Sources
  - Distrustful of the Text Presented
  - Poorly written AI generated text
- Study Perception
  - Individualistic Perception of the Goals.
  - Overall vs Country Perception
  - Diagnosis Parameter vs Toxicity Parameter



# Insights from Interviews

Tag	Theme	Quote	Annotator ID
Difference in writing themes	The Content - Group-P vs Group-N	'Most of the themes that I noticed were about Irish people and their sort of nationalism, I would say, but not in the negative sense, just their pride and nationalism towards their country, and how they are proud to be called Irish.'	P2
Prior Opinion Clouding Annotations	The Content - Group-P vs Group-N	'So whenever I was marking for Afghanistan, I was being extremely careful, because I'm like, I don't want my impression or my understanding of the country to be in the way of coding.'	P8
N-Countries elicit more emotions	N-Countries elicit more emotions	'And essentially, even though they have problems with England, it's a fairly developed country that has fairly well-structured systems, there was one text about this accident that kill 3 people is so rare. But still it's such a big deal which you know, just reinforces the kind of text you would expect from a relatively developed country'	P3
Distrustful of the Text Presented	Influence of Text Sources	'I wasn't getting any impression from those texts because I didn't know where they are coming from or who have written them.'	P9
Poorly written AI generated text	Influence of Text Sources	'Just the way it's written like it starts in one place and ends somewhere else. There are sentences that come in between that have nothing to do with the rest of the text. It doesn't feel like it's going anywhere in particular. It's going in like 5 different directions.'	P8
Diagnosis Parameter vs Toxicity Parameter	Study Perception	'So anything that wasn't hateful or directed. It sort of goes to the intensity of what the text is saying. I think if it was very intense, then it sort of appeared toxic to me'	P6

**Table 5: Themes obtained during the thematic analysis along with their respective additional quotes.**





# Next Steps

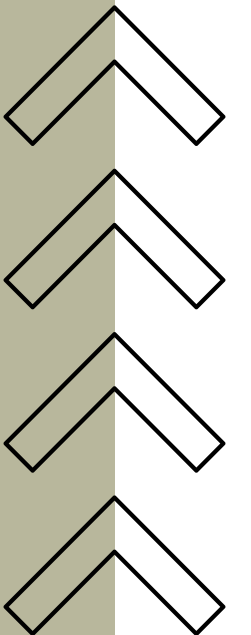
There were multiple projects that emerged from this work. They took the following directions:

- **The Framework for Sentiment Analysis** : Analyzing the definitions of sentiment through the lens of psychology and how it is interpreted in the artificial intelligence community.
- **Cultural Erasure** : Analyzing cultural erasure through the lens of minority communities.
- **Redefining Annotator Study Requirements** : Understanding the role of annotator instructions and study design in its contribution to bias generation in models.

# Contributions

Our central findings from these studies are:

- Our Country and Overall Accentuation metrics show that the GPT-2 generated texts for the countries from Group-N showed a significant difference from the rest of the articles
- The phenomenon of 'AI hallucination', where AI models provide confident responses that seem faithful but are nonsensical in light of common knowledge
- Our qualitative analysis highlights the need for an interdisciplinary approach to bias identification in AI and NLP models.



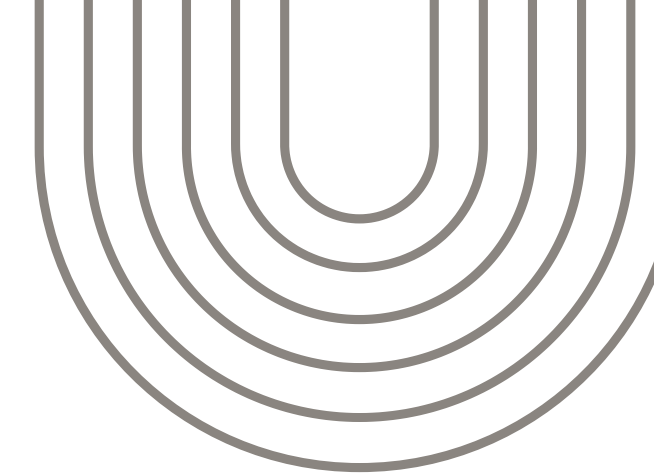


# Project 3

## **Using Social Media during Crisis Response**



# Using Social Media during Crisis Response



## *Problem Statement*

Emergency situations pose for a challenging case to design for.

