

## **Undergraduate Informatics Research Projects FA2020**

### **Project 1 (Prof. Michael Twidale, iSchool) Analysis of University Donations that lead to Named Chairs**

A colleague and I are looking at university donations by people that lead to named chairs. It is inspired by all the concern about the Sackler family's donations to universities and the problems that can cause when we learned more about opioid abuse. But of course it can apply to all kinds of problems that can arise when we look a bit more closely at how the money was made, or who the person was doing the giving.

We want to create a database of named chairs: who gave the money, when, who the chair is in honor of, any stipulations on what it is for.

We'd like to do this for all major universities in Illinois. The work involves looking up information about these chairs, press announcements etc.

### **Project 2 (Prof. Michael Twidale, iSchool) Developing a small proof of concept of integrated family scrapbooks**

You take Great-grandma's scrapbook you found in the attic. You photograph the pages and upload them to the hypothetical EverythingConnectsBot. It does tineye-like image matching and give you back a pile of links to things in digitized collections worldwide that connect to the scraps of paper that Great-grandma collected as meaningful to her, plus links to further reading of things you might be interested in. Example items might be a concert program, a ticket for a play, a postcard of Old Faithful, a political rally, a newspaper cutting

The project does not require tech development skills. We are not going to code it up yet. Instead we will generate examples by doing manual searches and compiling results as worked examples as a way to communicate the vision of the idea

### **Project 3 (Prof. Michael Twidale, iSchool) Analysis of Magazine Covers (ie Rolling Stone) through Time**

Certain magazines have great cultural significance. Rolling Stone was one. Who appeared on the cover of Rolling Stone was A Big Deal in revealing the cultural zeitgeist. So who did appear month by month over the decades? What does that tell us about evolving societal and cultural issues?

The project will be to construct a simple database of covers. Also to look at the ages of who appears. In the 1960s, it was always young people: Mick Jagger, Paul McCartney. More recently it has included much older people: Pope Francis, Bernie Sanders - and Mick Jagger. How has age, gender and race of who is on the cover changed over time

**Project 4 (Prof. Jessie Chin, iSchool)**  
**How do Adults Interact with Health Misinformation?**

While health misinformation is prevalent, studies showed that people are vulnerable to identify the low-quality health information, and eliminate the consequences of misbeliefs. The project is to understand how adults across the lifespan process and interact with health misinformation through both social media analysis and behavioral experiments. Students will have training in behavioral sciences and health informatics. Students will assist in study materials preparation (reviewing health articles, creating study materials), data preparation (cleaning, formatting and annotation), and data analysis.

Prerequisite Skills:

None. Experience in statistics, natural language processing, or machine learning are preferred.

**Project 5 (Prof. MANUEL HERNANDEZ, Kinesiology & Community Health)**  
**Prediction of motor and cognitive impairments using wearable accelerometer data in persons with Parkinson's disease**

The project goal will be to develop machine learning/artificial intelligence frameworks to predict rapid declines in motor and cognitive function in persons with Parkinson's disease using wearable accelerometer data. Using python, we will first integrate multimodal wearable sensor data to improve the classification performance of motor and cognitive dysfunction in persons with Parkinson's disease, and then use longitudinal data to validate the prediction of rapid declines in cognitive and motor function in this population. You will be working with members of our team and colleagues in the nascent Center for Wearable Intelligent Technologies to build ML/AI frameworks and guide development of future wearable sensors that can provide feedback to users, which may positively impact health and wellness.

Required and preferred qualifications are provided, but interest and willingness to learn will be most crucial.

Required Qualifications: programming skill - python - R

Preferred Qualifications: - machine learning - experience with biomedical data, neuroscience, or multimodal data

A student interested in contributing to writing is also encouraged.

## **Project 6 (Prof. Nigel Bosch, iSchool)**

### **Examining Students' Perspectives on Learning Analytics**

Online and computer-based learning has become increasingly popular, even before COVID-19 forced nearly all learning to move online. Computers can record all the actions that students do while learning, like when students take quizzes, watch lecture videos, or write posts in discussion forums. These data allow teachers and researchers to do “learning analytics”, where they examine students’ data to discover ways in which learning could be improved. However, students typically have little choice in what data gets recorded and may not even be aware of what data are recorded or what types of learning analytics could be performed with their data. We would like to learn more about students’ perspectives on learning analytics by designing surveys and collecting data from a large, diverse sample of students. We will explore a variety of questions to find out what students think about learning analytics and privacy in computer-based learning. For example, what do students know about how learning analytics is used? What data are students comfortable with sharing? Do students feel like they are well-represented by the data collected about them, or are there important parts of their learning experiences that are being overlooked?

