

Syracuse University and Indiana University

Enabling Accessibility and Linking Digital Media Collections in Academic Libraries

Syracuse University (SU) and Indiana University (IU), collaborating with the SU Bird Library, IU Wells Library and the Coulter Library of Onondaga Community College (OCC) in Syracuse, request \$249,909 and will costshare \$91,763 to support a National Digital Platform project.

Statement of Need

Video captioning is a relied-upon method not only for providing essential accessibility for the deaf and hearing-impaired community--made up of 36 million Americans--but also for improving students' comprehension when consuming visual content. However, the cost of providing captions for a large volume of videos is prohibitive. As the National Association of the Deaf (NAD) has been taking legal action to require educational organizations to provide captioned online videos, many universities, including SU and IU, are actively seeking cost-effective solutions to enable accessibility of video collections.

Researchers at SU's School of Information Studies and IU's School of Informatics and Computing, partnering with the SU Bird Library, the IU Wells Library, and the OCC Coulter Library, propose to design and develop an open-source platform that will 1) address the accessibility of video content by creating tools to provide a cost-efficient captioning service by applying Automatic Speech Recognition (ASR) and crowdsourcing closed captions; and 2) promote easy sharing, searching, and discovery of library resources by linking captioned videos with digital collections.

This project is a timely response to IMLS' National Leadership Grants for Libraries (NLG) *National Digital Platform* funding priority. Our open-source tools can be used by academic libraries nationwide to help advance accessibility practices and to improve the quality of service related to digital collections.

Goal and Project Design

The SU/IU Libraries hold thousands of circulating visual media items in their digital collections along with streaming video content hosted on their University-owned sites. These media items and videos are not, however, accessible to all users, as the majority are not captioned. Online course instructors also frequently approach libraries to acquire captioning services for their video lectures. Academic libraries face issues of accessibility, scale, and cost: the rate can vary from \$1/minute to \$10/minute for professional closed captioning services. Commercial vendors are largely expensive and restrictive.

In this project, we propose a holistic approach to address on-demand, real-time needs, as well as offline services for long-term accessibility and archiving of digital collections. These objectives will be accomplished by creating tools based on the PI's own system, *CaptionBand* (Huang et al., 2017), which is a web application that has been deployed at SU. According to the team's extensive experience with *CaptionBand* and our prior research on video indexing and query, we propose a 2-phase plan as follows.

Phase One (Accessibility): To reduce the cost of creating captions from scratch, our tools will first employ Automatic Speech Recognition (ASR) technology to provide users with machine-generated captions as a baseline, and will then allow users to request corrections for an ASR-generated caption or to edit captions of a particular video segment. These two processes are the key to obtain the initial captions and to enhance the quality of captions. Using the similar processes, *CaptionBand* saves about 94% typing effort compared to creating captions from scratch. To streamline the key processes at different institutions, we will conduct interviews and surveys to collect the requirements or policies that are currently in place. We will create both a browser plugin and JavaScript libraries that integrate with the major functional components of *CaptionBand*, such that the provided service can address both online and offline requests for closed captioning. We have already identified a technically feasible and sound solution that can secure the delivery of ASR-generated captions via a browser plugin. Prior research (Shiver & Wolfe, 2015) found that providing ASR-generated captions can improve deaf people's comprehension of video content even though ASR-generated captions may contain errors. To this end, the baseline solution with ASR will make a big stride towards addressing accessibility. Our recent study (Huang et al., 2017) showed that hearing-impaired users would send caption correction requests when they felt frustrated with caption errors; it also showed that displaying the number of correction requests would promote caption correction as a result of altruism. Using the new proposed tools, we

will further explore more intrinsic motivators (e.g., curiosity, self-importance, etc.) and incentive mechanisms (gamification) to encourage user contributions (Kraut & Resnick, 2012).

Phase Two (Linkability): Without captions, the current means of accessing videos and connecting them with other digital collections relies on the metadata from indexing videos, which is usually created with standards such as Dublin Core. The automatically generated and crowd-enhanced captions will provide a richer source for producing a much more comprehensive content representation of videos, which in turn will promote more effective discovery of collections by utilizing full text transcripts together with video images. The Co-PIs have extensive research experience with creating innovative structural and referential metadata properties, which can enhance the linkability of videos and digital collections. For example, machine-learning algorithms can be used to extract structured, descriptive, and subject metadata (Liu & Qin, 2014) from videos. Entity names such as personal names, organization names and event names as well as metadata (for time, geographical space, relations, etc.) can be extracted from the captions and organized into a knowledge base, which can aid not only the interface design for searching, identifying, selecting, and obtaining videos as well as other collections, but also the linkage between videos and other digital collections. We anticipate that the automatic linkages will enhance heuristic and serendipitous discovery, potentially resulting in more use of videos and other digital collections. Our novel algorithms will enable knowledge-based collection search and linkage with high relevancy and accuracy tolerating the caption errors generated by ASR. Copyright and licensing concerns of digital collections will be carefully addressed with the support of our advisory board members, including Peter Blanck, an expert in disability law and policy, as well as SU's Office of University Counsel.

