



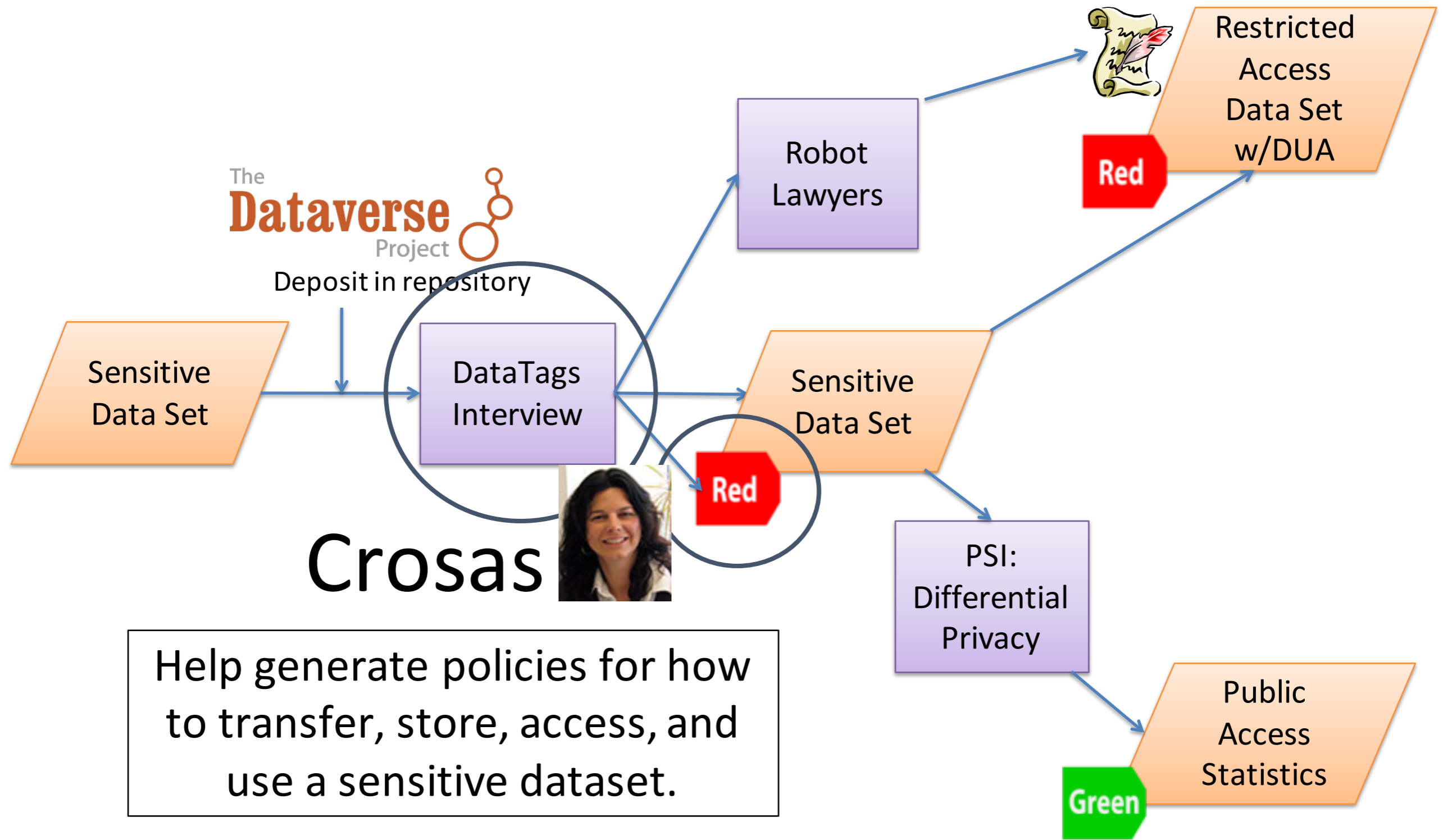
# DataTags in Dataverse

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Help generate policies for how to transfer, store, access, and use a sensitive dataset.

