Multi-Level, Multi-Modal CCF UI for Data Providers and Users within the Human BioMolecular Atlas Program (HuBMAP)

MC-IU Team:

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HuBMAP HIVE Q3 Demo Day

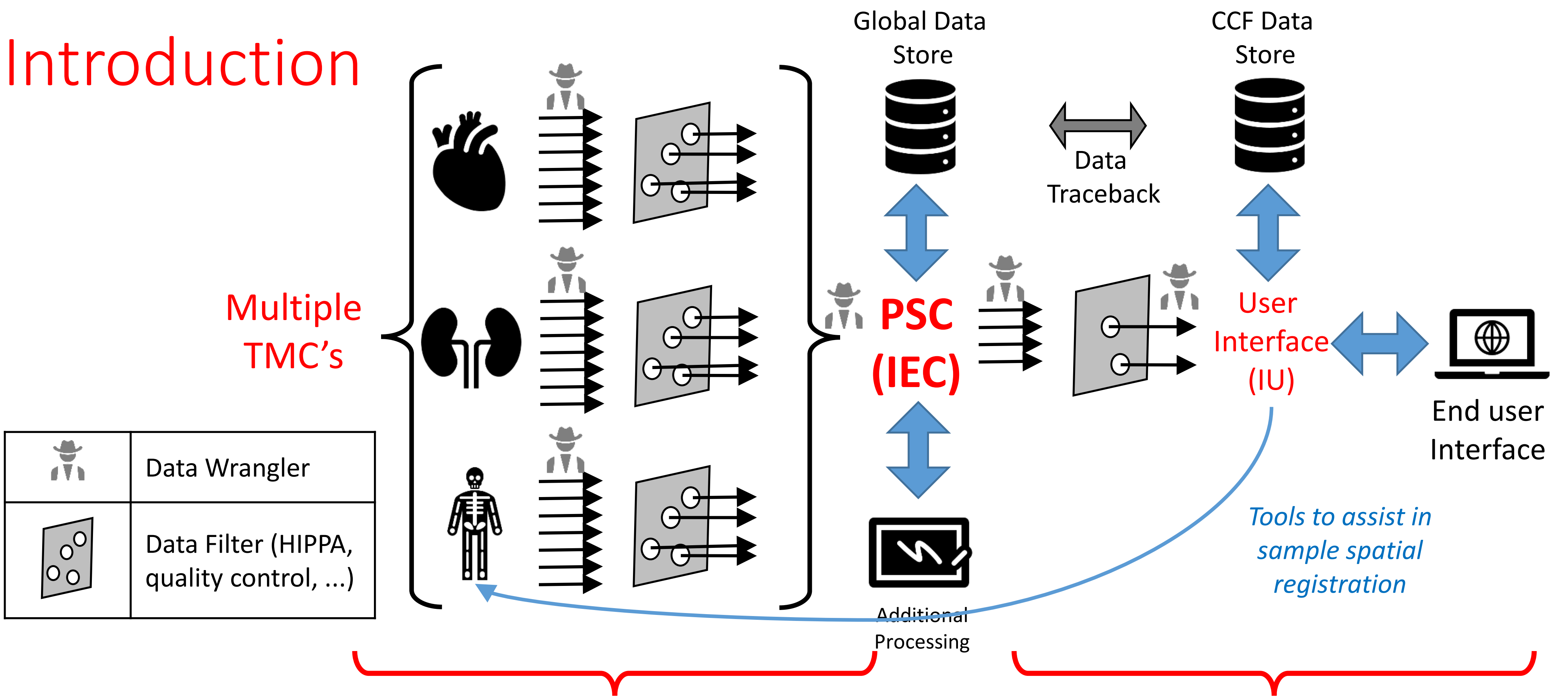
Harvard Medical School, Boston, MA

June 27, 2019

Overview

- Introduction
- Y1 Q3 Progress Report
  - CCF Ontology
  - CCF Meta-Data Review
  - CCF Data Wiki
  - CCF User Interface (UI)
- Y2 Plans (June 21, 2019 - June 20, 2020)
  - CCF Mapping and Ontologies
  - CCF UI and Tissue Registration UI
  - Visual Human Massive Open Online Course (VHMOOC)
  - User Studies