Project Team and Partners: The team is well qualified and prepared for the proposed activities. The project will be led by Dr. Yun Huang, PI, who has built and deployed several production systems and open software. She has been awarded by NSF and Google as a single PI and DOE as a co-PI to conduct her systems research. Dr. Jian Qin, co-PI, will contribute her expertise in data management and information organization. Co-PI, Dr. Xiaozhong Liu, will facilitate the design of knowledge-based video indexing, retrieval and recommendation. Collaborating with the three academic libraries will provide a unique opportunity to learn how size, private vs. public institution status, and policy factors inform and impact the design of the platform.

National Impact: This proposed project will provide a service platform that can be used by academic libraries nationwide in order to address the ever-expanding amount of visual content that needs to be made accessible in order to meet institutional and organizational policies and Americans with Disabilities Act (ADA) requirements. The infrastructure built from this project will also offer an opportunity to link videos with other digital collections, promoting access to library resources. This will benefit the library and scholarly community as a whole, but even more so, students, faculty and other users who are deaf or hard of hearing.

Estimated Budget: The project budget is estimated at \$249,909, which will support PI and co-PI salary (\$25,977), graduate students' salary (\$82,219), fringe benefits (\$18,630), dissemination (\$3000), human subjects (\$900), subcontract to Indiana University (\$39,821), advisory board (\$1,000) and indirect costs (\$78,362). Additionally, Syracuse University will provide \$91,763 in cost sharing of graduate student tuition (\$58,380), 0.25 academic year months for the PI (\$16,559), fringe benefits (\$5696) and indirect costs (\$11,128).

References:

- Yun Huang, Yifeng Huang, Na Xue, Jeffery Bigham, Leveraging Complementary Contributions of Different Workers for Efficient Crowdsourcing of Video Captions, Proceedings of the ACM Conference on Human Factors in Computer Systems (CHI2017), 2017.
- Robert E. Kraut and Paul Resnick, Encouraging contributions to online communities, Building successful online communities: Evidence--based social design. Cambridge, MA: MIT Press, 2012.
- Xiaozhong Liu, Jian Qin, An interactive metadata model for structural, descriptive, and referential representation of scholarly output. Journal of the American Society for Information Science and Technology, 65(5): 964-983, 2014.
- Brent Shiver and Rosalee Wolfe, Evaluating Alternatives for Better Deaf Accessibility to Selected Web--based Multimedia, ASSETS 2015.

APPLICATION FOR FEDERAL DOMESTIC ASSISTANCE - Short Organizational	
* 1. NAME OF FEDERAL AGENCY: Institute of Museum and Library Services	
2. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: 45.312 CFDA TITLE: National Leadership Grants	
* 3. DATE RECEIVED: 09/01/2017	SYSTEM USE ONLY
* 4. FUNDING OPPORTUNITY NUMBER: NLG-LIBRARIES-FY18-1 * TITLE: National Leadership Grants for Libraries	
5. APPLICANT INFORMATION	
* a. Legal Name: Syracuse University	
b. Address:	
* Street1: 211 Lyman Hall	Street2:
* City: Syracuse	County/Parish:
* State: NY: New York	Province:
* Country: USA: UNITED STATES	* Zip/Postal Code: 13244-1200
c. Web Address: http://	
* d. Type of Applicant: Select Applicant Type Code(s): O: Private Institution of Higher Education Type of Applicant: Type of Applicant: * Other (specify):	* e. Employer/Taxpayer Identification Number (EIN/TIN): 150532081 * f. Organizational DUNS: 0022573500000 * g. Congressional District of Applicant: NY-024
6. PROJECT INFORMATION	
* a. Project Title: Enabling Accessibility and Linking Digital Media Collections in Academic Libraries	
* b. Project Description: Accessibility of digital collections has become a critical issue for academic libraries. In this project, we propose to design, implement, and evaluate an open-source platform to enable accessibility and link digital media collections through partnership with academic libraries. More specifically, we will (1) address the accessibility of video content by creating tools that will provide a cost-efficient captioning service by applying Automatic Speech Recognition (ASR) and crowdsourcing strategies; and (2) promote easy sharing, searching, and discovery of library resources by linking captioned videos with digital collections. This project addresses IMLS's National Leadership Grants for Libraries (NLG) National Digital Platform funding priority in that the deliverables can be used by academic libraries nationwide to help advance accessibility practices and to improve the quality of service related to digital collections.	
c. Proposed Project: * Start Date: 07/01/2018 * End Date: 06/30/2021	

