Craft of Research

Week 7: Practice Poster Presentations

Instructor: Yvonne Farah

Practice Presentation

- 3 minute elevator speeches with a draft of project (one slide)
- All group members must present
- Feedback given

Why Choose a Poster Presentation?

- Provides a visual summary of research
- Engages with a diverse audience
- Facilitates networking and collaboration opportunities
- Offers a chance to receive feedback and insights from peers and experts

Key Elements of an Effective Poster Presentation:

- Title
- Introduction
- Methods
- Results
- Discussion
- Conclusion and Future Directions

Title:

- Clear and concise, conveying the main idea of the research
- Large and easily readable font

Introduction

- Provides background information and context for the research
- Includes research objectives and hypotheses

Methods:

- Describes the research design, data collection, and analysis methods
- Use visuals like diagrams, charts, or tables to present complex information

Results:

- Presents the key findings of the research
- Use graphs, charts, or images to illustrate the results
- Highlight the most important data points

Discussion:

- Analyzes and interprets the results
- Relates the findings to existing literature or theories
- Discusses the implications and significance of the research

Conclusion and Future Directions:

Summarizes the main findings and their implications

- Suggests potential avenues for future research

Design Tips:

- Use a clean and organized layout
- Choose an appropriate color scheme
- Incorporate visuals, but avoid overcrowding the poster
- Ensure text is legible from a reasonable distance

Miro for Poster Presentation Layout

- Provides a virtual canvas for easy poster creation and collaboration.
- Offers a range of tools and features for visual appeal and engagement.
- Facilitates seamless collaboration with team members or classmates.

Engaging Your Audience:

- Practice a concise and engaging oral presentation
- Use visuals strategically to complement your speech
- Encourage questions and discussions
- Be prepared to summarize your research in a brief elevator pitch

Samples:

Artificial Intelligence Bias Regulation Aggregator

Michelle Chang, Maryam Dawood, Hannah Gonzalez, Katie Sie
Mentors: Hoda Heidari and Anna Kawakami

Codebase

Background

- The **US government** has taken a **distributed/fragmented** approach to **AI regulation** thus far.
- Some states have enacted their own laws and regulations, while other federal agencies are actively working toward national frameworks.
- **AI-based tools** are rapidly proliferating across the United States, for example, in **high-stakes domains** such as predictive policing, child maltreatment risk assessments, and emotion recognition.
- These tools have been met with widespread **contention**, with researchers and community members alike raising concerns around **bias and fairness**.
- The goal of this project is to understand **how federal and state-level agencies currently regulate their uses of AI, to prevent and remedy *biased* and *discriminatory* patterns.**

Research Questions

Focusing on publicly available information on gov websites:

- What fraction of them contain **relevant** information?
- Among those, how many contained **concrete processes and guidelines** to guard against AI/ML bias?

Results & Discussions

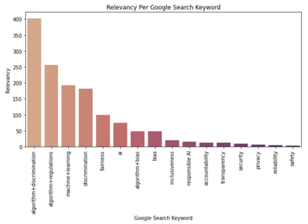


Figure 1. Queries vs. Frequency of Keywords Mentioned
Determined the best Google Search Keywords based on the frequency of the Keywords Mentioned from the URLs fetched.

Methods

Definitions

1. **Search keywords**: bias, discrimination, fairness, algorithm bias, algorithm discrimination, algorithm regulations, accountability, transparency, reliability, safety, privacy, security, inclusiveness, responsible AI, Machine Learning, AI
2. **Keywords mentioned**: bias, discrimination, fairness, algorithm, algorithmic bias, AI, Artificial Intelligence, algorithmic discrimination, algorithm regulations, Machine Learning, ML, inclusive, diverse, diversity

Data Collection:

1. Identify keywords to get the initial set of websites to scrape
2. Web crawling & scraping starting with the seed set, advanced search for .gov sites

Data Analysis:

1. **Quantitative Analysis: Scoring pages** according to their relevance
   a. For each of the pages, we scored based on the frequency of containing the *keywords mentioned.*
2. **Qualitative analysis: Analyze** the top 10 manually.
   a. **Descriptive statistics** with counts and visualizations of most common relevant keywords and portion of keywords that relate to AI bias or other topics.
   b. **Qualitative analysis** of the scraped top K=10 documents

Future Experimentation

- Expanding the scope to other countries, e.g., .ca or .uk
- Contrasting our results for bias with a more established concept such as **privacy**
- Expanding relevance criteria to include external links

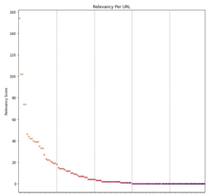


Figure 2. Relevance scores per URL. Analyzed scores to determine threshold of relevance (15), including the top quintile.