# This Talk

- Dataverse
- DataTags
- DataTags integrated with a Dataverse repository
- Workflow step by step: deposit and access
- Next Steps and Lessons learned

Dataverse

- An open-source software platform to build data repositories
- Used to share, find, cite, and archive data
- Incentivizes data sharing by giving a data citation for each dataset with credit to data authors
- Main features:
  - Customization by branding or embedding a dataverse in your website
  - Standard and extensible metadata
  - Versioning (and soon provenance!)
  - Access control: guestbooks, file restrictions, terms of use and licensing
  - Extraction of variable (column) information from tabular data files
  - Integration with data explorations
  - APIs for depositing, searching, and accessing data and metadata
- Compliant with the FAIR principles: Findable, Accessible, Interoperable, Reusable data

# Dataverse software used world-wide

- Installed in 27 sites around the world
- Each site might support an institution or the entire research community
- Sites can be federated by sharing metadata
- Has a growing and active open-source community



# Harvard Dataverse repository

- Since 2007, hosts 2,400 dataverses
- 75,000 datasets, local and harvested
- 25,000 datasets with 219,000 files, deposited to Harvard Dataverse
- 40,000 files in tabular standardized format, with variable information
- 2.8 Million downloads
- 20,000 registered users
- 36,000 unique visitors per month, average for 2017
- 300 new datasets per month, average for 2017
- 50% social science research data, 13% biomedicine & health

DataTags



A **datatag** is a set of security features and access requirements for file handling.

A **datatags repository** is one that stores and shares data files in accordance with a standardized and ordered levels of security and access requirements

A DataTags Repository must satisfy the following conditions:

1. Supports more than one **datatag**
2. Each file in the repository must have one and only one **datatag**
  - a. additional requirements cannot weaken the file security
  - b. and cannot required the same or more security than a more restrictive datatag
3. A recipient of a file from the repository must:
  - a. satisfy file's access requirements,
  - b. produce sufficient credentials as requested,
  - c. and agree to any terms of use required to acquire the file.
4. Provides technological guarantees for requirements 1, 2 and 3.

# DataTags Levels

<b>Tag Type</b>	<b>Description</b>	<b>Security Features</b>	<b>Access Credentials</b>
<b>Blue</b>	Public	Clear storage, Clear transmit	Open
<b>Green</b>	Controlled public	Clear storage, Clear transmit	Email- or OAuth Verified Registration
<b>Yellow</b>	Accountable	Clear storage, Encrypted transmit	Password, Registered, Approval, Click-through DUA
<b>Orange</b>	More accountable	Encrypted storage, Encrypted transmit	Password, Registered, Approval, Signed DUA
<b>Red</b>	Fully accountable	Encrypted storage, Encrypted transmit	Two-factor authentication, Approval, Signed DUA
<b>Crimson</b>	Maximally restricted	Multi-encrypted storage, Encrypted transmit	Two-factor authentication, Approval, Signed DUA

## *DataTags and their respective policies*

Sweeney L, Crosas M, Bar-Sinai M. [Sharing Sensitive Data with Confidence: The Datatags System](#).  
Technology Science. 2015.

# DataTags vs Harvard Security Levels

**Blue**

**Level 1:**

No sensitive data; open data

**Green**

**Level 1:**

Low risk de-identified data

**Yellow**

**Level 2:**

Confidential information by University standards; no material harm

**Orange**

**Level 3:**

Confidential information that could cause material harm (non-level 4 FERPA)

**Red**

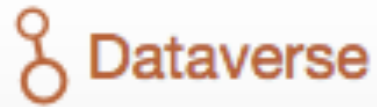
**Level 4:**

High-risk confidential information (SSN)

**Crimson**

**Level 5\*** (Level 4.5, on the network)  
Information that would cause severe harm

# Integrating DataTags in Dataverse



Harvard Dataverse

“User Uploads must be void of all identifiable information, such that re-identification of any subjects from the amalgamation of the information available from all of the materials (across datasets and dataverses) uploaded under any one author and/or user should not be possible.”