APPLICATION FOR FEDERAL DOMESTIC ASSISTANCE - Short Organizational

7. PROJECT DIRECTOR

Prefix: Dr.	* First Name: Yun	Middle Name:
* Last Name: Huang	Suffix: Ph.D.	
* Title: Assistant Professor	* Email: yhuang@syr.edu	
* Telephone Number: 315-443-5299	Fax Number:	
* Street1: 226 Hinds Hall	Street2:	
* City: Syracuse	County/Parish:	
* State: NY: New York	Province:	
* Country: USA: UNITED STATES	* Zip/Postal Code: 13244-1190	

8. PRIMARY CONTACT/GRANTS ADMINISTRATOR

<input type="checkbox"/> Same as Project Director (skip to item 9):		
Prefix:	* First Name: Amy	Middle Name: S
* Last Name: Deppa	Suffix:	
* Title: Research Administrator	* Email: asdeppa@syr.edu	
* Telephone Number: 315-443-9355	Fax Number:	
* Street1: 211 Lyman Hall	Street2:	
* City: Syracuse	County/Parish:	
* State: NY: New York	Province:	
* Country: USA: UNITED STATES	* Zip/Postal Code: 13244-1200	

APPLICATION FOR FEDERAL DOMESTIC ASSISTANCE - Short Organizational

9. * By signing this application, I certify (1) to the statements contained in the list of certifications** and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties (U.S. Code, Title 218, Section 1001)

** I Agree

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

AUTHORIZED REPRESENTATIVE

Prefix: <input type="text"/>	* First Name: Amy <input type="text"/>	Middle Name: S <input type="text"/>
* Last Name: Deppa <input type="text"/>	Suffix: <input type="text"/>	
* Title: Research Administrator <input type="text"/>	* Email: asdeppa@syr.edu <input type="text"/>	
* Telephone Number: 315-443-9355 <input type="text"/>	Fax Number: <input type="text"/>	
* Signature of Authorized Representative: Amy Deppa <input type="text"/>	* Date Signed: 09/01/2017 <input type="text"/>	

IMLS PROGRAM INFORMATION SHEET

PLEASE NOTE: Information contained within this form may be made publicly available.

1. Applicant Information

a. Legal Name as it appears in SAM.gov (5a from SF424S):

b. Organizational D-U-N-S® Number (5f from SF-424S):

0	0	2	2	5	7	3	5	0
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c. Expiration date of your SAM.gov registration

d. Organizational Unit Name (if different from Legal Name):

e. Organizational Unit Address (if different from Legal Name address)

Street 1

Street 2

City County

State Zip+4/Postal Code

1	3	2	4	4	-	1	1	9	0
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f. Organizational Unit Type (check one):

- | | | |
|--|---|---|
| <input type="radio"/> Academic Library
<input type="radio"/> Aquarium
<input type="radio"/> Arboretum/Botanical Garden
<input type="radio"/> Art Museum
<input type="radio"/> Children's/Youth Museum
<input type="radio"/> Community College
<input type="radio"/> Digital Library
<input type="radio"/> Four-year College
<input type="radio"/> General Museum*
<input checked="" type="radio"/> Graduate School of Library and Information Science
<input type="radio"/> Historic House/Site
<input type="radio"/> Historically Black College or University (HBCU)
<input type="radio"/> History Museum | <input type="radio"/> Library Association
<input type="radio"/> Library Consortium
<input type="radio"/> Museum Library
<input type="radio"/> Museum Services Organization/Association
<input type="radio"/> Native American Tribe/Alaska Native/Native Hawaiian Organization
<input type="radio"/> Natural History/Anthropology Museum
<input type="radio"/> Nature Center
<input type="radio"/> Planetarium
<input type="radio"/> Public Library
<input type="radio"/> Research Library/Archives | <input type="radio"/> School Library or School District applying on behalf of a School Library or Libraries
<input type="radio"/> Science/Technology Museum
<input type="radio"/> Special Library
<input type="radio"/> Specialized Museum**
<input type="radio"/> State Library
<input type="radio"/> State Museum Agency
<input type="radio"/> State Museum Library
<input type="radio"/> Zoo
<input type="radio"/> Institution of higher education other than listed above
<input type="radio"/> Other <input style="width: 100px; height: 20px;" type="text"/> |
|--|---|---|

* A museum with collections representing two or more disciplines equally (e.g., art and history)

** A museum with collections limited to one narrowly defined discipline (e.g., textiles, maritime, ethnic group)

IMLS PROGRAM INFORMATION SHEET

2. Organizational Financial Information

a. Please complete the following table for the Organizational Unit for the three most recently completed fiscal years.

