MSE 598 Lecture #1: Intro to 4CeeD

https://learn.4ceed.illinois.edu/

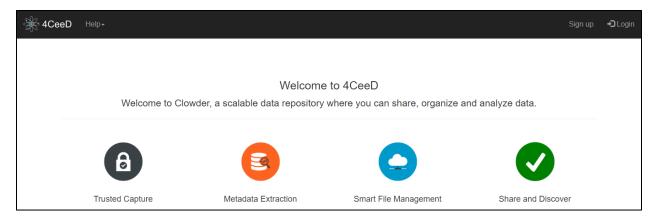
(Note: Must be on IllinoisNet or VPN to University Wifi) (Note: Works best on Chrome-based Browser. Has issues on FireFox and Microsoft Edge)

Learning about 4CeeD

1) Breakout Session #1: Logging into 4CeeD and Exploring

Please log into 4CeeD with the account that you made. If you haven't made an account yet, please click on the "sign-up" tab and follow the instructions of the **MSE598_4CeeD_CreateAnAccount.docx**. If you are having difficulties logging in, you may need to VPN into the University network for security purposes. Also please use Google Chrome, any other web browser typically has issues with 4CeeD.

a. From the homepage, click Login on the upper right corner



b. You should see the following homepage once you are logged into learn.4CeeD.illinois.edu

4CeeD You - Shared - Create - Th		Search	Q Jupyter Hub 🕞 Logout 💄-
	Search 🧿 <		
	Sort Delete		
	Example #2: GaAs Etch Experiment E Example #1: Silicon Wafer		
	E I MSES98 4CeeD Help Guides		
	🧞 Space 🔚 Collection 📷 Dataset 🍃 File		

Notice that there's three pre-made datasets with pre-loaded data to give you a sense of what stored data looks like.

- Search...

 Sort

 Delete

 Delete

 Delete

 Example #1: Silicon Wafer

 Delete

 Delete

 Example #1: Silicon Wafer

 Delete

 </
- c. Now, click on Example #1: Silicon Wafer (Highlighted Green).

The scenario here is that you just received new silicon wafers from a vendor and want to document this for inventory purposes. Normally this would be spread across several files (.jpg, .txt) but 4CeeD was designed to compact the visualization of these files into one.

- d. Now let's explore the main dataset components: Files, Metadata, and Comments.
 - Files: Stored image or text files pertaining to the dataset.
 - Metadata: Experimental parameters or descriptors stored via key-value pairs.

• Comments: Community posting board that is accessible by collaborators shared with this dataset.



Notice that the image file is pre-viewed to give the user a better understanding of the dataset instead of just a list of file names using traditional file explorer.

e. Now, click on the "Metadata" tab.

Files	Metadata	Comments (1)		
	METADATA TEM	PLATE		
Key:			Value	Units:
Date Red	ceived		03-01-2021	MM/DD/YY
Кеу:		Value	Units:	
Doping T	уре		n	n or p
Key:			Value	Units:
Doping S	Species		phosphorou	Phos. or Bo
Key:			Value	Units:
Resistivi	ty		2	Ohm-cm
Key:		Value	Units:	
Orientati	on		100	(100) or (11 [.]

Here, we've stored the pertaining key-value pairs regarding the Silicon wafer. This data can be modified by the "Edit Metadata Template" where the values can be edited and the parameters can be removed or added.

f. Lastly, click on the "Comments" tab.

🗐 Exa	Example #1: Silicon Wafer								
+ ADD I	FILES								
Files	Metadata Comments (1)								
POST									
	Patrick Su • Mar 19, 2021 16:48:35								
2	Deposited Silicon Nitride (50nm) on 03-19-2021								
	➢ Reply								

Comments can be posted by the users for "self-notes" or posted by other collaborators who are sharing the 4CeeD dataset. Any dataset that is made can be shared to other 4CeeD users with different levels of access settings. This topic will be explored more in the second lecture.

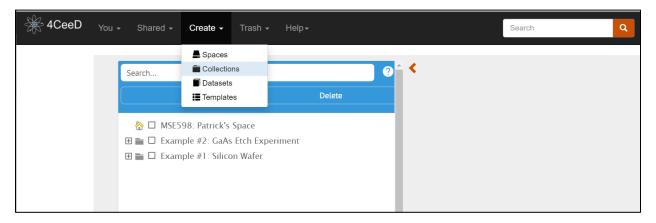
2) Breakout Session #2: Storing Your Own Data and Using Templates

Now let's try having you store data yourself using 4CeeD. This example is to mimic that you've taken handwritten notes that you want to digitize using 4CeeD.

a. Please open MSE598-GaNEtch-Experiment.pdf.