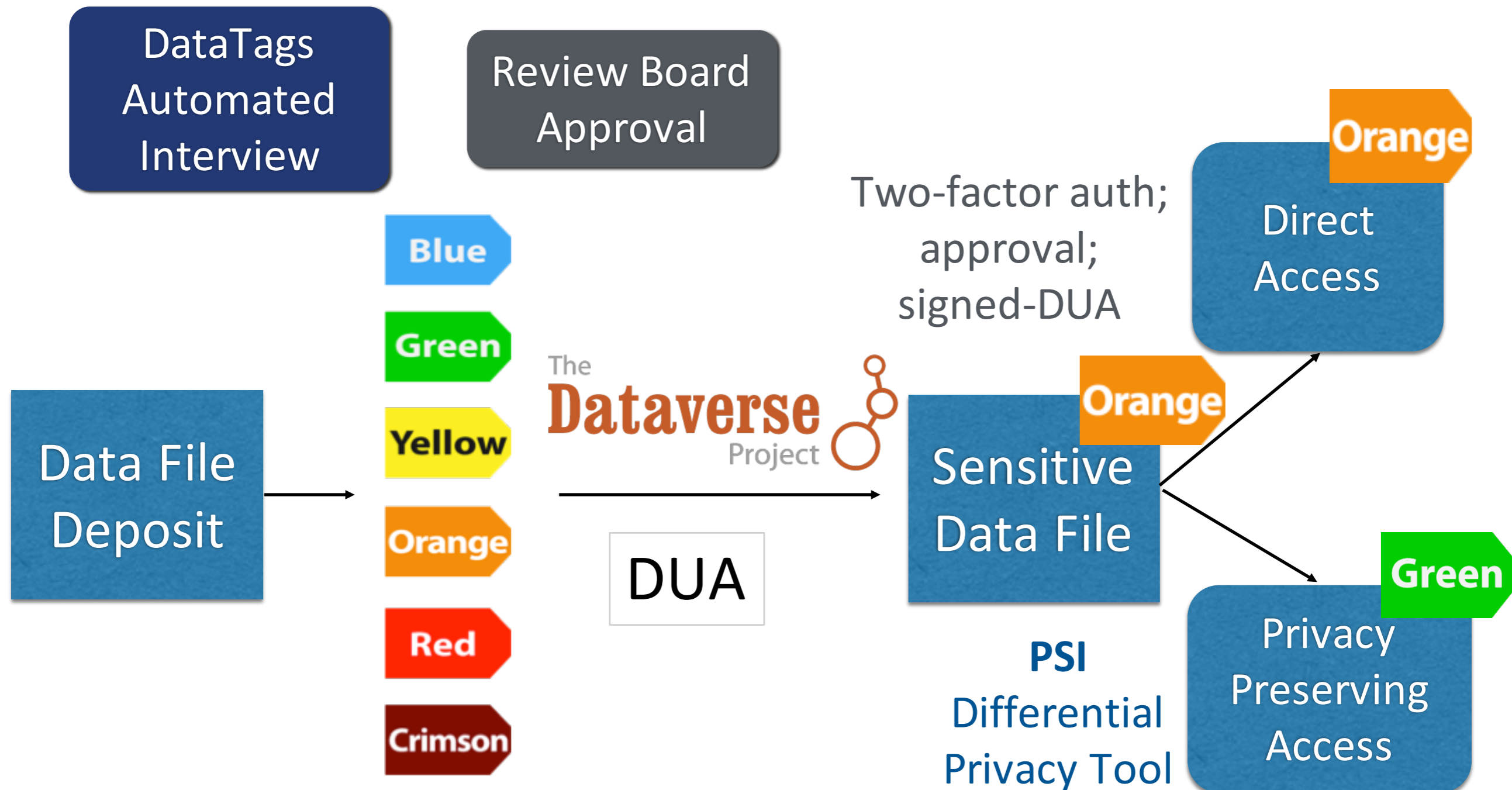
“Submitter represents and warrants that the Content does not contain any information (i) which identifies, or which can be used in conjunction with other publicly available information to personally identify, any individual;”



# GenBank

“If you are submitting human sequences to GenBank, do not include any data that could reveal the personal identity of the source. It is our assumption that you have received any necessary informed consent authorizations that your organizations require prior to submitting your sequences.”

