The iSchool at Illinois
Data storytelling means sharing compelling narratives about the meaning discovered by sophisticated data analyses. It is essential to communicating real-world value to key audiences. iSchool faculty are developing new approaches to focus on important points otherwise hidden in large collections of data—combining the latest visualization technologies with storytelling concepts, narrative theories, and performance techniques. Data storytelling creates a bridge between the data and the audience to facilitate better informed, more impactful, data-driven decisions.

**CORPORATE VALUE**
- Combining data visualization with storytelling techniques and structures for more effective presentations, recruiting, and engagement efforts

**SELECTED EXPERTISE**

**Data Analytics and Human-Centered Data**
- Understanding the practical consequences of the limited quality of big data and digital traces of social and professional interactions
- Improving the rigor, reliability, and transparency of research in computational social science, human-centered data science, and scientific data

**Data Storytelling Techniques**
- Storytelling dynamics, applications, and narratives for disseminating information
- Troubleshooting disconnects between storyteller and audience

**Data Visualization**
- Analysis and visualization of spatial data, especially in 3D and 4D models that demonstrate change over time
- Actionable science, including research geared towards developing climate-change resistant crops to help resolve the gap between food supply and demand

*Maybe stories are just data with a soul* —BRENÉ BROWN
SELECTED WORKSHOPS

These workshops have been offered to nonprofits, businesses, and universities. These include Prairie Rivers Network, Library UX Chicago, and at the University of Illinois, the Office of the Vice Chancellor for Institutional Advancement, College of Media, Gies Business, College of Fine and Applied Arts, Grainger Engineering, and College of Agricultural, Consumer, and Environmental Sciences.

- Data Storytelling: Strategies and Structures
- Storytelling Your Career
- Storytelling and Narrative Structures
- Storytelling Thinking for Recruiters
- Storytelling Thinking for School Librarians
- Exploring Endings: Story Conclusions, Resolution, and Closure
- Storytelling and Advancement

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A WELL-TOLD STORY CAN
ELICIT A CONNECTION TO THE STORYTELLER,
LEAD TO THE RELEASE OF DOPAMINE, AND
ENGAGE THE SENSORY AND FRONTAL CORTEX
Artificial Intelligence (AI) helps us build exciting and powerful new decision-making tools at scales unimaginable just a few years ago. Unfortunately, AI systems can be so complex that the decision-making process is best described as “black box” magic. Explainable AI research at the iSchool opens up these black boxes to shed light on how decisions are actually made. Advances in Explainable AI help us avoid hidden biases and unintended consequences that can undermine effectiveness and erode trust in the organizations deploying AI solutions.

CORPORATE VALUE
- Developing frameworks, algorithms, and models to analyze data bias, validity, and anomalies
- Analyzing how AI system failures impact trust in and use of those systems
- Designing intelligent interfaces that help users understand AI systems

SELECTED EXPERTISE

AI and Machine Learning
- Controlled experiments and simulations to assess attacks on social networks to improve network security, advance privacy protection systems, and develop more robust network metrics

Misconception Analysis and Consequences
- Analysis of sociotechnical systems to uncover the source of unintended consequences
- Systems design to foresee unexpected consequences (including anything from bias to errors to a bot being banned from social media)

Explaining AI to Users
- Easy-to-understand explanations of AI algorithms, especially those used to make automated decisions that affect individuals
Learning Analytics and Bias
- Development of interpretable deep learning methods design with the goal of extracting meaningful patterns from data in the realm of education

Rare Category Analysis and Data Heterogeneity
- Anomaly detection to predict fraud, retail (retail) patterns, and manufacturing production yields as well as identifying healthcare connections

Reproducibility of Scientific Research and Analyses
- Data validity and reproducibility and resolution of legal and policy barriers to disseminating reproducible research
- Analysis of scientific validation systems

Trustworthy AI
- Human trust and its influences on reliance on Autonomous Systems

EXPLAINABLE AI

72% OF EXECUTIVES REPORT THAT THEIR ORGANIZATIONS SEEK TO GAIN CUSTOMER TRUST AND CONFIDENCE BY BEING TRANSPARENT IN THEIR AI-BASED DECISIONS AND ACTIONS.