An ideal student for this project would be interested in educational technology, skilled at writing, and comfortable with designing prototype survey questions. The student will collaborate with faculty and graduate students to create surveys, test them, collect data, and write results for publication.

## **Project 7 (Prof. Yang Wang, iSchool)**

### **Supporting marginalized groups in coping with misinformation**

#### **Project goal**

Cognitive effort has been found to be one of the reasons people choose not to investigate misinformation on social media. Such investigation requires disproportionate cognitive effort on the part of users with low literacy and/or visual impairments.

We aim to study why and how Internet users with low literacy and/or with visual impairments investigate social media posts for accuracy. We set out to uncover ways to better support these users in mitigating the impacts of misinformation. This is the first study in our efforts to better support people who may belong in marginalized groups to identify and investigate potential misinformation.

#### **What we have done so far?**

We have drafted the study design for an interview study complemented by a diary study.

## **What you will be doing?**

- (Optional) Implement a browser extension or mobile app where we will be able to flag the relevant posts and ask the diary study participants to log their experiences.
- Pilot test the study design
- Conduct the actual studies
- Analyze the qualitative and quantitative data from the studies
- Write a report (and ideally turn that into a publication)

## **Minimum qualification**

- Excited to support marginalized groups

## **Nice to have qualifications**

- Have worked with marginalized groups
- Have knowledge about human-computer interaction or user research
- Have conducted interviews or diary studies
- Have experience in developing browser plugins (JavaScript)
- Have experience in developing mobile apps (e.g., Android or iOS)

### **Project 8 (Monica Porteanu, PhD Candidate in Informatics) How are identity and privacy felt through sound and vice-versa**

This proposal comes from Informatics research into Design, Technology, and Society. The purpose of this project is to create agency and action that leads to a regenerative society. However, our society, built on ideas of the past, limits our capacity to renew. In particular, the existing instruments of civic engagement (e.g., citizenship, residency), in a specific environment/place are at odds with the effects on the daily life of rising migration and the digital world. The research argues that a new face of civic engagement would link identity and modern inquiries into privacy. The investigation starts from a cultural and sensorium perspective, focused on sound.

The goal is to understand better how the experience created by sound onto identity and privacy, in a specific place of living, can lead to the promotion of agency, enabling individuals' access to alternative models of civic engagement.

This study looks at how identity and privacy are felt through sound and vice-versa. Sound applied in a specific place and context can create the framework for situations and actions. The connections between the perception and design of the auditory environment and identity/privacy/place found so far point to the possibility of agency.

The work is now in the experiment design stage, researching embodied navigations of contextual identity and privacy through sound.

User studies and data collection will aim to uncover further how (in connection to place) identity and privacy express through sound, as well as how the auditorium might shape identity and privacy.

For data collection, the experiments might include surveys, game(s), experience(s), and interaction(s). Such research-through-design methods welcome imagination and a playful mindset coupled with rigorous thinking, researching, and data science methods. Data will then be analyzed (potentially using audio-centered software such as python with sound-related packages) and presented through methods such as sonification, and other interactive media.

A new researcher working on this project would become familiar with innovative research methods. Some new media, design thinking, and audible data collection and interpretation skills (or the desire to learn them) will be helpful.

### **Project 9 (Prof. Jana Diesner, iSchool)**

#### **Title: Using Natural Language Processing to Extract the Long-term Impact of Private Foundation Investment in International Biodiversity Conservation using Project Proposals and Final Reports**

##### **Project Description:**

The goal of this research project is to leverage methods from natural language processing and information extraction to extract the impact (i.e., objectives or outcomes) of MacArthur foundation's investment in global conservation from project reports or proposals. We aim to answer the following questions:

- 1- What are the long-term impacts of monetary sources on people and their surroundings?
- 2- How does impact evolve throughout the time between proposal and actual outcome?
- 3- Do the reports or proposals show any regional differences in terms of outcomes and impact?

The findings of this project will inform funders and sponsors to gain a more detailed and comprehensive understanding of the objectives and impacts of the projects, see how their investment has been used, and what has been implemented.