# Datatags integrated with a Dataverse Repository



# Step 1. Create a dataset, default no sensitive data (datatag **blue**)

Harvard Dataverse > Murray Research Archive Dataverse >

**i** Add Dataset - Create an unpublished draft dataset in Murray Research Archive Dataverse. Add additional metadata, files, terms and permissions before publishing. ×

## New Dataset

**Draft** **Unpublished** **Blue**

To-Do List: Before Publishing your Dataset ^

- Required Citation Metadata -- These are the only required fields to create a dataset citation.
- Additional Metadata -- All other metadata fields that are not required to create a dataset citation.
- Sensitive Data Level -- The DataTag applied to this dataset is **Blue**, which means it does not contain sensitive data or identifiable information.
- Files -- The data files associated with this dataset.
- Terms -- These are the terms of use, access, etc.
- Permissions -- Who can access my dataset and data files.

**Host Dataverse** Murray Research Archive Dataverse

**Dataset Template** **i** Changing the template will clear any fields you may have entered data into.

None ▼

\*Asterisks indicate required fields

### Citation Metadata ^

**Title \***

**Author \***

<b>Name *</b>	<input type="text" value="Crosas, Mercè"/>	<b>Affiliation</b>	<input type="text" value="Dataverse.org"/>	<input type="button" value="+"/>
<b>Identifier Scheme</b>	<input type="text" value="Select..."/>	<b>Identifier</b>	<input type="text"/>	

# Step 2. Wait, take the DataTags Questionnaire because you might have sensitive data!

Sensitive Data Level -- The DataTag applied to this dataset is **Blue**, which means it does not contain sensitive data or identifiable information. Edit

Files -- The data files associated with this dataset. Edit

Terms -- These are the terms of use, access, etc. Edit

Permissions -- Who can access my dataset and data files. Edit

Summary Files Metadata Explore Terms Provenance Versions

Crosas, Mercè, 2017, "Sample Data from the Harvard University Graduate School of Education, Law, and Public Administration Dataset, DRAFT VERSION" ?

[Learn about Data Citation Standards](#)

**Sensitive Data Level** ×

Learn about sensitive and identifying information, please refer to the DataTags section of our [User Guide](#).

**Sensitive Data Level \*** Blue - No sensitive data or identifiable information in this dataset

**DataTag \*** This dataset is **Blue**, or non-confidential, CC0, and files are unrestricted, or accessible by anyone.

Need help to determine what restrictions may be appropriate for your data?

[Take DataTags Questionnaire](#)

I confirm the information above is accurate, correct and true.

Accept Cancel

**Description**

This study gathered information on the experiences of seven Harvard University graduates in the fields of Divinity, Education, Law, and Public Administration. Additional participants from the Department of Education collected by means of a mailed questionnaire responded, including 1,255 men and women.

Variables assessed from the questionnaire included: children and child-care arrangements, partner's work, and evaluations of one's own education and career as compared to other male and female colleagues. Nadelson and Notman's study of medical school alumnae (see Log# 00629 ) included many similar questions.

The Murray Archive holds additional analogue materials for this study. If you would like to access this material, please apply to use

# Step 3: The DataTags Questionnaire ...

The image shows three overlapping browser windows from the website [www.datatags.org](http://www.datatags.org). The foreground window is at the URL `www.datatags.org/interviews/questionnaireId/q/MR7` and displays the following content:

**Question: Please select one answer**

Do the data contain information from a covered entity or business associate of a covered entity?

**Terms**

**Business associate**  
A business associate is any person or organization, including a subcontractor, that acts on behalf of, or provides services to, a covered entity involving the use or disclosure of protected health information. This includes, but is not limited to, legal, actuarial, accounting, consulting, claim processing, data analysis, administration, utilization review, quality assurance, billing, benefit management, practice management, and re-pricing activities.