—ACCENTURE TECHNOLOGY VISION, 2018

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COMPUTING FOR SOCIAL GOOD

Computing for Social Good (CSG) means harnessing the power of information technology to understand the impact and ramifications of data usage, ensuring positive social outcomes. Our CSG research teams see the well-being of individuals and their communities as a top priority and measure success primarily in terms of social benefit and improved circumstances. CSG projects can generate positive economic outcomes, including lower costs of public services.

CORPORATE VALUE

- Informing AI design, autonomous technologies, and intelligent agents in support of social good
- Help protect users’ privacy and security and comply with regulations
- Designing inclusive tools to ensure access for marginalized groups and comply with ADA regulations

SELECTED EXPERTISE

Adaptive Cognition and Interaction Design (ACTION) Lab

- Technologies that promote evidence-based health programs for patients with access issues
- Educational applications and technologies supporting the development of health literacy for diverse patients

Social Computing Systems

- Socio-technical systems that address social problems and improve community well-being
- AI-based solutions to facilitate the provision of local public services, such as public safety and environmental protection

End-User Privacy and Security

- Smart Home privacy design
- Privacy and security mechanisms for people with disabilities, specifically the visually impaired

PRIVACY MEANS PEOPLE KNOW WHAT THEY’RE SIGNING UP FOR, IN PLAIN LANGUAGE —STEVE JOBS
Human-Centered Data Science, Responsible Computing, and Data Mining

- Computational approaches measuring the impact of issue-focused media and providing actionable insights for stakeholders
- Natural language processing and machine learning methods to detect and evaluate the impact of publicly funded research projects on society
- Collaborating with the U.S. Coast Guard to increase awareness of humanitarian assistance and disaster relief efforts
- Data mining methods to assess the long-term impact of private foundation investments in international biodiversity conservation

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In this age of information overload, it’s important to be able to find the islands of knowledge hidden in an ocean of text. At the iSchool, our researchers use Natural Language Processing (NLP) and related methods from computational linguistics and textual analysis to create tools that guide users to make unexpected connections between disparate sources and analyze the potential impact on information users. NLP projects also help computers understand what users want and how they are feeling about it, in order to improve interactions between people and digital devices.

**CORPORATE VALUE**
- Building tools that support the analysis of text at the rate of a quintillion calculations per second
- Extracting and synthesizing evidence from a wide variety of texts to accelerate scientific discovery
- Developing processes and resources to understand impacts and trends in data

**SELECTED EXPERTISE**

**Impact Assessment**
- Developing processes to understand how customer reviews impact people’s knowledge, behavior, and feelings, and how social media posts impact people’s values and moral principles
- Identifying secondary uses of research findings
- Discovering trends through data accessed in large digital libraries, including science and detective fiction to describe shifting assumptions about gender in literature from 1780 to present

**Knowledge Discovery & Synthesizing Text**
- Improving the quality of relationships in text extraction systems for biomedical literature—i.e., connecting terms like “alopecia” and “hair loss”
- Providing efficient access to biomedical knowledge to facilitate the use of data to support clinical decision making and pharmaceutical research
Knowledge Discovery & Synthesizing Text

- Extracting claim data (including key words like “better” and “worse”) from scientific literature, which can be used for systematic reviews and risk assessments
- Resolving contradictions and redundancies
- Developing approaches to linked data (adding hyperlinks to text, etc.) to manage scientific evidence
- Extracting arguments from scientific texts through social media mining of opinion/argument
- Synthesizing text, such as consumer comments, government consultations, etc.