The undergraduate student will work with graduate students to conduct research. Through this collaboration, the undergraduate student will have the opportunity to enhance their research skills and gain hands-on experience in research. The work involves studying and annotating data, conducting literature reviews, designing and evaluating algorithms and models for information extraction, and interpreting quantitative and qualitative results.

**Preferred Requirements:**

Prior exposure to at least one programming language is required (Python or R preferably). In addition, basic knowledge about natural language processing, machine learning, and social data analysis is strongly preferred. It's worth noting that we do not expect high-level computer skills, however, we hope that the students are eager to learn and improve their skills throughout the project.

**Project 10 (Prof. Jana Diesner, iSchool)****Title: Words and Networks – validating and advancing methods for the relational analysis of text data**

This project advances methodological research at the nexus of text analysis and network analysis. This work matters as considering the content of text data and meta-data for understanding social interactions enables us to understand the impact of language use on social networks and vice versa. Research on “Words and Networks” has led to eminent work on language change, collaborative work, recommender systems, semantic computing, relation extraction, and the diffusion and use of (mis)information offline and online.

In this project, students validate and advance methods, and help to make reliable solutions available in ConText. ConText ( <http://context.ischool.illinois.edu/>) is an open-source tool for the integrated analysis of text data and network data. It is designed to enable researchers with any level of technical skills to analyze text and network jointly. In this project, you will have the opportunity to explore various Natural Language Processing and Network Analysis tools, integrate latest technologies into the open-sourced application, and improve the design of a user-friendly interface. Moreover, you will be able to contribute to the open source community and help researchers from all over the world!

Your primary tasks for this project will be to (1) understand and validate relation extraction methods, (2) add and update features in the ConText application with the guidance of senior members in the lab, (3) test the functions in the application and provide feedback, and (4) assist with creating user manual for the application.

**Preferred Requirements:**

Programming / coding skills (Java, Python) are required. Proficient communication skills (especially in writing) is preferred. Knowledge in natural language processing and network analysis is preferred. But most importantly, if you are detail-oriented, interested in learning new things, and passionate about helping others, please join us!

### **Project 11 (Prof. Jana Diesner, iSchool)**

#### **Title: Data science for Humanitarian Assistance and Disaster Relief (HADR)**

In times of crisis, substantial amounts of information about the crisis are shared and discussed on a number of platforms, including social media, news, official situational reports, and expert blogs. This project focuses on reliably extracting relevant information from sizable corpora of text from multiple data sources. We define relevant information as both about (1) the needs of the affected and at-risk populations as well as (2) the entities involved in the response operations of a particular crisis. Student researchers working with us will have an opportunity to work hands-on with data from multiple disaster events in the past, namely earthquakes, hurricanes, typhoons, and floods. In particular, the student will be familiarized with the process of crisis management for natural disasters, and how data analytics play important roles in providing responders with necessary situational awareness information (e.g. infrastructure damage, missing/trapped persons, donation needs). The student researcher will then participate in an annotation task to identify and label the named entities mentioned in official situational reports. The completion of the annotation process enables both the student researcher and the collaborators to understand the types of entities involved (e.g. authority figures, organizations, cities, countries) in response operations and the extent to which these entities work together.

**Preferred (but not required) qualifications:** experience with content analysis, text analysis with Python (e.g. nltk, spaCy).

### **Project 12 (Qiong Nie, PhD candidate in Human Factors and Aging lab, Applied Health Sciences)**

#### **Designing a Mobile Application for Older Adults to Improve Hypertension Medication Adherence**

Hypertension is prevalent in older people and blood pressure (BP) medications are effective in controlling BP and reducing adverse health outcomes. In this project, we developed the theory-based Multifaceted Prospective Memory Intervention (MPMI), which improved older adults' adherence to BP medications. We further supported this intervention by developing the Medication Education, Decision Support, Reminding, and Monitoring System (MEDSReM) mobile application, which changes medication taking from an effortful process dependent on executive functions and cognitive processes that decline with age, to cue-driven associative processes that are mostly preserved with age. MEDSReM-2 will capitalize on technological advances to integrate additional functionalities into MEDSReM, including electronic BP monitoring and providing feedback about the relationship between medication adherence and BP. Central to this process is developing engaging and easy to understand visualizations so that older adults can track their progress.

We are looking for an undergraduate researcher to contribute to the behavioral feedback and visualization design process. You will work closely with Dr. Daniel Morrow, interact with graduate students and other undergraduates to work on this project.