**Covered entity**  
A covered entity is a health plan, health care clearinghouse, or health care provider that transmits any health information in electronic form.

- Health plans include health insurance companies, health maintenance organizations [HMOs], company health plans, and government programs that pay for health care, such as Medicare, Medicaid, and the military and veterans health care programs.
- Health care providers include doctors, clinics, psychologists, dentists, chiropractors, nursing homes, and pharmacies.
- Health care clearinghouses include entities that process nonstandard health information they receive from another entity into a standard, i.e. standard electronic format or data content, or vice versa.

Yes Not Sure No

**Answer Feed**

Do the data contain information related to substance abuse diagnosis, referral, or treatment? No [Revisit](#)

**Current Tags**

DataTags

Code **green**

The middle window is at the URL `www.datatags.org/interviews/FlowChartSet-1/q/medicalRecordsCompliance` and shows a question: "Do the data contain health information related to substance abuse diagnosis, referral, or treatment?" with "Yes" and "No" buttons.

The background window is at the URL `www.datatags.org/interviews/FlowChartSet-1/start` and shows a question: "Do the data concern living persons?" with "Yes" and "No" buttons. It also includes an "Answer Feed" section with the text "This space will contain your answer when..." and an "Engine Trace" table:

Id	Type
58	ask

... recommends datatag **Orange**, and generates a machine-readable datatag for your dataset (and files)

The screenshot shows a web browser window with the URL `www.datatags.org/interviews/questionnaireId/accept`. The page features a green banner at the top stating "Dataset Can be Accepted". Below this, a message reads "Your dataset is tagged as **Orange**" with a sub-note: "May include sensitive, identifiable personal information, shared with verified and/or approved recipients under agreement." The main content area is titled "DataTags" and is organized into sections: "Legal", "MedicalRecords", "EducationRecords", "ContractOrPolicy", "GovernmentRecords", "Code", and "Assertions".

Category	Tag
Legal	
MedicalRecords	HIPAA <b>safeHarborDeidentified</b>
EducationRecords	PPRA <b>protectedDeidentified</b> <b>consent</b>
ContractOrPolicy	<b>no</b>
GovernmentRecords	DPPA <b>highlyRestricted</b>
Code	<b>orange</b>
Assertions	

# Step 4: Select **Orange** datatag in Dataverse and agree to terms of use for that datatag

The screenshot shows a web interface for a dataset in Dataverse. A modal dialog titled "Sensitive Data Level" is open in the center. The dialog contains the following elements:

- Title:** Sensitive Data Level
- Introductory text:** Learn about sensitive and identifying information, please refer to the DataTags section of our [User Guide](#).
- Sensitive Data Level:** A dropdown menu currently set to "Orange - Confidential information in this dataset".
- DataTag:** A section stating "This dataset is **Orange**, or moderately confidential, and is restricted unless users are approved and have signed a DUA." Below this is a link: "Need help to determine what restrictions may be appropriate for your data?" and a button: "Take DataTags Questionnaire".
- Terms of acceptance:** A text area with the placeholder "Terms of acceptance for DataTags...".
- Confirmation:** A checked checkbox with the text "I confirm the information above is accurate, correct and true."
- Buttons:** "Accept" and "Cancel" buttons at the bottom.

The background shows a dataset page with tabs for "Summary", "Files", and "Metadata". The dataset title is "Crosas, Mercè, 2017, 'Sample Data', Dataverse, DRAFT VERSION". There are buttons for "Share" and "Contact".