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Image courtesy of Shubhanshu Mishra and Jana Diesner
Human computer interaction (HCI) and user experience (UX) research together provide a systematic way to understand and improve the user experience of computing and institutional technologies. Every day, users experience computer and organizational interfaces in relation to areas such as travel, finance, retail, education, and health. As a result, interface and experience failures are both frustrating to users and costly to organizations. Improvements in HCI/UX enable deeper engagements and improve efficiencies. HCI/UX research at the iSchool is human centered and has direct application in every single marketplace and most internal processes.

**CORPORATE VALUE**
- Designing, implementing, and evaluating computing systems that effectively engage people.
- Building accessible technologies to support self-paced learning and improve students’ interactions with learning technologies.
- Developing systems to improve delivery of social support systems and public services.

**SELECTED EXPERTISE**

**Interface Usability Analysis**
- Improving the usability and usefulness of systems by understanding how users learn new technologies and respond to struggles with design features
- Improving workplace productivity by uncovering and fixing blocks in the workflow caused by confusing technology design

**Personalized Education**
- Adapting interfaces based on automatically detected alertness and attention of users
- Improving interfaces for tasks where maintaining attention is important
Health Information Delivery
• Delivering effective and sustained health interventions; helping to translate evidence-based health interventions into practices
• Designing systems to promote delivery of healthcare services and information to aging adults, rural/remote patients, and adults with low health literacy

Virtual Agents and Mobile Systems Research
• Applying HCI research methods to advance fundamental public services
• Studying how virtual agents can be used to innovate and scale mental health services
• Designing crowdsourcing and location-based sensing systems that allow users to co-create knowledge about their communities

Empowering Users
• Designing intelligent computing tools to empower marginalized individuals and to create easier access to electronic resources
• Designing transparency and control tools for real-world applications (e.g., smart homes, online behavioral advertising, unmanned aerial vehicles)
• Developing digital interventions that nudge user behaviors and decision-making to foster a more positive online environment

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iSchool data curation researchers improve how we collect, correct, clean, and care for the very data that informs each step in the data analysis life cycle. Proper data curation preserves the investment of time and money made to create the valuable datasets powering today’s artificial intelligence systems and allows future researchers to reuse and recombine different data sources to support earlier decisions or enable new discoveries.

**CORPORATE VALUE**
- Crafting standards to facilitate increased accessibility and usability of datasets
- Supporting the full realization of data-driven strategies and data-intensive decision making
- Positioning workers to interact with and understand data at different stages of the data pipeline
- Broadening opportunities for the use and reuse of large-scale datasets

**SELECTED EXPERTISE**

**At-Scale Data Curation Training**
- Delivering scalable, accessible, inclusive, just-in-time training for work with data
- Supporting development of a strong data culture within companies to ensure proper curation

**Heritage Preservation**
- Preserving the data that make up the traditions and knowledge of any culture, including corporate culture or an industry’s history and heritage
- Analyzing the impact of social factors on metadata systems and systems interoperability

**Design-Level Tool Development**
- Creating practical tools for researchers working with large-scale humanities data
- Comparing data and metadata standards for best-fit implementation of data curation practices
Information Modeling & Practices
- Analyzing common concepts in information systems and services
- Developing strategies to meet the need for consistent definitions and descriptions in digital environments
- Examining the impact of collaboration, contexts, and infrastructures on scientists’ data practices
- Analyzing changes in the conduct of scientific research that result from the collection of increasing quantities and types of scientific data

Reproducibility
- Improving the reliability of results in the face of sophisticated computational approaches to research
- Understanding the effect of big data and computation on scientific inference, the design and implementation of scientific validation systems and standards of openness and transparency for data and code sharing

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INFORMATION LIFECYCLE
- Developing strategies for data collection and management
- Collecting and assembling structured and unstructured data
- Integrating data from multiple sources
- Assuring data quality and protection
- Describing data metadata, taxonomy, ontology
- Analyzing data to identify trends and actionable insights
- Developing visualizations and stories to communicate insights
- Archiving, saving, and/or disposing data

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Digital libraries (DL) can bring all the world’s electronic books to our fingertips. Beyond books, DL systems allow us to collect, organize, preserve, and distribute all kinds of information objects, including scientific reports, business records, documents, maps, images, video, and even music. At the iSchool, researchers are developing DL solutions that combine the latest search engine, recommender, artificial intelligence, and interface technologies. Digital libraries can be created and customized for all sizes of collections and organizations: from a handful of photographs for a local history group to the combined documentation output of a global enterprise. Modern DL systems help us bring together all the information objects, regardless of format, relevant to a topic of interest. For example, imagine how useful it would be to have all the articles, books, images, recordings, and videos covering a popular subject of interest in one place.