**Intern responsibilities.** Your work will include conducting literature reviews, collaborating and supporting the design and development of visualization prototypes, conducting usability tests and taking meeting notes, etc.

**Intern requirements.** Our ideal researcher is motivated, detail-oriented, and responsible. You should be willing to learn specialized software and research methods (such as interface design tools, user testing, and qualitative and quantitative statistical analysis).

### **Project 13 (Prof. Dan Morrow, Educational Psychology) Interactive Technology Support for Older Adult Self-Management of Chronic Illness**

Electronic Health Record (EHR) systems are revolutionizing health care, and have the potential to improve patient/provider collaboration and patient self-care. A barrier to realizing this potential is the fact that patient-relevant information in EHRs tends to be fragmented, nonstandard, and technical rather than patient-centered. There is need for tools to translate EHR information into patient-centered language that engages and educates patients, especially older adults. In this project we are developing Natural Language Processing (NLP) tools that generate language that is easy for older adults to understand, and integrating this patient-centered language output into a conversational agent (CA)-based system that serves as a 'health adviser' for older adults with chronic illness. We are conducting studies to evaluate the effectiveness of a prototype interactive CA system that teaches older adults about self-care. We are also exploring the potential of narratives about patients struggling with self-care challenges in order to further engage and motivate older adults. Eventually, our CA-based system could deliver these narratives to older adults on demand.

**Intern responsibilities.** Your work will include conducting literature reviews, collaborating with the team to develop study protocols, as well as collect and analyze data.

**Intern requirements.** Our ideal researcher is motivated, detail-oriented, and responsible. You should be willing to learn specialized software and research methods. Knowledge of data management and analysis and/or NLP would be helpful, but is not necessary



**Project 14 (Prof. Hannah Holscher, Food Science & Human Nutrition)**  
**More than a gut feeling: a bioinformatics approach to studying the impact of diet on the gut microbiome and health**

**Background:** The phrase “a gut feeling” is cliché, but it may be truer than previously thought. The human gastrointestinal tract (or “gut”) contains one of the most densely populated microbial communities on earth, comprised of trillions of microbes spanning at least 1000 different species collectively known as the “gut microbiome.” Interestingly, the gut microbiome and diet are independently linked to diseases, including obesity, type 2 diabetes, and cancer. However, there is little research on the impact of foods and nutrients and their impact on the gut microbiome, and subsequently, health and disease.

**Our Work:** With the advent of advanced sequencing technologies and informatics techniques, we aim to fill this gap. Currently, we are working with two large datasets. The first of them was generated in our lab from sequencing data of bacterial samples from participants of our clinical trials. These participants consumed specific foods (walnuts, almonds, oats, barley, avocado, and broccoli) during 5 different studies. Sequencing the DNA of these samples yielded big data on the bacterial composition of each subjects’ gut before and after the study. Our goal is to utilize these sizable datasets to find connections between the foods and changes in the gut microbiome, along with various health markers, like blood sugar and body weight.

Our second dataset is from the American Gut Project (AGP). The AGP is an open-source, citizen science project that has compiled a massive repository of microbiome data from over 30,000 participant samples. Our objective is to find connections between the nutritional metadata of these participants and their gut microbiota, utilizing bioinformatic tools that are of the forefront of microbiome research.

**Current Progress:** Thus far, we have built a machine learning model that can predict which of the six foods mentioned above a person consumed with relatively high accuracy (~88%). We are working to improve our model’s accuracy, both via advanced data science techniques as well as incorporating additional data taken from the clinical trials.

Additionally, we have employed differential abundance microbiome analysis tools to investigate the difference in microbiota structure based on diet quality in adults of the AGP.

**How You Can Contribute:** These projects offer opportunities to work with large clinical datasets and machine learning techniques along with industry-standard bioinformatics software to analyze and visualize data. Knowledge of basic data mining, analysis, and visualization techniques is preferred. Familiarity with using command line tools is also a plus. Past INFO students have presented their research at the Undergraduate Research Symposium and also contributed to conference abstracts.