Title	Source	Goal	Suggested Practices
Blueprint for AI Bill of Rights: Algorithmic Discrimination Protections (2022)	White House Office of Science and Technology Policy (OSTP)	Prevent discrimination by algorithms and ensure systems are used and designed in an equitable way.	Proactive assessment of equity in design; Representative and robust data; Guarding against proxies; Ensuring accessibility during design, development, and deployment; Disparity assessment and mitigation; Ongoing monitoring and mitigation.
The Americans with Disabilities Act and the Use of Software, Algorithms, and Artificial Intelligence to Assess Job Applicants and Employees (2022)	U.S. Equal Employment Opportunity Commission	Protect individuals with disabilities against computer-based tools that assist in hiring workers, monitoring worker performance, determining pay or promotions, and establishing the terms and conditions of employment.	Provide situations in which employers handle people with disabilities in regards to computer based tools and how in certain scenarios those with disabilities can be affected by algorithms.
Algorithmic Justice and Online Platform Transparency Act (2021)	U.S. Senate	Prohibit the discriminatory use of personal information by online platforms in any algorithmic process, and require transparency in the use of algorithmic processes and content moderation, and for other purposes.	Prohibit algorithmic processes on online platforms that discriminate; Establish a safety and effectiveness standard for algorithms; Describe the types of algorithmic processes they employ and the information they collect; Maintain detailed records describing their algorithmic process; Publish annual public reports detailing their content moderation practices.
Towards a Standard for Identifying and Managing Bias in Artificial Intelligence (2022)	National Institute for Standards and Tech (NIST)	Root out bias in artificial intelligence and require addressing human and systemic biases.	Plan a series of public workshops at drafting a technical report for addressing AI bias and connecting the report with the AI Risk Management Framework.

Figure 3. Qualitative Analysis of Top 4 Most Relevant URLs. Out of the top 10 URLs, 4 URLs were relevant to our research focus. All URLs contained recommended practices and processes to mitigate algorithmic bias and discrimination.

Carnegie Mellon University
School of Computer Science

IOWA STATE UNIVERSITY
Chemical and Biological Engineering

Honors Poster Session
April 26, 2017

Catherine Le Denmat[1], Dr. Kaitlin Bratlie[1,2,3]

1. Department of Chemical and Biological Engineering, Iowa State University
2. Department of Materials Science and Engineering, Iowa State University
3. Ames National Lab, Ames, Iowa

Fibroblast to myofibroblast differentiation on modified poly-L-lysine surfaces

Background

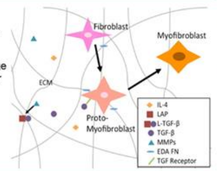
The **foreign body response** to implanted devices is responsible for encapsulation of the device[1], often hindering its function for patients.

- **Transforming growth factor β (TGF-β)** is involved in fibrous capsule formation[2,3]
- **TGF-β leads to the differentiation of fibroblasts into myofibroblasts.**[2,3] Myofibroblasts secrete large amounts of collagen and express α-smooth muscle actin, a cytoskeletal protein that enables myofibroblasts to contract collagen to form a dense, acellular, fibrous capsule[1]
- **TGF-β must be activated from its latent form (L-TGF-β) by MMPs**

Goal

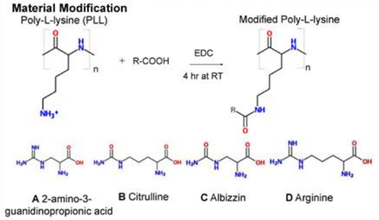
Reduce the thickness of the fibrous capsule formed in response to implanted devices.