**CORPORATE VALUE**

- Designing and evaluating systems to organize, preserve, and provide broad-scale digital access to data and information objects
- Combining social and technological approaches to create customized digital collections across a variety of media formats
- Developing human-centered solutions to information retrieval problems

**SELECTED EXPERTISE**

**Collaborative Technologies**

- Supporting the application of collaborative technologies to manage data quality and information retrieval

**Complex Media Preservation**

- Developing sociotechnical approaches to the design of digital libraries, including metadata and description
- Digital preservation of complex media and software, including video games and interactive software
Moving Image Digitization
- Analyzing standards for moving image digitization, including the impact of social contexts, technical choices, and decision-making processes

Digital Humanities
- Designing and evaluating systems for large-scale digital libraries
- Developing systems for music information retrieval
- Analyzing patterns in large collections, as shown below

References to money in literature

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The iSchool is home to the Business Intelligence Group (BIG), a fast-paced, real-world learning opportunity for graduate students working in interdisciplinary teams to solve information and technology problems for international, national, and regional clients. Led by Associate Professor Yoo-Seong Song, who brings extensive experience as a consultant and an entrepreneur, this program offers a unique learning opportunity for students. Student consultants at BIG acquire and practice problem-solving skills critical to the success of today’s organizations. BIG’s clients include multinational corporations, nonprofit organizations, and technology start-ups.

**CONSULTING PROJECTS**

- Impact of blockchain technology on the agribusiness and food supply chain
- Creating a dashboard for global sales management for a manufacturing company
- Building a business model and assessing market opportunities for a mobile healthcare device manufacturer
- Creating a data management strategy for a wearable healthcare device start-up
- Identifying talent gaps for data scientists
- Developing an investment proposal for a genomic testing start-up
- Creating a knowledge management roadmap for an international university consortium
- Creating a growth plan using data analytics for a sports management start-up

**HOW BIG WORKS**

- Students are assigned to different teams and engage with selected clients from industry and community organizations. Projects range from drafting engagement letters to delivering final presentations.
- A typical student team consists of one project manager and consultants. The faculty advisor may assign a senior consultant if necessary. The team will have either weekly or biweekly calls with the client throughout the engagement.
- Students sign a non-disclosure agreement (NDA).
Areas of Expertise

- Data analytics
- Entrepreneurship based on data analytics
- Knowledge management
- Competitive intelligence
- Data curation and management
- Information security
- Business and technology research

Project Lifecycle

Clients typically connect with Associate Professor Song six to eight weeks in advance of the semester with a list of projects. Once the semester begins, the life cycle runs eight to twelve weeks.

- Weeks 1–2: Project team is assigned
- Weeks 3–6: Project launches with NDA and initial meeting
- Weeks 6–9: Focused research with biweekly client meetings
- Week 10: Project midpoint and client confirmation of direction
- Weeks 10–12: Final presentation to client

Get Involved

We invite corporate and community involvement in the BIG program. BIG is continually looking to identify projects and partnerships outside of the university. If you have an information research project suitable for this semester-long collaboration, please contact Associate Professor Song at yoosong@illinois.edu.

Outcomes

Clients receive

- Solutions to complex problems via BIG’s expertise as well as access to experts on campus
- Deep understanding of students’ talents and innovative approaches
- Creative recommendations from student teams with diverse subject backgrounds and work experiences

Students learn to

- Approach complex problems using proven methods of strategy and management consulting
- Produce professional deliverables that have true impact on the clients’ businesses

BIG Management

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