Professor: Hannah D. Holscher, PhD, RD

Website: <https://hdh.fshn.illinois.edu/>

**Project 15 (Prof Ted Underwood, iSchool)**  
**Modeling plot arcs in fiction and biography.**

Text analysis has already helped researchers understand many aspects of fiction: characterization, for instance, and genre. But plot has been somewhat resistant to computational analysis—especially plot at the scale of a whole book. We can analyze short, page-length stories by extracting events and modeling relations between the events. But book-length narratives are so long and complex that a different strategy may be needed. We might, for instance, simply train a model to predict which of two passages came first in a story. This approach models "plot" only in a limited sense, but we have found that simple models of this kind are sufficient to illuminate interesting structural differences, for instance, between fiction and nonfictional narratives (such as biographies). The undergraduate research assistants for this project will help graduate students and faculty develop and analyze a corpus of English-language texts; in particular, we need to ensure that our files begin at the beginning of the story and end where the story ends. This will involve a certain amount of manual corpus-development work, trimming prefaces and indexes from digital files. But research assistants will also take part in (virtual) conversations about the methods we use to analyze these texts, and contribute to the interpretation of results. Coding skills are not necessary for this project; the methods we use will be explained.

There is room for one or two undergraduate research assistants in this project.

**Project 16 (Prof Jodi Schneider, iSchool)**  
**Information Quality Lab Projects**

The information quality lab studies the science of science, bibliographic information retrieval (especially retrieval and quality of medical information), and how evidence-based arguments are used in scholarship and in public discourse. The long-term goal of the lab's work is to develop computer support for debate and argumentation, especially evidence synthesis. The lab's technical perspective draws on data science, argumentation, knowledge representation, computer supported cooperative work, and human-computer interaction. Technical skills commonly used in this lab include data science (machine learning, network analysis, textmining), knowledge representation (ontologies and semantic technologies), prototyping, annotation, mixed methods research, and user-based evaluations. Typical applications areas include digital libraries and health informatics.

Topics for independent studies include:

- experimenting with replicating citation bias
- analyzing COVID19 literature with data science and literature review tools
- analyzing retracted research and citations to retracted research
- various other topics; see 2018-2020 publications <<http://jodischneider.com/jodi.html>>

### **Project 17 & 18 (Prof. Zahra Mohaghegh, NPRE)**

The Socio-Technical Risk Analysis (SoTeRiA) Laboratory (<http://soteria.npre.illinois.edu/>) is welcoming Undergraduate Researchers in diverse areas of multidisciplinary risk analysis. The central risk assessment technique used in the SoTeRiA Laboratory research is Probabilistic Risk Assessment (PRA), which is a systematic risk methodology and a key pillar of policy setting in the U.S. Nuclear Risk-Informed Regulatory Framework. Its applications have been extended to diverse high-consequence industries (e.g., space, oil and gas, healthcare, etc.).

The SoTeRiA Laboratory has been working on real-world risk analysis problems that are scientific, innovative, and practical. For example, this Laboratory has been focusing on advancing risk sciences (e.g., National Science Foundation (NSF) [[Award #1535167](#)]) and developing multidisciplinary methodological risk toolkits (e.g., Department of Energy (DOE) [[Award #17-12614](#)]).

Undergraduates will have the opportunity to research under the supervision of [Professor Zahra Mohaghegh](#) and in collaboration with other Undergraduates, Masters and Ph.D. students in the SoTeRiA Laboratory. SoTeRiA is seeking undergraduate researchers for the following two research projects.

#### **Project 17: Advancing Probabilistic Risk Assessment Methodologies for New and Innovative Designs of Socio-Technical Systems**

Recently, inventions of new and innovative designs of socio-technical systems have been accelerated due to various technical and social factors, such as the availability of stronger computational capabilities, advancements in artificial intelligence and machine learning approaches, and the increased need for maintaining the competitiveness of business under deregulation and fluidization in the international markets. While the new and innovative designs can improve both safety and efficiency of the socio-technical systems, PRA for the new and innovative designs is challenging due to a lack of historical experience and potential for newly emerging failure mechanisms that do not exist in the traditional systems. In the recent years, advancements and implementations of PRA for new and innovative designs have been an active area of research and development in various fields; however, as of now, there is no scientific attempt to develop overarching theories and principles as a foundation of PRA for new and innovative designs. We are looking for undergraduate researchers who are interested in involving in the initiation and establishment of this new research area at the SoTeRiA Research Laboratory. Examples of research activities by undergraduate researchers include: (i) developing a database of literature; (ii) running an exploratory risk modeling and data analytics to compare the existing risk analysis techniques; and (iii) getting involved in the development of academic publications such as conference and journal papers on this new research area. Our group is a mix of interdisciplinary scholars, encompassing risk and reliability engineering, computational statistics, social science, and physical modeling. We can mentor both novice and experienced students with multidisciplinary backgrounds. We can design a specific scope of the project based on your research interests, background, and computational skills.