# Step 5: Your dataset is tagged **Orange**; users may request access for raw data if they sign DUA

Harvard Dataverse > Murray Research Archive Dataverse >

## Alumnae Study: Graduate and Professional Schools at Harvard University, 1979

Version 2.0 **Orange**

Summary Files Metadata Explore Terms Provenance Versions

Susan McGee Bailey; Barbara Burrell, 2007, "Alumnae Study: Graduate and Professional Schools at Harvard University, 1979", hdl:1902.1/00536, Harvard Dataverse, V2, UNF:3:j4wTC/d94/OzhhW0lg3LSg==

[Cite Dataset](#) [Share](#) [Contact](#)

[Learn about Data Citation Standards](#)

**Metrics** 5,750 Views 209 Downloads 33 Citations 57 Files 5 Total Files 22 Documentation 30 Tabular Data [Download All Files \(57\)](#)

### Description

This study gathered information on the career development, family responsibilities, and professional standing of graduates from seven Harvard University graduate and professional schools: the Graduate School of Arts and Sciences, Dental Medicine, Design, Divinity, Education, Law, and Public Health. All degree recipients from the class of 1972 at each school were surveyed, with additional participants from the Dental School classes of 1968-1978, and the Divinity School classes of 1974 and 1976. Data were collected by means of a mailed questionnaire in the spring of 1979. Of the 3,000 eligible degree-holders, a total of 1,620 or 63% responded, including 1,255 men and 365 women.

Variables assessed from the questionnaire included educational background, employment history, career goals and job satisfaction, children and child-care arrangements, partner's work, and evaluations of one's own education and career as compared to other male and female colleagues. Nadelson and Notman's study of medical school alumnae (see Log# 00629 ) included many similar questions.

The Murray Archive holds additional analogue materials for this study. If you would like to access this material, please apply to use the data

### Related Publication

Nevo, Aviv, and Rosen, Adam M., (2012) " Identification With Imperfect Instruments." Review of Economics and Statistics 94:3, 659-671.

### Notes

Manuscript Number NCOMMS-17-15407B

### Subject

Social Sciences

### Keyword

electoral integrity project, elections, electoral integrity, electoral fraud, voting behavior

### Preview




Table A.1: Survey Questions Used in Class of 1972

Question	Response	Mean	SD	Min	Max
Q1	Strongly agree	1.5	0.8	1	5
Q2	Strongly disagree	4.5	0.8	1	5
Q3	Agree	2.5	0.8	1	5
Q4	Disagree	3.5	0.8	1	5
Q5	Strongly agree	1.5	0.8	1	5
Q6	Strongly disagree	4.5	0.8	1	5
Q7	Agree	2.5	0.8	1	5
Q8	Disagree	3.5	0.8	1	5
Q9	Strongly agree	1.5	0.8	1	5
Q10	Strongly disagree	4.5	0.8	1	5
Q11	Agree	2.5	0.8	1	5
Q12	Disagree	3.5	0.8	1	5
Q13	Strongly agree	1.5	0.8	1	5
Q14	Strongly disagree	4.5	0.8	1	5
Q15	Agree	2.5	0.8	1	5
Q16	Disagree	3.5	0.8	1	5
Q17	Strongly agree	1.5	0.8	1	5
Q18	Strongly disagree	4.5	0.8	1	5
Q19	Agree	2.5	0.8	1	5
Q20	Disagree	3.5	0.8	1	5

# Step 6: Other files in the **Orange** dataset might have less restrictive datatags
















Harvard Dataverse > Murray Research Archive Dataverse >

## Alumnae Study: Graduate and Professional Schools at Harvard University, 1979 Version 2.0 Orange

Summary **Files** Metadata Explore Terms Provenance Versions

Search this dataset...

1 to 5 of 57 Files    Type: All    Tag: All    Access: All    Publication Date: All    Metadata Source: All