Introduction

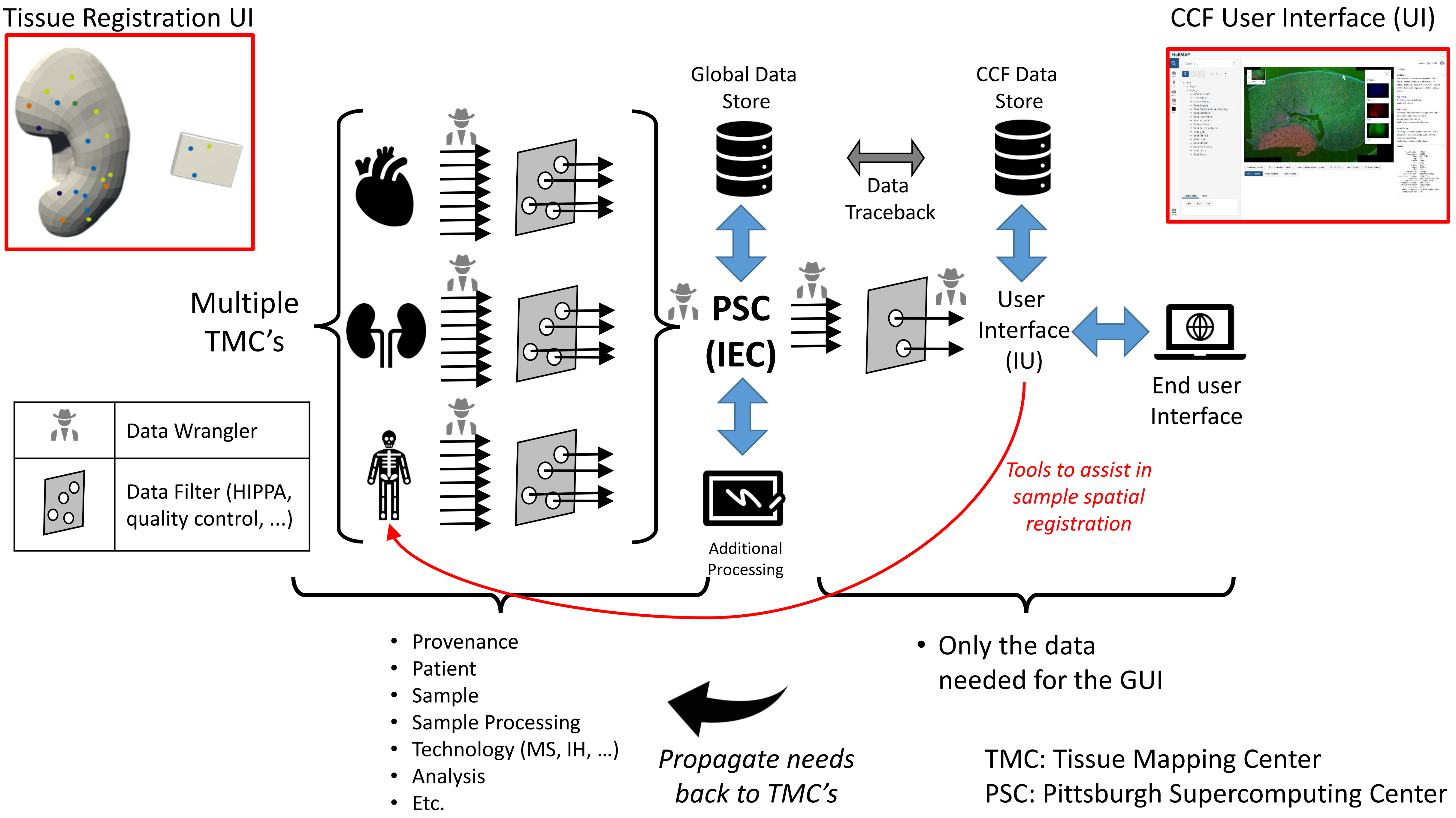


- Provenance
- Patient
- Sample
- Sample Processing
- Technology (MS, IH, ...)
- Analysis
- Etc.

Propagate needs back to TMC's

- Only the data needed for the GUI

TMC: Tissue Mapping Center
PSC: Pittsburgh Supercomputing Center


Tissue Registration UI
CCF User Interface (UI)
Global Data Store
CCF Data Store
Data Traceback
Multiple TMC's
PSC (IEC)
User Interface (IU)
End user Interface
Data Wrangler
Data Filter (HIPPA, quality control, ...)
Additional Processing
Tools to assist in sample spatial registration
Provenance
Patient
Sample
Sample Processing
Technology (MS, IH, ...)
Analysis
Etc.
Only the data needed for the GUI
Propagate needs back to TMC's
TMC: Tissue Mapping Center
PSC: Pittsburgh Supercomputing Center

Y1 Q3 Progress - Ontology for Kidney

CCF Ontology: some guiding principles

- Reuse existing ontologies and data formats developed for projects similar to HuBMAP to the greatest extent possible
  - GUDMAP / RBK
  - Human Cell Atlas
  - …
- Reuse domain-specific ontologies and data formats
  - OME-Tiff (Open Microcopy Community advanced image format)
  - MIAME (Minimum Information About a Microarray Experiment)
  - …
- Leverage HuBMAP domain expertise!
  - Each TMC is an expert in its organ. Capture this in the organ-specific ontologies.
- Use a standard Ontology format and development tools
  - We will use OWL
  - Include test cases in the ontology itself (e.g. both A-box and T-box) for testing, validation and demonstration purposes.
- Cross-link with existing ontologies as much as possible
- Need partOf trees for simplified navigation in GUI.