## **Project 18: Applying Machine Learning to Quantify Organizational Failure Mechanisms in Probabilistic Risk Assessment**

This project focuses on modeling the effects of human and organizational factors on the failure of technical systems in nuclear power plants. In this research, we develop predictive causal modeling and big-data theoretic technologies for PRA and expand the classical approach of data management for risk analysis by utilizing data analytic techniques and simulation to uncover organizational contributors to system risk. At this level of research, the team focuses on using supervised machine learning techniques to extract information from historical event databases regarding the underlying causal factors contributing to risk. Critical elements of the methodological steps for model development in this research include collection and pre-processing of unstructured text data, implementation of supervised machine learning, and evaluation of the proposed model. In addition, generating training data for supervised machine learning is another important element of this research. Training data can be generated using annotation of operational reports for developing the machine learning model. While we currently utilized Support Vector Machine, other machine learning techniques, such as decision tree, can also be applied for this purpose. We are looking for undergraduate researchers who are interested in implementing machine learning techniques in real-world applications. Programming experience, such as Python experience, and experience in the machine learning domain are required for this research.

## **Project 19 (Prof. Mike Yao, Media) Evaluating the effect of social media on the health of a brand**

### **Project Description:**

Brands are increasingly leveraging social media platforms to disseminate product information and engage consumers. How consumers “talk” about a brand on social media is a direct measure of the brand’s health. Separately, traditional media outlets such as the news media also cover brand-related events and social issues as matters of public interest. For example, the press may cover Amazon in the context of online shopping during COVID-19 or a Senate hearing on Antitrust. These coverages may affect how a brand is talked about on social media. This project investigates the interplay between brand related coverage on social media and news media platforms before, during, and after various major public events (e.g., Boeing after an airplane crash, TikTok during the U.S.-China political escalation, etc.). Students working on this project will help the research team aggregate, clean, transform, and standardize a large set of rich textual data collected from social media and digital news platforms. They are also expected to propose a set of hypotheses as a case study to be tested using the data they help prepared.

Status: Currently active, raw data collected by the research team

- Phase One: Week one to four
- Phase Two: Week five to eight
- Phase Three: Week nine to 12
- Phase Four: Week 13 to 16

Description of Phases	<ul style="list-style-type: none"> <li>● Familiarizing with the datasets, literature review, and problem identification</li> <li>● Data cleaning and transformation</li> <li>● Propose specific hypotheses as a case study using the dataset</li> <li>● Data Analysis and Visualization</li> </ul>
Skills students will learn or use their expertise in :	<ul style="list-style-type: none"> <li>● SQL: Advanced concepts like Views, Stored Routines, Triggers, Case Statements, Tableau Integration</li> <li>● Python: Web Scrapping using LXML, Data Structures &amp; Algorithms like Buble Sort, Quick Sort</li> <li>● R: Time Series</li> <li>● Visualization: JavaScript, Python, R, Tableau</li> </ul>
The use case for grading	<ul style="list-style-type: none"> <li>● Successful application of each skill taught from Phase One till Phase Four</li> <li>● Bonus Points: Demonstration or implementation of technologies beyond the class scope</li> <li>● Class participation</li> </ul>
Benefits to students	<ul style="list-style-type: none"> <li>● Internships: Interviewers test the knowledge of students about SQL during the interviews. Advanced concepts learned/revised will benefit the students in the long term</li> <li>● A chance to work with graduate students to learn the implementation of skills alongside under faculty supervision</li> </ul>

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**Project 20 (Robb Lindgren, Curriculum & Instruction)**

**Prototyping an Augmented Reality Biology Education Simulation**

Faculty and students in the [EmIT](#) (Embodied and Immersive Technologies) Lab at UIUC are working with a faculty member at the University of Iowa to create an augmented reality simulation to help college students understand complex systems in biology. Specifically, we are working with an existing NetLogo simulation that models the dynamic equilibrium at the cell membrane (chemical and electrical). The goal is to convert this simulation into an augmented reality experience that blends visualizations of activity across the cell membrane with physical interactions such as receiving haptic feedback or the ability to manipulate digital components of the simulation with gestures. A student working on this project would work with our lab to develop a prototype AR simulation that could be used for pilot testing with undergraduate biology students.