Fiscal Year	Total Revenue*	Total Expenses**	Surplus or Deficit
2014	\$34,180,931	\$34,180,931	\$0
2015	\$37,703,970	\$37,703,970	
2016	\$38,895,367	\$38,895,367	

* For nonprofit tax filers, Total Revenue can be found on Line 12 of the IRS Form 990.

** For nonprofit tax filers, Total Expenses can be found on Line 18 of the IRS Form 990.

b. If you had a budget surplus or deficit greater than 10% of your annual operating budget for two or more of the three fiscal years listed above, please explain the circumstances of this surplus or deficit in the box below.

c. Were there any material weaknesses identified in your prior year's audit report?

Yes

No

Not applicable

A **material weakness** is a deficiency, or combination of deficiencies, in internal control, such that there is a reasonable possibility that a material misstatement of the entity's financial statements will not be prevented, or detected and corrected on a timely basis.

If **yes**, please explain.

d. Has your organization had an A-133 audit in the past three years?

Yes

No

IMLS PROGRAM INFORMATION SHEET

Refer to the Notice of Funding Opportunity for descriptions of these options and instructions for how to make selections.

3. Grant Program

a. Laura Bush 21st Century Librarian Program

1. Select one:

- Planning Grant
- National Forum Grant
- Project Grant
- Research Grant

2. Select one:

- Pre-professional
- Masters-level and Doctoral-level Programs
- Early Career Development
- Continuing Education

3. Select one

- Community Anchors
- National Digital Platform
- Curating Collections

b. National Leadership Grants for Libraries

1. Select one:

- Sparks Grant
- Planning Grant
- National Forum Grant
- Project Grant
- Research Grant

2. Select one:

- Community Anchors
- National Digital Platform
- Curating Collections

c. Native American/Native Hawaiian Library Services

1. Select one:

- Native American Basic Grant
- Native American Enhancement Grant
- Native Hawaiian Library Services

d. Museums for America

1. Select one:

- Learning Experiences
- Community Anchors
- Collections Stewardship

2. Select one:

- \$5,000–\$25,000 with no cost share permitted.
- \$25,001–\$250,000 with cost share required.

e. Museums Empowered (an MFA Special Initiative)

1. Select one:

- Digital Technology
- Diversity and Inclusion
- Evaluation
- Organizational Management

2. Select one:

- \$5,000–\$25,000 with no cost share permitted.
- \$25,001–\$250,000 with cost share required.

f. National Leadership Grants for Museums

1. Select one:

- Advancing Digital Assets and Capacity
- Collection Care and Access
- Diversity and Inclusion
- Professional Development

2. Select one:

- Non-research grant, \$50,000–\$1,000,000 with cost share required.
- Research grant, \$50,000–\$1,000,000 with no cost share required.
- Rapid prototyping grant, \$5,000–\$50,000 with no cost share required.

g. Museum Grants for African American History and Culture

1. Select one:

- \$5,000–\$25,000 with no cost share permitted.
- \$25,001–\$150,000 with cost share required.

h. Native American/Native Hawaiian Museum Services

4. Performance Goals

Select one of the following three IMLS agency-level goals: (a) Learning, (b) Community, or (c) Content and Collections. Then select at least one of the performance goals listed beneath it:

a. Learning

- Train and develop museum and library professionals
- Support communities of practice
- Develop and provide inclusive and accessible learning opportunities

b. Community

- Strengthen museums and libraries as essential partners in addressing the needs of their communities

c. Content and Collections

- Broaden access and expand use of the Nation's content and collections
- Improve management of the Nation's content and collections
- Improve preservation, conservation, and care of the Nation's content and collections

If you select a performance goal listed beneath Learning or Community for your project, please review in the NOFO the specific performance measure statement choices and the information you will be required to collect for each.