CCF: Source Ontologies

Anatomic/Phenotypic

- Uberon
- Foundational Model of Anatomy (FMA) (has anatomical terms NOT in Uberon)
- Human Phenotype Ontology (HPO)
- Phenotype and Trait Ontology (PATO)
- Organ specific: Kidney Tissue Atlas Ontology (KTAO) and LungMAP

Tissue/Data Collection

- Biological Spatial Ontology (BSPO)
- Ontology of Biomedical Investigations (OBI)
- EDAM (Bioinformatics concepts)

Open Biological and Biomedical Ontology (OBO) Foundry is a collective of ontology developers that are committed to collaboration and adherence to shared principles.
BioPortal is a collection of ontologies for biomedical research.

(Sub-)Cellular

- Cell Ontology (CL)
- Gene Ontology (GO)
- Chemical Entities of Biological Interest (ChEBI)
- RNA Ontology (RNAO)
- Protein Ontology (PR)
- Cell Behavior Ontology (CBO)

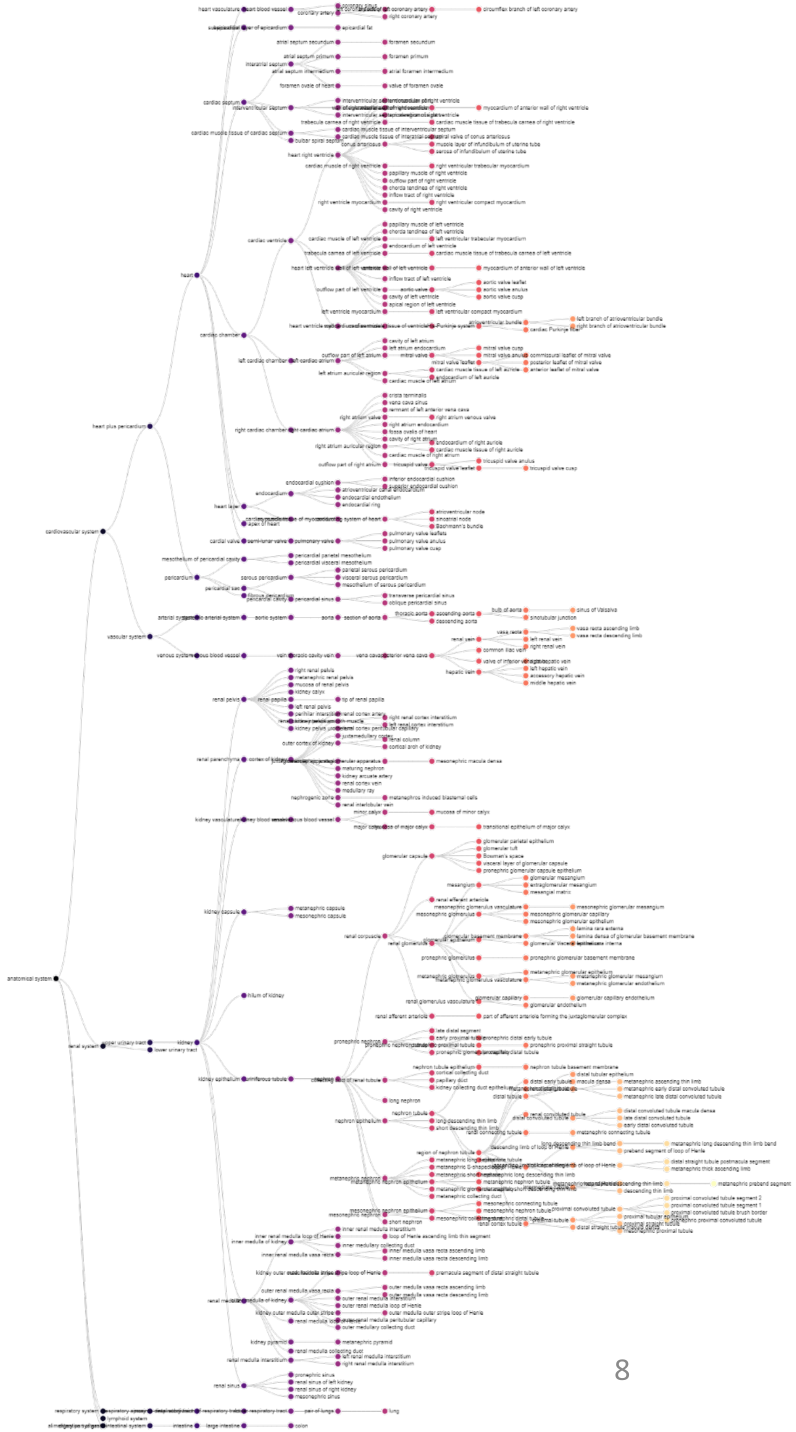
Metadata

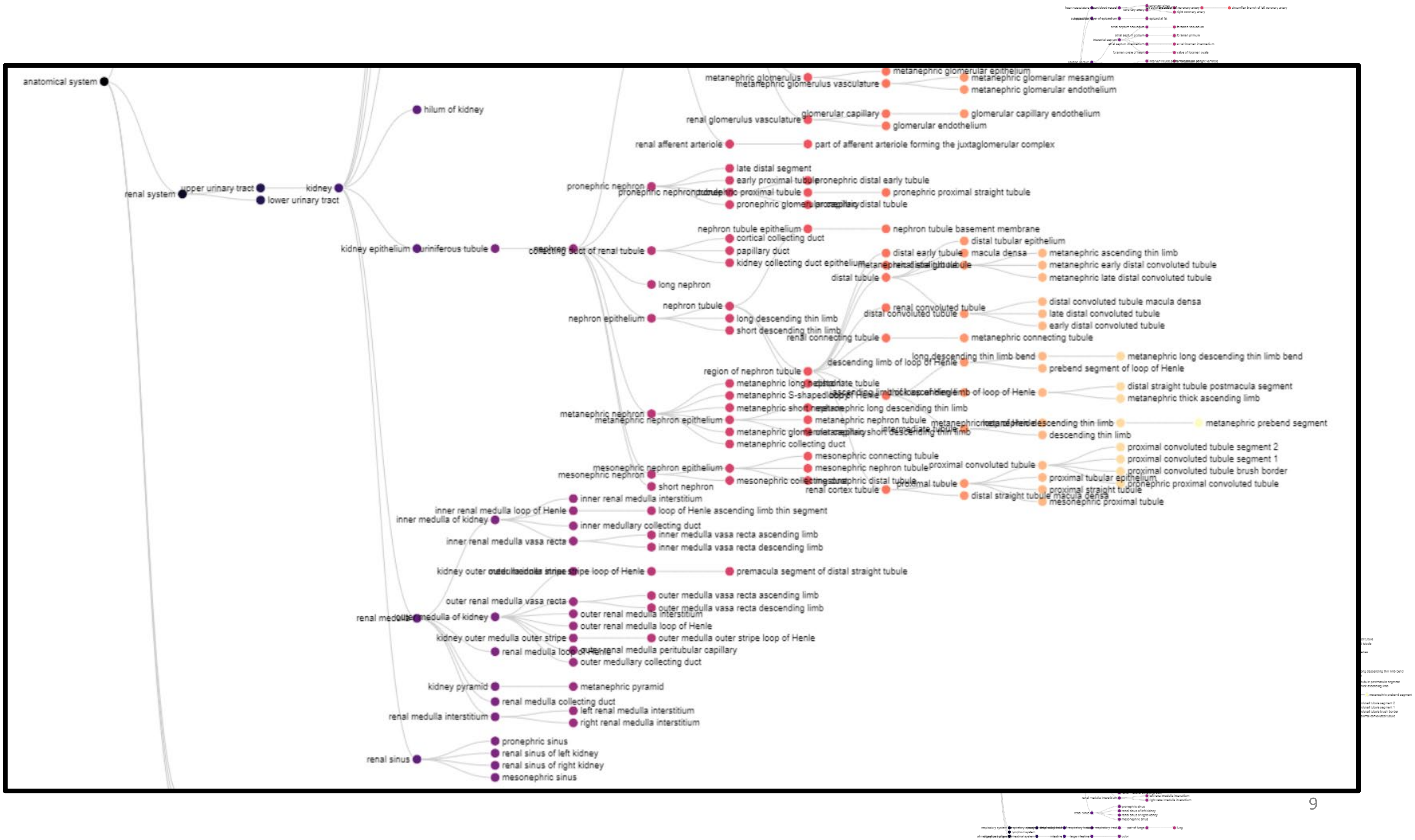
- Basic Formal Ontology (BFO)
- Information Artifact Ontology (IAO)
- Ontology of units of Measure (OM)
- Provenance, Authoring and Versioning ontology (PAV)
- VIVO (Identifying researchers)