<input type="checkbox"/>		<a href="#">/Example/Hierarchy/Structure/README.docx</a> MS Word (docx) 12.5 KB Aug 26, 2017 11 Downloads MD5: c5cde698dea2f75d27157311cc54c8bc <b>Documentation</b> <span>Green</span>	 
<input type="checkbox"/>		<a href="#">/Example/Hierarchy/Structure/Database_ACM_PRIVACY_Authors_2006_2016.csv</a> Comma Separated Values 1.9 MB Sep 27, 2017 17 Downloads MD5: 0f1816e5450ff1ea7bea820eabd7abc1 <b>Data</b> <span>Orange</span> Dataset of privacy researchers from 2006 to 2016 extracted from the ACM digital library	 
<input type="checkbox"/>		<a href="#">/Example/Hierarchy/Structure/Survey Round1 - Final Questionnaire - Code Book.pdf</a> Adobe PDF 193.7 KB Aug 26, 2017 15 Downloads MD5: 6cb397c2303cf7dfe5d59df54f47e569 <b>Documentation</b> <span>Green</span>	 
<input type="checkbox"/>		<a href="#">/Example/Hierarchy/Structure/Database_ACM_PRIVACY_Authors_2006_2016.csv</a> Comma Separated Values 1.9 MB Sep 27, 2017 17 Downloads MD5: 0f1816e5450ff1ea7bea820eabd7abc1 <b>Data</b> <span>Orange</span> Dataset of privacy researchers from 2006 to 2016 extracted from the ACM digital library	 
<input type="checkbox"/>		<a href="#">/Example/Hierarchy/Structure/Database_ACM_PRIVACY_Authors_2006_2016.csv</a> Comma Separated Values 1.9 MB Sep 27, 2017 17 Downloads MD5: 0f1816e5450ff1ea7bea820eabd7abc1 <b>Data</b> <span>Orange</span> Dataset of privacy researchers from 2006 to 2016 extracted from the ACM digital library	 

# Step 7: Users may explore an Orange data file, with results from PSI (differentially private stats)

Harvard Dataverse > Murray Research Archive Dataverse > Alumnae Study: Graduate and Professional Schools at Harvard University, 1979 >

## 00536Bailey-Burrell-Law-Data.tab

Version 2.0 Data Geospatial Orange

Summary Metadata **Explore** Terms Provenance Versions

Q  116 Results Download

ID	Name	Label	Categories	Valid Cases	Missing Cases	Minimum	Maximum
196545	PanelistIdQuestion	ARF - Panelist ID		493	0	133689	138228
196539	arf_Gender	ARF - Gender	2	493	0	1	2
196519	arf_Age_Rollup_fine	ARF - Age (7 groups)	7	493	0	2	7
196579	ARF_Education_Level_DV	ARF - Education [derived variable]	8	493	0	1	8
196527	arf_HH_Income	ARF - HH Income	8	493	0	1	8

First « 1 2 3 4 5 » Last Records Per Page 5

### Variables

```

    graph TD
      year((year)) --> unicode((unicode))
      unicode2((unicode2)) --> unicode
  
```

### Model Estimate

Predicted Values: Y|X

Expected Values: E(Y|X)

	Estimate	SE	t-value	Pr(< t )
(Intercept)	57.8	0.774	74.7	0.00
unicode2	0.0100	2.80e-7	3.57e+4	0.00

Formula: normal( unicode ~ unicode2 )

# Next Steps and Lessons Learned

- DataTags up to **orange** to be integrated with **Dataverse v5.0** (Q2 2018)
- **Harvard Dataverse** repository to support DataTags once v5 is released (Harvard Security Level 3)
- **Other Dataverse repositories** will be able to support DataTags, if they satisfy hosting/archiving security requirements
- **Other repository or file systems** can use DataTags (not only for Dataverse)
- Institutions might have additional requirements than those imposed by DataTags; **review with IT**
- Liability issues require careful review of terms of use and all information text in the application; **review with OGC, IRB, Berkman/Law school**
- Balance between user-friendly, fast deposit and well-informed steps legally vetted; **lots of UX research and testing**

# Thanks!

## References:

Sweeney L, Crosas M, Bar-Sinai M. Sharing Sensitive Data with Confidence: The Datatags System. Technology Science. 2015. Technology Science

Bar-Sinai M, Sweeney L, Crosas M. DataTags, Data Handling Policy Spaces, and the Tags Language. Proceedings of the International Workshop on Privacy Engineering. 2016. IEEE Symposium on Security and Privacy

<http://datatags.org> (Demo of DataTags questionnaire)

<http://privacytools.seas.harvard.edu>

<http://dataverse.org>