Date: Nau GaN Etch	ch 15 th , 2021 Exponiment#	- 1		
Etch A Etch B Etch C Etch D	Etch Rate 90 nm/min 130nm/min 140 nm/min 200 nm/min	RIE Power 100 W 125W 150W 175W	BUg Gras 21 sccm 49 sccm 55 sccm 63 sccm	Pressue 7mTorr 7mTorr 7 vnTorr 7mTorr 7mTor

Note that we are looking at one main experiment, GaN Etch Experiment #1 (Collection) with four attempts underneath (Datasets). We'll first create a **Collection** named **GaN Etch Experiment** that contains **four Datasets** named **Etch A, Etch B, Etch C, and Etch D.**



b. Click on the "Create" dropdown menu and then click "Collections"

c. Enter in the "Name" and "Description" and hit "Create"

₩ 4CeeD	You 🗸 Shared	+ Create +	Trash +	Help+		Search	٩	Jupyter Hub	C+ Logout	1-
	Patrick Su /	Create New Coll	ection							
	Create New Collection Collections allow you to bring together multiple datasets and their associated files in an almost unlimited number of ways. Share a collection to a Space to work with your team.									
	Permissions will be	Permissions will be applied according to the Space's settings.								
	GaN Etch Experime	t #1								
	Description								_	
	MSE598 Dataset Ex	ample							7.	
	Share with Spaces									
	(optional)									
	By default the collection	n is only accessible	to the user wh	no created it. You can share this	collection with members of one or r	more Spaces. This is optional.				
	✓ CREATE	RESET								

You should now see an empty collection that allows you to either "Create Dataset" or "Create Child Collections" in the current collection.

🔆 4CeeD	You - Shared - Create - Trash - Help-	Search	٩	Jupyter Hub	C+ Logout	1-
	L Patrick Su / III GaN Etch Experi					
	Gan Etch Experiment #1 Owner: Patrick Su Created on Mar 22, 2021					
	MSE598 Dataset Example					
	Delete L Download All Files					
	Datasets in the Collection		C	✓ Create Datase	t	
	Child Collections in the Collection		🗸 Crea	te Child Collection	1	
	Space containing the Collection					
	Select a Space - + ADD					
	Parent collections					
	Select a Collection - + ADD					

Let's first create our first "Dataset" in this collection and call it Etch A so we can begin digitizing our handwritten notes.

d. Please click "Create Dataset" outlined in the yellow box in the figure above.

🔆 4CeeD	You - Shared -	Create - Tras	h → Help+		Search	٩	Jupyter Hub	🕞 Logout	1-	
	GaN Etch Experi	/ 🗐 Create New Dat	aset							
	Create New Dataset									
	Datasets are the primary way to organize files. Share the dataset with a Space to work with your team. Permissions will be applied according to your Space's settings.									
	This dataset will be ad	ded to collection GaN Et	ch Experiment #1							
	Name									
	Etch A									
	Description									
	First experiment bei	ng logged								
	Share with Spaces									
	(optional)									
	By default the dataset	is only accessible to the	user who created it. You c	an share this dataset with members of or	ne or more Spaces. This is optic	onal.				
	Access: Default	Private 🔿 Public								
	CREATE	RESET								

e. Fill out the name and description box and hit "Create"

🔆 4CeeD	You - Shared - Create - Trash - Help -	Search	٩	Jupyter Hub	🕞 Logout	1-				
	L Patrick Su / Etch A / O Upload Files									
	Dataset Created									
	The dataset Etch A was successfully created. Please follow the instructions below to add files to the dataset or view the dataset.									
	i≣ view dataset									
	Add Files Select files using the button below or drag files directly from the desktop to this window. Then click the upload button to up	pload them to the dataset.								
	+ SELECT FILES OUPLOAD X CANCEL UPLOAD									

At this point, you can upload any files you'd like pertaining to this dataset like measurement data or images. For this example, we'll skip this step and just go into **"View Dataset"**.

f. Now let's add our data into the Metadata tab of our dataset.

∰ 4CeeD	You - Shared - Create - Trash - Hel	p.	Search	Q Jupyter Hub	C+ Logout	1-			
	2 Patrick Su / 🖀 Etch A		Space containing the Dataset						
	Etch A		Select a Space	+ ADD					
	Created by Patrick Su Created on Mar 22, 2021 Access: © Space Default (Private) O Private O Public	All Rights Reserved Patrick Su	Collections containing th GaN Etch Experime 1 dataset X Rem	nt #1					
	First experiment being logged		Select a collection	- + ADD					
	🛧 Add Files 🕹 Download All Files f Delete	Tags							
	Files Metadata Comments (0)			TAG					
	Folder is empty								

g. In the metadata tab (highlighted in yellow), go ahead and click "Edit Metadata Template".