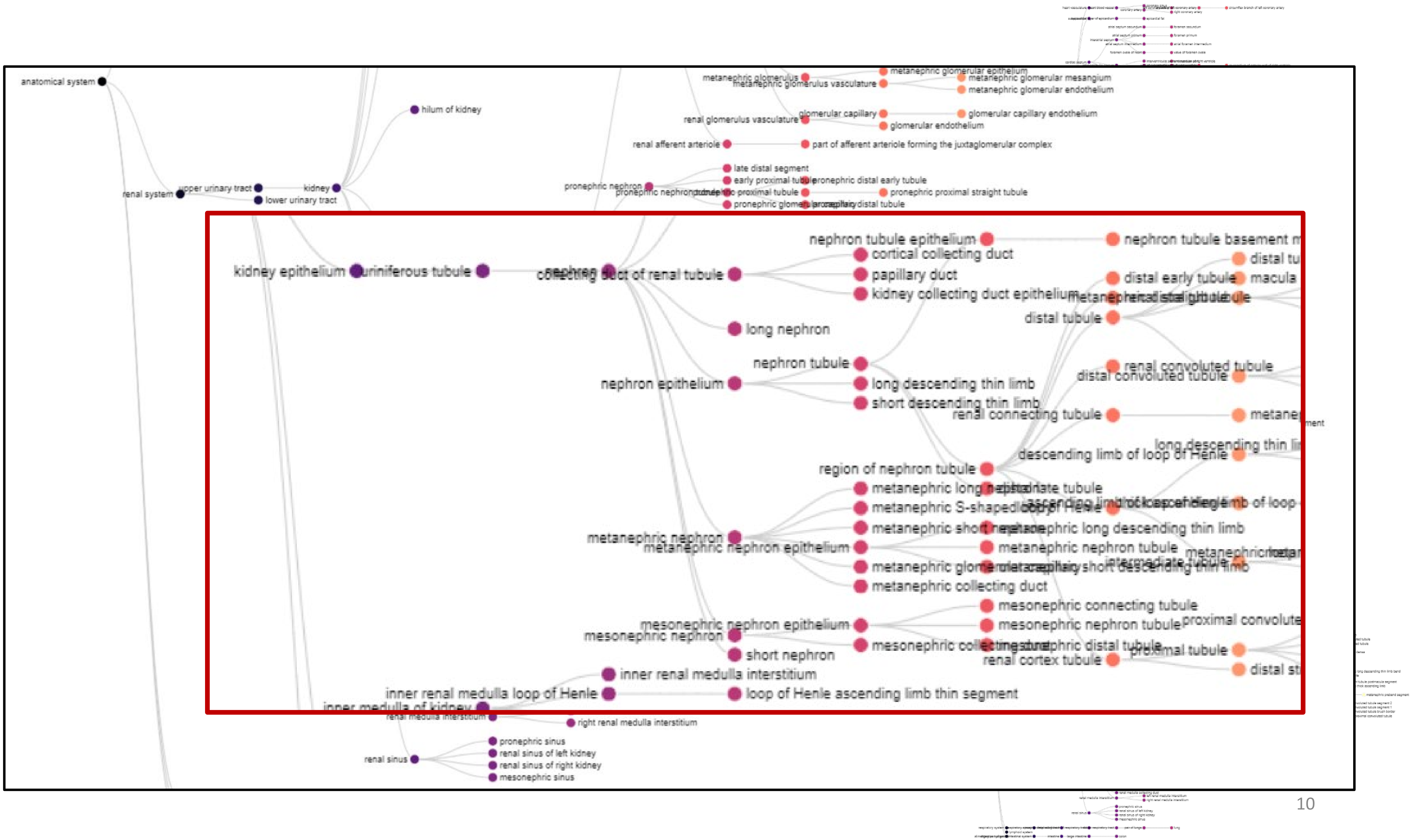
MeSH and NCI Thesaurus

Current CCF Ontology

- Uses Uberon and user-supplied tables of terms to create a SLIM ontology
- Users (initially TMCs) can request missing terms as needed
- "partOf" and other partonomy terms used to help relate concepts
    - Requires domain expertise!
    - Individual TMCs will need to pitch in for their specific organs to refine
- [Click here to visualize the current CCF ontology]