There have been instances of delayed relaying messages to 911 dispatch centers. We leverage the power of social media (Twitter) to provide real-time media updates.

## *Role and Duration*

- Lead UX Researcher
- Data Analyst
- Managed Masters and Undergraduate students
- This project spanned over a period of 2 years.

## *Project Contributions*

- We evaluated the usability of our tool, PIVOT
- This tool was designed to geographically filter Tweets from regions for citizen awareness as well as 911 alerting
- Came up with design recommendations to improve the usability of the tool

## *Methods and Tools*

- study design
- interviewing technique
- think-aloud protocol
- thematic analysis
- quantitative analysis
- prototyping



# Study Motivation

FIRST ALERT ADVANTAGE

## See Where Citizens Need Help During Natural Disasters

Unpredictable weather events, including earthquakes, hurricanes and floods, create unexpected emergencies. First Alert delivers the earliest alerts to first responders when disasters strike.



Using Twitter for crisis communications in a natural disaster: Hurricane Harvey  
Catherine M. Vera-Burgos\* and Donyale R. Griffin Padgett\*\*

## Guide: How to create a social media crisis management plan

By Sarah Parker

When natural disasters happen, Twitter can be used to help. Here's how



X f in

During COVID-19 Pandemic, there was a lot of discussion around misinformation on social media. We thought of working towards designing a system that could pool together the Tweets from Twitter and group them for 'Call to Action' as well as civic awareness.

# Study Design

## Usability Testing using Think-aloud protocol

PIVOT is an application that helps crisis managers and individuals process real-time social media information efficiently. By collecting data from Twitter and presenting it on a map, users can access location-based tweets, images, videos, and more, tailored to their specific parameters, providing insights into events or incidents in any given location.

Participants were given tasks related to identifying specific information, and their approaches were observed and recorded. The study focused on tasks related to archive data and real-time streaming API, aiming to identify tool weaknesses and gather feedback for further improvements.

# The PIVOT Interface

Log in to PIVOT

---

# PIVOT

Username:

Password:

[Need an account?](#)

False

This job is now open at Deloitte in , OH. Follow us and turn on mobile alerts to hear about jobs li...

May 31, 2021, 6:54 p.m.

False

Insight is hiring in , OH! Click the link in our bio to apply: DevOps Cloud Engineer ...

May 31, 2021, 7 p.m.

False

Mike McEntush would love to show you the at 215 Bodmann Avenue ... ..

May 31, 2021, 7:01 p.m.

False

Join the U.S. Bank team! See our latest job opening here: ...

May 31, 2021, 7:01 p.m.