4CeeD	You - Shared - Create - Tr	Dataset Metadata		Search	۹.	Jupyter Hub	🕞 Logout	1 -
	L Patrick Su / Etch A	Select a template:			aining the Datase	et		
	Etch A	MSE598: GaN Etch	~			+ ADD		
	Created by Patrick Su Created on Mar 22, 2021	Key:	Value	Units:	containing the D	ataset		
	Access: Space Default (Private) Private	RIE Power		Watts REMOVE	Etch Experiment #1			
		Key: BCI3 Gas Flow	Value	sccm REMOVE	itaset 🗶 Remove			
	First experiment being logged	Key:	Value	Units:	lon -	+ ADD		
	+ Add Files 🕹 Download All Files	Pressure		mTorr				
	Files Metadata Comments (ADD NEW		SUBMIT CLOSE		STAG		
	+EDIT METADATA TEMPLATE							
	Extractions							
	A Submit dataset for extraction							

Now let's select a **Template.** A template is a preset list of key-value pairs that makes it easy to upload data of repeated experiments. Here we will choose **near the bottom, MSE598: GaN Etch.**

Note that while RIE Power, BCl3 Gas Flow, and Pressure are listed, Etch Rate is not for this template. That's okay! 4CeeD is flexible and allows us to add another field right in this window

h. Click "Add New" and add the "Etch Rate" field with "nm/min" as the units. Fill out all the remaining information for Etch A as well and hit submit.

₩ 4CeeD	You - Shared - Create - T	Dataset Metadata			Search	٩	Jupyter Hub	🕞 Logout	1-
	L Patrick Su / Etch A	Select a template:				aining the Datase	t		
	Etch A	MSE598: GaN Etch V					+ ADD		
	Created by Patrick Su	Key:	Value	Units:		containing the Da	tagat		
	Created on Mar 22, 2021	RIE Power	100	Watts	REMOVE	Letch Experiment #1	lasel		
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	First experiment being logged	BCI3 Gas Flow	21	sccm	REMOVE				
		Key:	Value	Units:		ion 👻	+ ADD		
	+ Add Files 🕹 Download All Files	Pressure	7	mTorr	REMOVE				
		Key:	Value	Units:					
		Etch Rate	90	nm/mir	REMOVE		STAG		
	Files Metadata Comments (ADD NEW		SUBMIT	CLOSE				
	Extractions								
	A Submit dataset for extraction								
	A Submit dataset for extraction								

The fields should be stored and can be pre-read by clicking again on the metadata tab. Note that everything is well stored and can be quickly accessed in each dataset.

🔆 4CeeD	You - Shared - Create - Trash - Helj	Search	Q Jupyter Hub	C+ Logout	1 -					
	L Patrick Su / Etch A				Space containing the D	ataset				
	Etch A				Select a Space - + ADD					
	Created by Patrick Su Created on Mar 22, 2021 Access: Space Default (Private) Private Public	All Rights Reserved Pat	rick Su		Collections containing t GaN Etch Experime 1 dataset X Rem	ent #1				
	First experiment being logged				Select a collection	→ ADD				
	+ Add Files 🕹 Download All Files 🖀 Delete	+ Add Files 🕹 Download All Files 🖀 Delete								
	Files Metadata Comments (0)		S TAG							
	+EDIT METADATA TEMPLATE									
	Key:	Value	Units:							
	RIE Power	100	Watts							
	Key:	Value	Units:							
	BCI3 Gas Flow	21	sccm							
	Key:	Value	Units:							
	Pressure	7	mTorr							
	Key:	Value	Units:							
	Etch Rate	90	nm/min							
	Extractions									

Now let's try the other way of modifying the actual template to include etch rate and showing you how to store "preset" values that you will use often.

∰ 4CeeD	You - Shared - Create - Trash - Help-			Search Q Jupyter Hub C+Logout		
	L Patrick Su / Etch.	Spaces			Space containing the Dataset	
	Etch A	 Datasets Templates 			Select a Space 👻 🕇 ADD	
	Created by Patrick Su Created on Mar 22, 2021 Access: Space Default	t (Private) 🔿 Private	All Rights Reserved Pa	atrick Su	Collections containing the Dataset	
	First experiment being log	gged			Select a collection - + ADD	
	🕂 Add Files 🛛 🛓 Dov	wnload All Files 🛛 🇂 De	lete	Tags		
	Files Metadata	Comments (0)			S TAG	
	+EDIT METADATA TE	MPLATE				
	Кеу:		Value	Units:		
	RIE Power		100	Watts		
	Key:		Value	Units:		
	BCI3 Gas Flow		21	sccm		
	Кеу:		Value	Units:		
	Pressure		7	mTorr		
	Key:		Value	Units:		
	Etch Rate		90	nm/min		
	Extractions	xtraction				

i. Click on the "Create" dropdown menu and click on "Templates". Then use the "Global Templates" dropdown menu and click on MSE598: GaN Etch.