anatomical system
renal system
upper urinary tract
lower urinary tract
kidney
hilum of kidney
kidney epithelium
uriniferous tubule
nephron
collecting duct of renal tubule
pronephric nephron
nephron epithelium
nephron tubule
long nephron
metanephric nephron
metanephric nephron epithelium
mesonephric nephron
mesonephric nephron epithelium
short nephron
metanephric glomerulus
metanephric glomerulus vasculature
metanephric glomerular epithelium
metanephric glomerular mesangium
metanephric glomerular endothelium
renal glomerulus vasculature
glomerular capillary
glomerular capillary endothelium
glomerular endothelium
renal afferent arteriole
part of afferent arteriole forming the juxtaglomerular complex
late distal segment
early proximal tubule
pronephric distal early tubule
pronephric proximal tubule
pronephric proximal straight tubule
nephron tubule epithelium
nephron tubule basement membrane
cortical collecting duct
papillary duct
kidney collecting duct epithelium
distal tubular epithelium
distal early tubule
macula densa
metanephric ascending thin limb
metanephric early distal convoluted tubule
metanephric late distal convoluted tubule
distal tubule
long descending thin limb
short descending thin limb
renal convoluted tubule
distal convoluted tubule
distal convoluted tubule macula densa
late distal convoluted tubule
early distal convoluted tubule
renal connecting tubule
metanephric connecting tubule
region of nephron tubule
descending limb of loop of Henle
long descending thin limb bend
metanephric long descending thin limb bend
prebend segment of loop of Henle
distal straight tubule postmacula segment
metanephric thick ascending limb
metanephric long descending thin limb
metanephric nephron tubule
metanephric prebend segment
descending thin limb
metanephric collecting duct
mesonephric connecting tubule
mesonephric nephron tubule
proximal convoluted tubule
proximal convoluted tubule segment 2
proximal convoluted tubule segment 1
proximal convoluted tubule brush border
proximal tubular epithelium
pronephric proximal convoluted tubule
proximal tubule
proximal straight tubule
renal cortex tubule
distal straight tubule macula densa
mesonephric proximal tubule
inner renal medulla interstitium
inner renal medulla loop of Henle
loop of Henle ascending limb thin segment
inner medulla of kidney
inner medullary collecting duct
inner renal medulla vasa recta
inner medulla vasa recta ascending limb
inner medulla vasa recta descending limb
premacula segment of distal straight tubule
outer renal medulla vasa recta
outer medulla vasa recta ascending limb
outer medulla vasa recta descending limb
renal medulla
outer medulla of kidney
outer renal medulla interstitium
outer renal medulla loop of Henle
kidney outer medulla outer stripe
outer medulla outer stripe loop of Henle
renal medulla loop of Henle
outer renal medulla peritubular capillary
outer medullary collecting duct
kidney pyramid
metanephric pyramid
renal medulla collecting duct
renal medulla interstitium
left renal medulla interstitium
right renal medulla interstitium
renal sinus
pronephric sinus
renal sinus of left kidney
renal sinus of right kidney
mesonephric sinus



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nephron tubule basement m
cortical collecting duct
papillary duct
kidney collecting duct epithelium
distal early tubule
distal tubule
long nephron
nephron tubule
nephron epithelium
long descending thin limb
short descending thin limb
renal convoluted tubule
distal convoluted tubule
renal connecting tubule
descending limb of loop of Henle
region of nephron tubule
metanephric long nephron
metanephric S-shaped body
metanephric short nephron
metanephric nephron
metanephric nephron epithelium
metanephric long descending thin limb
metanephric nephron tubule
metanephric collecting duct
mesonephric connecting tubule
mesonephric nephron epithelium
mesonephric nephron tubule
mesonephric nephron
mesonephric collecting duct
short nephron
renal cortex tubule
proximal tubule
inner renal medulla interstitium
inner renal medulla loop of Henle
loop of Henle ascending limb thin segment
inner medulla of kidney
renal medulla interstitium
right renal medulla interstitium
renal sinus
pronephric sinus
renal sinus of left kidney
renal sinus of right kidney
mesonephric sinus

Y1 Q3 Progress – CCF Meta-Data Review

IU CCF Initial (v0.5.0) Image Formats

Basic image: OME-Tiff as the base “image” format based on:

- 2D to 4D data (includes movies)
- more than three “color channels”
- More flexible “color” data format (int, float, etc.)