IMLS PROGRAM INFORMATION SHEET

5. Funding Request

a. IMLS funds requested:

b. Cost share amount:

6. Population Served

Please select the target population(s) served by the proposed project:

- | | |
|---|--|
| <input type="checkbox"/> General Population | <input type="checkbox"/> Museum and/or Library Professionals |
| <input type="checkbox"/> Early Childhood/Preschool (0-5 years) | <input type="checkbox"/> Native Americans/Alaska Natives/Native Hawaiians |
| <input type="checkbox"/> Middle Childhood/Primary School (6-12 years) | <input checked="" type="checkbox"/> People with Mental or Physical Challenges/Disabilities |
| <input type="checkbox"/> Adolescents/High School (13-19 years) | <input type="checkbox"/> People Who Are Low Income/Economically Disadvantaged |
| <input checked="" type="checkbox"/> Adults | <input type="checkbox"/> Rural Populations |
| <input type="checkbox"/> Aging, Elderly, Senior Citizens (65+ years) | <input type="checkbox"/> Scholars/Researchers |
| <input type="checkbox"/> Ethnic or Racial Minority Populations other than Native Americans/Native Hawaiians | <input type="checkbox"/> Unemployed |
| <input type="checkbox"/> Families/Intergenerational | <input type="checkbox"/> Urban Populations |
| <input type="checkbox"/> Immigrants/Refugees | <input type="checkbox"/> Other |
| <input type="checkbox"/> Military Families | |

If other, please specify:

7. Museum Profile (Museum Applicants Only)

a. Is your institution organized on a permanent basis for essentially educational or aesthetic purposes, and is it **either** a private not-for-profit organization that has tax-exempt status under the Internal Revenue Code **or** a unit of state or local government? Yes No

b. Does your institution own or use tangible objects, either animate or inanimate? Yes No

c. Does your institution care for these objects? Yes No

d. Does your institution exhibit these objects to the general public at least 120 days a year through facilities your institution owns or operates? Yes No

e. Your institution's attendance for the 12-month period prior to the application

f. Year your institution was first open and exhibiting to the public:

g. Total number of days your institution was open to the public for the 12-month period prior to application:

h. Does your institution employ at least one professional staff member, or the full-time equivalent, whether paid or unpaid, who is primarily engaged in the acquisition, care, or exhibition to the public of tangible objects owned or used by your institution? Yes No

i. Number of full-time paid institution staff:

j. Number of full-time unpaid institution staff:

k. Number of part-time paid institution staff:

l. Number of part-time unpaid institution staff:

IMLS PROGRAM INFORMATION SHEET

8. Project Elements (Museums for America Only)

Your response to this question will help us match your application to reviewers with appropriate experience. Make your choice under the project category that you selected in Question 3 (Grant Program).

LEARNING EXPERIENCES

If you are applying in the Learning Experiences Project Category, select the **primary** element that is core to your proposed project from the list below (**check only one**):

- | | |
|---------------------------------------|---|
| <input type="radio"/> Adult Programs | <input type="radio"/> Interpretation |
| <input type="radio"/> Digital Media | <input type="radio"/> K-12 Programs, With Schools |
| <input type="radio"/> Early Learning | <input type="radio"/> K-12 Programs, Out of School |
| <input type="radio"/> Exhibitions | <input type="radio"/> Professional Development/Training |
| <input type="radio"/> Family Programs | <input type="radio"/> Public Programs |

COMMUNITY ANCHORS

If you are applying in the Community Anchors Project Category, select the **primary** element that is core to your proposed project from the list below (**check only one**):

- | | |
|---|---|
| <input type="radio"/> Audience Research and Evaluation | <input type="radio"/> Community Outreach/Audience Development |
| <input type="radio"/> Civic Engagement | <input type="radio"/> Digital Media |
| <input type="radio"/> Community-Driven Exhibitions and Programs | <input type="radio"/> Professional Development/Training |
| <input type="radio"/> Community-Focused Planning Activities | |

COLLECTIONS STEWARDSHIP

If you are applying in the Collections Stewardship Project Category, select the **primary** element that is core to your proposed project from the list below (**check only one**):

Access and Use

- Database Management
- Digitization
- Software Applications
- Website Development

Collections Management

- Cataloguing, Inventorying, Registration
- Collections Information Management
- Collections Planning

Conservation

- Conservation Environmental Improvement/Rehousing
- Conservation Survey
- Conservation Treatment
- Professional Development/Training

Please identify the material type(s) that will be affected by your project:

- | | |
|---|---|
| <input type="checkbox"/> Animals, living | <input type="checkbox"/> Photographic Materials |
| <input type="checkbox"/> Animals, preserved | <input type="checkbox"/> Plants, living |
| <input type="checkbox"/> Architecture | <input type="checkbox"/> Plants, preserved |
| <input type="checkbox"/> Books and Paper | <input type="checkbox"/> Sculpture |
| <input type="checkbox"/> Electronic Media | <input type="checkbox"/> Textiles |
| <input type="checkbox"/> Objects | <input type="checkbox"/> Wooden Artifacts |
| <input type="checkbox"/> Paintings | |