- **Use MMP-inhibiting materials** to impede cleavage of L-TGF-β to TGF-β in order to **prevent fibroblast to myofibroblast differentiation**
- Evaluate material characteristics to determine which factors influence this differentiation process



Materials and Methods

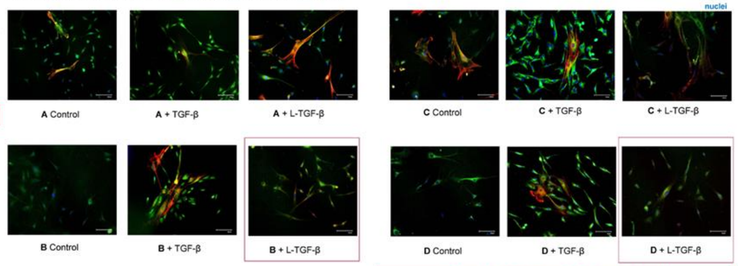
Material Modification



Results

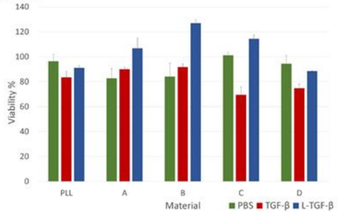
Fibroblast to myofibroblast differentiation

Mouse NIH-3T3 fibroblasts were stimulated *in vitro* with TGF-β and L-TGF-β, then stained for tubulin, α-smooth muscle actin, and nuclei. A control with no stimulation was also performed for each material.



NIH/3T3 – modified PLL cytocompatibility

Fibroblasts were stimulated *in vitro* with TGF-β and L-TGF-β on modified PLL-coated surfaces. Viability > 70% indicates cytocompatibility. All samples are compared to a control of fibroblasts on tissue culture plastic in the presence of the indicated stimulant.



Conclusions and Future Work

- Materials B and D inhibited myofibroblast formation to a large extent when fibroblasts were stimulated with L-TGF-β
- Results suggest that longer carbon chains may be more influential than chemical end groups
- All materials tested were shown to be cytocompatible
- A better understanding of the differentiation process was achieved

Future work could include cell co-culture to investigate the influence of materials on fibroblasts in the presence of different cell types, and *in vivo* studies could eventually be conducted to evaluate material effects.

References
1. Anderson, J. M., Rodriguez, A. & Chang, D. T. Foreign body reaction to biomaterials. Semin. Immunol. 20, 86–100 (2008).
2. Li, A. G. et al. Elevation of transforming growth factor beta (TGF b) and its downstream mediators in subcutaneous foreign body capsule tissue. J. Biomed. Mater. Res. Part A 82, 498–508 (2007).
3. Batra, V. et al. Bronchoalveolar lavage fluid concentrations of transforming growth factor (TGF)-β1, TGF-β2, interleukin (IL)-4 and IL-13 after segmental allergen challenge and their effects on alpha-smooth muscle actin and collagen III synthesis by primary human lung fibroblasts. Clin. Exp. Allergy 34, 437–444 (2004).
4. Bygd, H., Forsmark, K., Bratlie, K. The significance of macrophage phenotype in cancer and biomaterials. Clinical and Translational Medicine. 2014

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Samples:

Measuring Tradeoffs In 3D Scene Capture for Telepresence

Marina Seheon, Grace Jung, Wendy Chen, Gisele Nelson
Mentors: Tao Jin, Mallesh Dasari, Srini Seshan, Anthony Rowe

Motivation

- 3D video allows a viewer to explore a scene freely.
- Supports AR and VR multimedia.

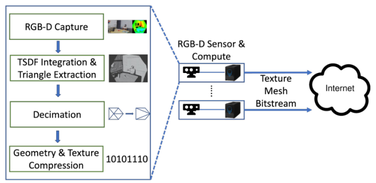
Challenges

- 3D scene data requires significantly more computing and streaming resources than 2D images.
- Determining optimal parameters for best performance across latency and bandwidth results.