Regions of images: SVG with annotations
(aligned with a particular OME-Tiff)

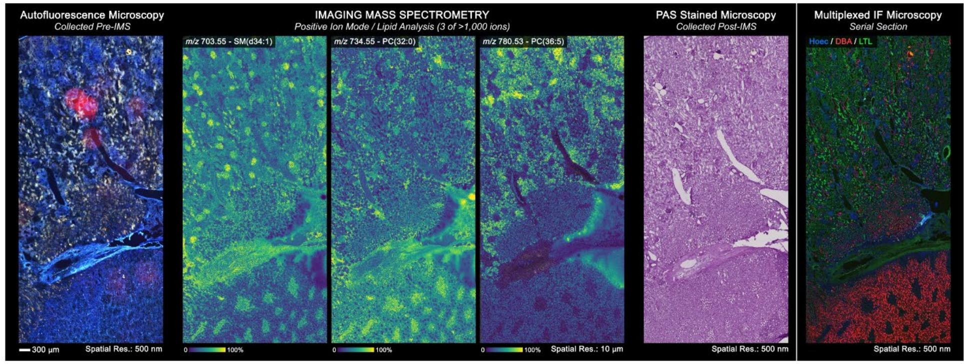
Volumetric (e.g., computed tomography, MR, ultrasound, …)

- Data normally represented as volumes or surfaces

Data. Is very heterogeneous. Must provide guidance.

Kidney: Jeff Spraggins et al., VU

See data on Globus, BIOMIC_patient-64354



Clinical and Spatial Metadata (21 rows)

Cell Types, on right

Cell type	Subset A	Subset B	Subset C
Tubular Epithelium	Proximal tubular cells	S1	
		S2	
		S3	
	Loop on Henle	Thin descending limg	
		Thin ascending limb	
		Thick limb	medullary
			cortical
		Macula Densa	
	Distal convoluted tubule		
	Connecting segment		
	Collecting duct	Principal cells	
		Intercalated cells	Type A
			Type B
Glomerulus	Epithelium	Visceral	
		Parietal	
	Mesangial cells		
Vasculature	Endothelium	Glomerular	
		Peritubular	
		Lymphatic	
	Pericytes		
	Juxta Glomerular Cells		
Interstitium	Fibroblasts	Myofibroblasts	
		EPO producing cells	
		Medullary fibroblasts	
	Mononuclear cells	Resident macrophages	
		Dendritic cells	
	Lymphocytes	T cells	
		B cells	
		NK cells	

Cell States (9 rows)

Cell states	Subset A
Proliferating cells	S-phase
	G2/M
Cell cyle arrest	G0
	G1/S
	G2/M

Heart: Shin Lin, UW

Year 1: Tissue data for 1-2cm cubed volumes from 9 sites for 1 heart from 1 individual.

Data Dictionary (115 rows)

Field # Sort	Field Label Sort	Field Name Sort	Field Units	Field Data `	Lookup Tal	Low Value	High Value	Valid value	IsNullable !	Parent Fiel	Parent Fiel	Can Child b	ReadOnly Sort
9	Donor //ABO:	abo		char(3)	lkup_abo				TRUE				FALSE
10	Donor //Date of birth:	dob		datetime					TRUE				FALSE
11	Donor //Gender:	gender		char(1)	lkup_gender			M,F	TRUE				FALSE
12	Details //Age:	age_in_months		smallint		0	1188		TRUE			FALSE	FALSE
13	Details //Age Unit:	age_unit		char(1)	lkup_age_unit			M,Y	TRUE	age_in_months			TRUE
14	Details //Height:	hgt_cm	cm	decimal(5, 2)		1	241.3		TRUE				FALSE
15	Donor hgt_ft //	hgt_ft	ft	int		0	7		TRUE				TRUE
16	Donor hgt_in //	hgt_in	in	int		0	11		TRUE				TRUE
17	Details //Weight:	wgt_kg	kg	decimal(7, 4)		0.454	294.835		TRUE				FALSE
18	Donor wgt_lb //	wgt_lb	lbs	decimal(3, 0)		2	650		TRUE				TRUE
19	Donor //Ethnicity/race:	race		bigint	lkup_race_subcat_multi				FALSE				FALSE
30	Details //History of diabe	hist_diabetes		smallint	lkup_histdiab_dur				TRUE				FALSE
31	Donor //History of cance	hist_cancer		smallint	lkup_histcancer_site				TRUE			FALSE	FALSE
32	Donor History of cancer ,	cancer_oth_ostxt		varchar(50)		1	50		TRUE	hist_cancer	999		FALSE
33	Details //History of hyper	hypertension		smallint	lkup_histhype_dur				TRUE			FALSE	FALSE

Cell Types (14)

endothelial cells	
	arterial
	capillary
	venous
	lymphatic
cardiomyocytes	
	atrial
	ventricular
	nodal
fibroblasts	
	fibroblasts
	myofibroblasts
immune cells	
	macrophages

Data: Clinical

Kidney: Jeff Spraggins et al., VU

Clinical and Spatial Metadata (21 rows)