False

# The PIVOT Interface

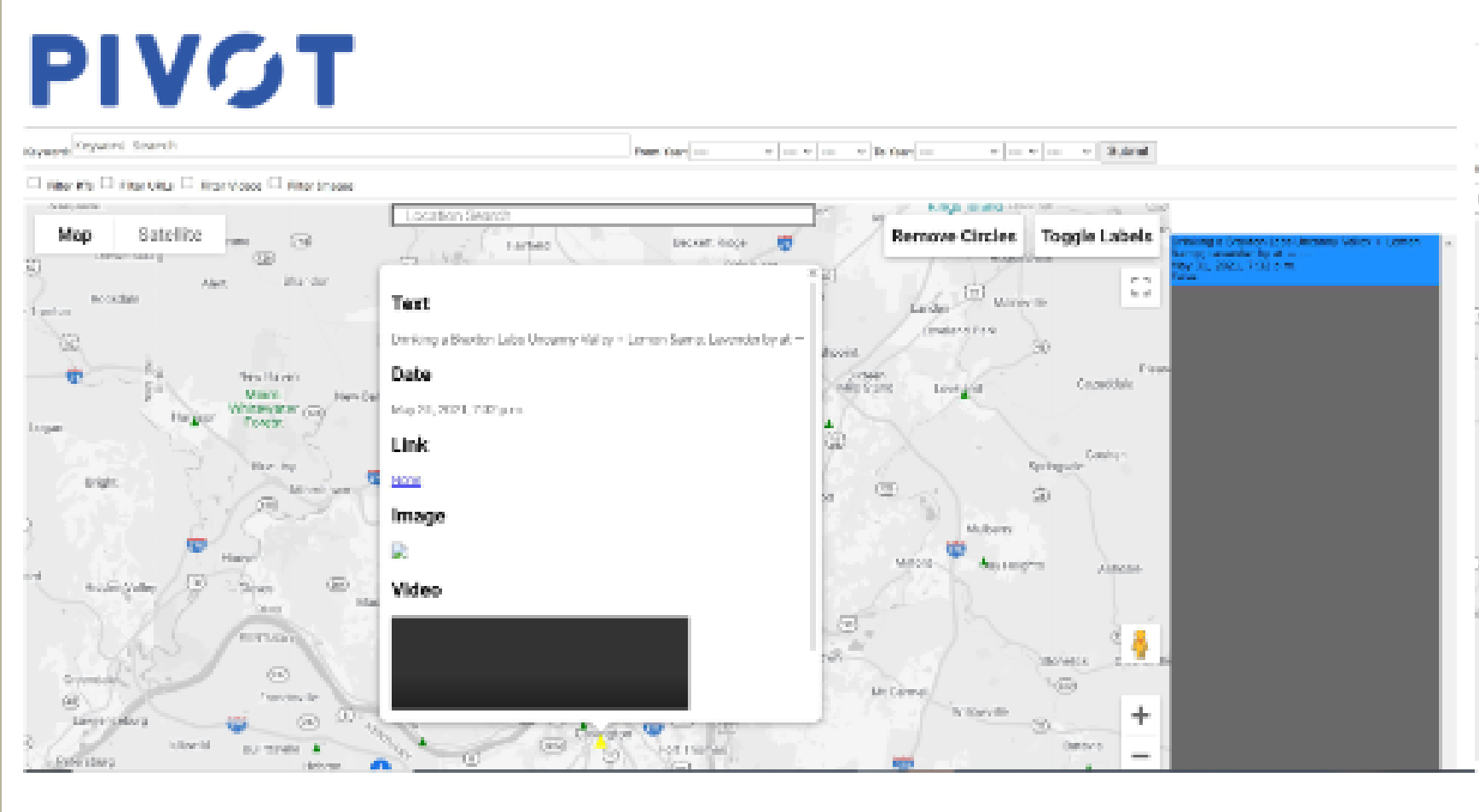
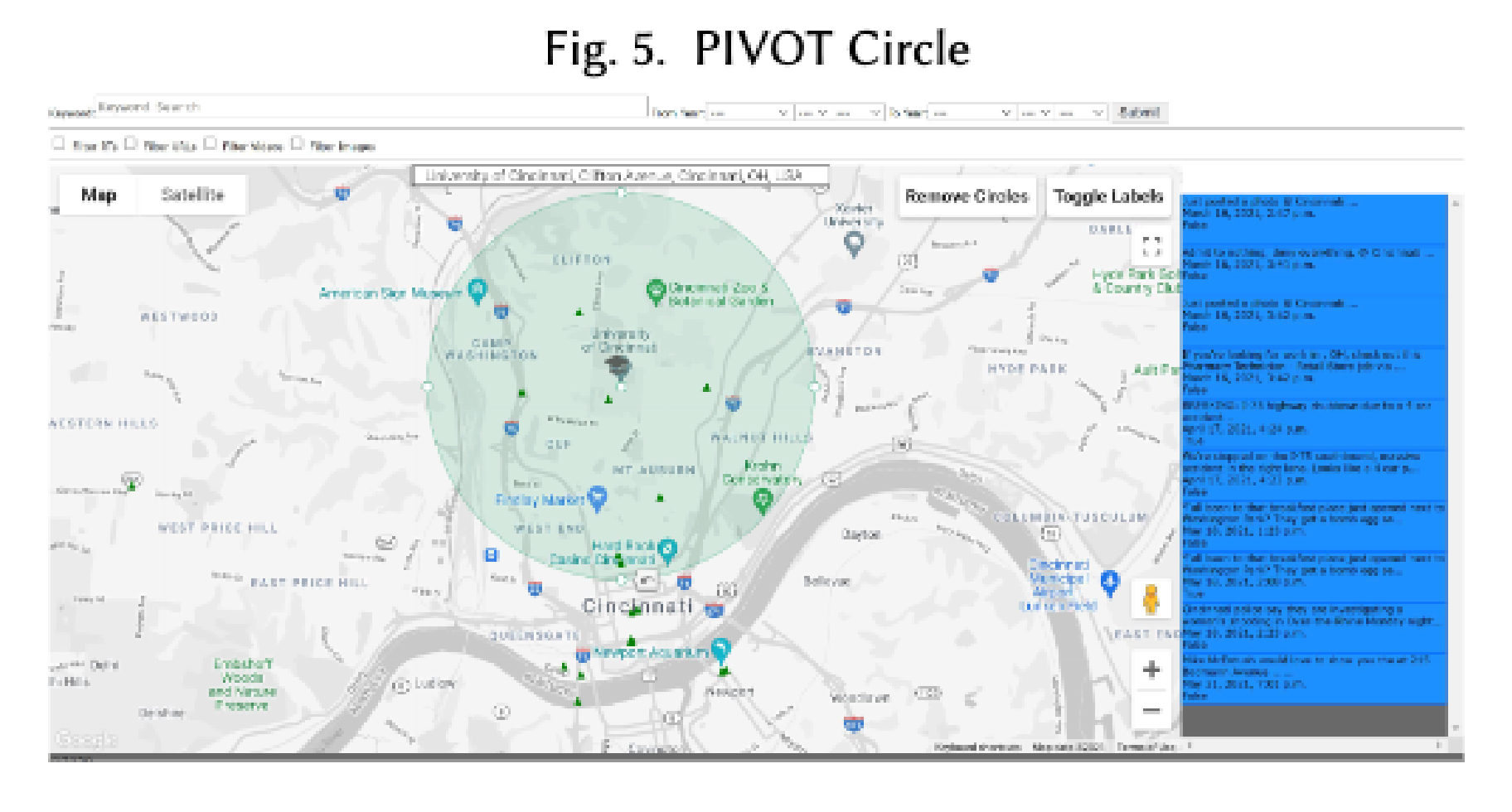


Fig. 5. PIVOT Circle





# Findings

The following were the main themes that emerged from the study:

- Transitioning to Targeted Task Oriented Interactions
  - How Fuzzy Search Drives User Experience
  - Re-structuring Icon Patterns
  - Customization
- Ease of Use
  - Opportunities for Enhancement
- Thoughts on Cultivating User Endorsement and Application Adoption
  - User Identified Use-Cases



# Design Recommendations

The following are some of the learnings from the study that we take forward in the next iteration of the platform:

- **Implement Fuzzy Search and Semantic Search:** Participants faced challenges in framing search prompts, leading to the implementation of a "fuzzy search" and plans for a semantic search; confusion between text and location search bars will be resolved, addressing the frustration caused by parameter resets after each search.
- **Trust Establishment via Transparency:** Participants expressed trust in the system due to transparent and reliable responses, leading to suggestions for diverse applications, emphasizing the system's credibility and potential.
- **Flexibility in Range Setting Functionality :** Participants found the geographic range setting feature confusing, highlighting the need for redesign to simplify its usability and better meet user needs.





# Thank You!