We are looking for a student who brings some software development skills (e.g., Unity) and who likes to tinker with hardware (e.g., haptic sensors), though there will be opportunities for training and mentoring in these areas from people in our lab. College-level biology, chemistry, and mathematics knowledge would be a plus, but not required. Most important are creativity, taking initiative, and an interest in working with an interdisciplinary team to design a novel educational technology.

### **Projects 21 -24 (Prof. Ian Brooks, iSchool)**

The Center for Health Informatics (CHI) is a multi-disciplinary unit and World Health Organization Collaborating Center that is working with WHO to develop information systems for health throughout the Americas, and to apply advanced analytical techniques to large health datasets. We have opportunities for undergraduate research assistants to work on several projects in 2019-2020:

#### **Project 21: Social Media Analytics**

CHI has dedicated access to the Brandwatch social media aggregator that provides the ability to search and download more than 1 trillion public posts from thousands of sites including the The Center for Health Informatics (CHI) is a multi-disciplinary unit and World Health Organization Collaborating Center that is working with WHO to develop information systems for health throughout the Americas, and to apply advanced analytical techniques to large health datasets. We have opportunities for undergraduate research assistants to work on several projects in 2019-2020:

complete Twitter stream stretching back to 2010. We are looking for a student who will work with our partners at WHO to demonstrate the value of social media to public health.

Preferred but not required skills: python, text machine learning.

Spanish or Portuguese language skills would be helpful, but not necessary.

#### **Project 22: Information Systems for Health**

The IS4H project is a major focus of the Pan American Health Organization, the regional office of the WHO for the Americas.

*“The project seeks to support countries in defining strategies, policies, standards for interoperable and interconnected systems, and best practices in health data management for improving decision-making and well-being.”*

We are looking for a student who will contribute to the development of “knowledge capsules”. These are one-page summaries of important IS4H topics, such as big data, artificial intelligence, or social media, intended to give public health officials a brief summary of the topic and links to further information.

#### **Project 23: Patient Interactive Diaries**

It is very difficult to determine the relationship of multiple lifestyle, diet, and environmental factors to the management of skin diseases such as psoriasis, acne, and skin cancer. We are looking for a student to join a multi-institution, multi-disciplinary team of dermatologists, social scientists, and health informaticians to help address this problem by developing patient

interactive diaries. These diaries consist of 150 – 200 questions about a patient’s behavior and skin condition that will provide input for complex adaptive analysis approaches to identify the factors that prove helpful or harmful. Specifically, this student will work to implement flow logic and consistency checks in LimeSurvey.

#### **Project 24: INDICATOR**

INDICATOR is a platform for monitoring the health of a community. It is designed to receive data daily from healthcare providers and other sources, analyze the data for unusual events of potential health interest, and communicate these events to local public health authorities for investigation and action. We are looking for a student who can troubleshoot workflow issues in the platform and help bring it back online. This project will provide a student practical experience working with multiple open-source packages such as TalenD, MySQL, R, Drupal, and highcharts while contributing to the health of the community.

Preferred skills: Linux, R, Java

#### **Project 25 (Prof. Shackelford, ANTH)**

##### **Designing virtual reality environments for students with disabilities**

Our team has previously designed, created and delivered a college-level course in archaeology using immersive, interactive virtual reality (VR). This archaeology course – like VR games and applications more broadly – cannot accommodate students with mobility challenges or other physical disabilities. The ubiquity of video games and the increasing affordability of consumer VR systems have brought issues of accessibility and the need to support gamers and other VR users with physical disabilities to the forefront.

Prior to the adoption of immersive VR, technology has required minimal physical interaction to access (i.e. typing, clicking, swiping). Immersive VR increases the physical component of the interaction so that it may require full-body involvement. These increased interactions create immediate barriers for many users with alternative accessibility needs. While VR has the potential to make learning more accessible, the hardware and software technologies need to be accessible and compatible with assistive technologies used by those with disabilities.

The current NSF-supported project builds on prior work to evaluate and design a framework of hardware, software and instructional solutions to enable wheelchair users to fully participate in educational VR activities. We invite applications from students who are interested in virtual reality and game-based learning and its use in education. We are looking for students to participate in data collecting through student surveys and observation and to assist in designing and testing user interface technologies and conducting usability testing. There is flexibility as to the type of project based on the student’s interests. Experience with statistical analysis, prototyping and design tools, or usability testing are helpful, but not required. Knowledge of Unreal Engine or gaming software is preferred, but not required.

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