	r⁄ou → Shared		Trash - Help -			Search	Q J	upyter Hub	🕒 Log	
	Templates	5								
C	Create Template	Update Templa	ate Delete Temp	late					_	
0	Create New T	emplate								
L	.oad another templ	late to start with (opt	ional):							
N	ly Templates:									
	Select One							~	·	
G	Global Templates:									
	MSE598: GaN Etc	ch						~	·]	
c	Choose a name for your template:									
	<example> Sample</example>	e Name, PECVD Oxid	le, Diffusion							
c	Create tags to desc	ribe your template: (optional) 😧							
	<example> SEM, I</example>	Diffusion								
	ADD NEW FIELD	CLEAR TEMPLAT	E							
	Share this template	urith ethere 2								
	ame:	with others?	Unit Type:	Data Type:	Value:	Required:				
	RIE Power		Watts	String	~	No	~	REMOVE		
N	lame:		Unit Type:	Data Type:	Value:	Required:				
	BCI3 Gas Flow		sccm	String	~	No	~	REMOVE		
N	lame:		Unit Type:	Data Type:	Value:	Required:				
	Pressure		mTorr	String	~	No	~	REMOVE		

Note that since Etch Rate was the missing key-value pair, we'll just click **"Add New Field"** to add it (<u>Name</u>: Etch Rate – <u>Unit Type:</u> nm/min – *leave rest default*). **Don't forget to name it in "Choose a name for your template"** before you click **"Create Template"**.

Also, go ahead and put the value "7" in the pressure value box. We'll see what it does in the next dataset we create.

₩ 4CeeD	You - Shared - 0	Create ▼ Trash ▼ Help ▼		Se	earch Q	Jupyter Hub	C+ Logout		
	Templates								
	Create Template	odate Template Delete Template							
	Create New Templ	ate							
	Load another template to	start with (optional):							
	My Templates:								
	-Select One-								
	Global Templates:								
	MSE598: GaN Etch v								
	Choose a name for your template:								
	MSE598: GaN Etch 2								
	Create tags to describe your template: (optional) 😔								
		EAR TEMPLATE							
	Share this template with o Name:	thers? 🗆 Unit Type:	Data Type:	Value:	Required:				
	Etch Rate	nm/min	String	~	No	✓ REMOVE			
	Name:	Unit Type:	Data Type:	Value:	Required:				
	RIE Power	Watts	String	~	No	REMOVE			
	Name:	Unit Type:	Data Type:	Value:	Required:				
	BCI3 Gas Flow	sccm	String	~	No	✓ REMOVE			
	Name:	Unit Type:	Data Type:	Value:	Required:				
	Pressure	mTorr	String	~ 7	No	✓ REMOVE			
			CREATE TEMPLATE						

j. Now go back to your dashboard by clicking the 4CeeD Icon. $rac{}{lpha 4 ext{CeeD}}$

₩ 4CeeD You - Shared - (Create → Trash → Help →		Search	Jupyter Hub	C+ Logout	1-
Search	rt Deb	ete	K			
🕀 🔂 🗖 GaN Etcl	A Create >	Collection	GaN Etch Experiment #1 Owner: Patrick Su Created on Mar 22, 2021			
⊕ 💼 🗆 Example ⊕ 📷 🗖 Example	resource rearry	Dataset	💼 Delete 👌 Download All Files			

k. "Right-Click" the "GaN Etch Experiemnt #1" collection and go Create -> Dataset.

This time, the "Create Dataset" Screen is more integrated by still has the same fields.

- I. Fill out the "Name" and "Description" fields and click "Create". Just like last time, after you hit "Create", go and "View Dataset".
- m. Follow the same steps of f h except using our newly created Template.

🔆 4CeeD	You - Shared - Create -	Create Dataset	Q Jupyter Hub 🕞 Logout 💄	Ŧ
	Search Sort	OPTIONS		
	 MSE598: Patrick's S □ GaN Etch Experiment □ Etch A 	Create New Dataset	:#1	
		work with your team. Permissions will be applied according to your Space's settings.		
		Etch B		
		Description MSE 598 Example		
		Share with Spaces		
		(optional) By default the dataset is only accessible to the user who created it. You can share this dataset with members of one or more Spaces. This is optional.		
		Access:		
		CLOSE	• • • • • • • • • • • • • • • • • • •	
	🏠 Space 🚍 Collection 📷 Dat	aset 🕃 File		

This is the end of the lecture series #1. If you were able to finish early, try uploading your own data onto 4CeeD using templates and creating templates for your experiments.

If you have any questions, please feel free to reach out to Robert Kaufman (<u>rbkaufm2@illinois.edu</u>) or Leah Espenhahn (<u>leahe2@illinois.edu</u>)