Site A | Virtual Reality | Site B

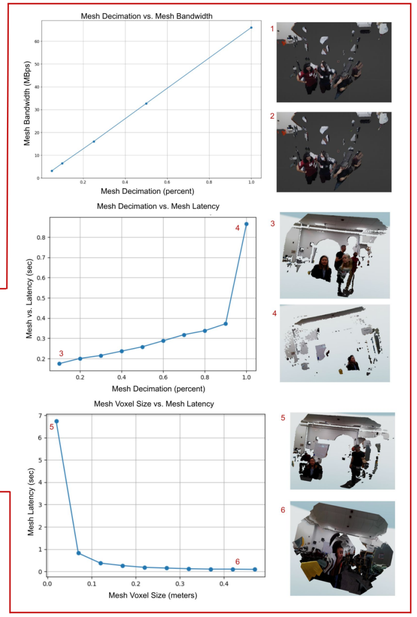
3D Scene Capture Pipeline

- Represent 3D images as two data streams: mesh (triangle) geometry and texture map.



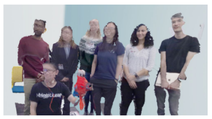
Results

- As the mesh decimation increases, mesh bandwidth and latency increase.
- As the mesh voxel size increases, mesh latency decreases.
- Mesh geometry and texture map streaming strategy is a practical alternative to existing strategies (e.g., sending point cloud or RGB-D data).



Future Work

Make picture look better →



Carnegie Mellon University
School of Computer Science

Designing Smart Home Security Systems Without Compromising Women's Privacy in Sub-Saharan Africa

By: Jessi Czerski, Karina LaRubbio, Jhanvi Pai, Chinat Yu
Mentored By: Hope Chidziwisano

Introduction

- Smart home security systems are popular in the U.S.
- Implementation in Sub-Saharan Africa creates concerns about women's privacy in a patriarchal society such as Malawi.
- Men may abuse security systems to monitor women.

Problem Statement:
Women need to protect household property without compromising personal privacy.

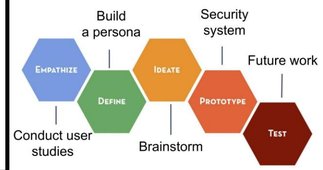
Typical home in Malawi

Objective: Design a Smart Home Security system that protects African families while respecting the privacy of women.

Data and Methods

User studies were conducted in communities in Kenya and Malawi to explore impact of security systems.

- Technology probe deployed to 20 households in Kenya for 4 weeks
- 33 women interviewed, 24 women participated in focused group discussions/design sessions



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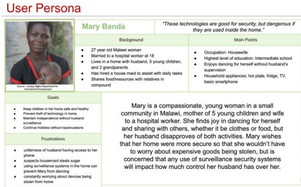
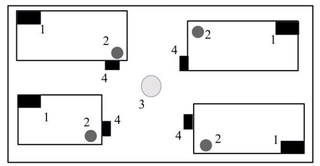
User Persona



Results

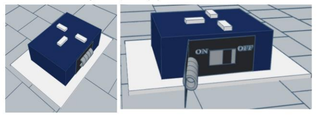
Secured Compound Layout



- Compound includes multiple homes & extended family
- Collective security provided through network devices & centralized alarm

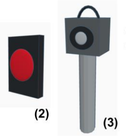
Privacy-Conscious Security System

Smart Wall Plug Adapter (1)



- Monitor voltage change to detect theft
- Alerts community alarm system via Bluetooth
- Physical lock with toggle to activate adapter

Community Alarm System (2, 3)

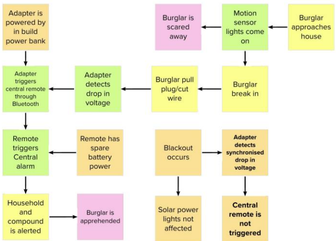


- Central alarm & manual lever
- Alarm triggered through digital remotes distributed to households in the compound

Motion Sensored Solar Powered Lights (4)

- Bright light scare tactics deter potential burglars
- Solar component discourages interior usage

Key Path Scenario



Future Work

- Create low fidelity security system prototype
- Evaluate system within a Malawi community
- Collect user feedback to iterate on design

Poster Reminders

- Note
  - Dimension: 4 X 3 feet
  - Due: Monday, July 30th
  - Remember to use NSF acknowledgment with the latest grant number from our REU website. (Funded by NSF Award Number #2244586)

Thank you!