Sample Number:	20
Patient Number:	64354
Procedure ID:	66598
Date:	1/30/2019
Age:	38
Gender:	Female
Race:	White
Height:	165.1 cm
Weight:	115.2 kg
BMI:	42.3
Comorbidities:	Obesity
Type of Procedure:	Total Nephrectomy
Indications for Procedure:	Renal tumor
Laterality:	Left
Tissue Type:	kidney
Dimensions (mm):	L: 19 x W: 13 x H: 7
Anatomical Landmark:	Lower Pole
Distance from Tumor:	7 cm
Sample Processing:	Frozen
Method of Freezing:	Dry Ice/Isopentane Slurry
Embedding Media:	CMC

Heart: Shin Lin, UW

Data Dictionary (115 rows)

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11	Donor //Gender:	gender		char(1)	lkup_gender			M,F
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13	Details //Age Unit:	age_unit		char(1)	lkup_age_unit			M,Y
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32	Donor History of cancer ,	cancer_oth_ostxt		varchar(50)		1	50	
33	Details //History of hyper	hypertension		smallint	lkup_histhype_dur			

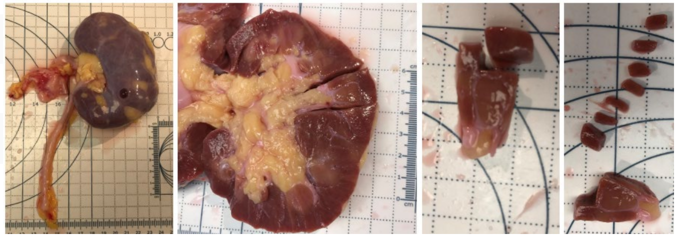
Data: 3D Tissue

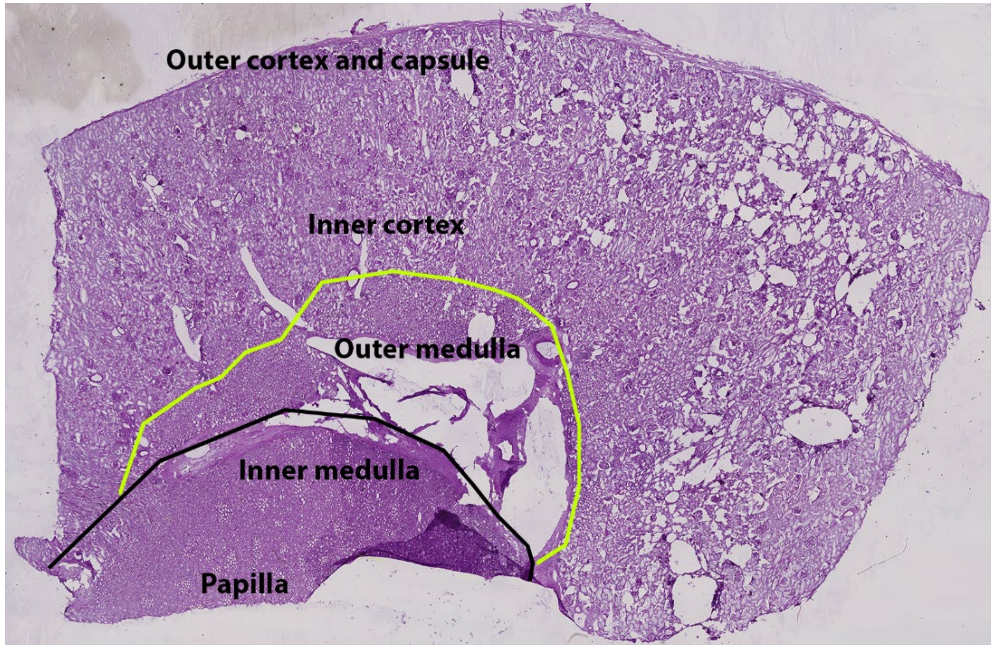
Kidney: Jeff Spraggins et al., VU

See data on Globus, BIOMIC_patient-64354

- BIOMIC_patient-64354_clinical_and_spatial_metadata.xlsx
- BIOMIC_patient-64354_data_guide.pptx
- BIOMIC_patient-64354_overview.png
- BIOMIC_patient-64354_Sample-20-Histology.tif
- neg_ion_mode_section
- pos_ion_mode_section

BUKMAP, Zhang Group

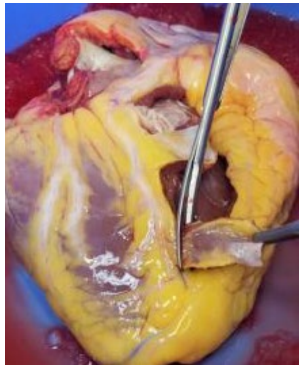




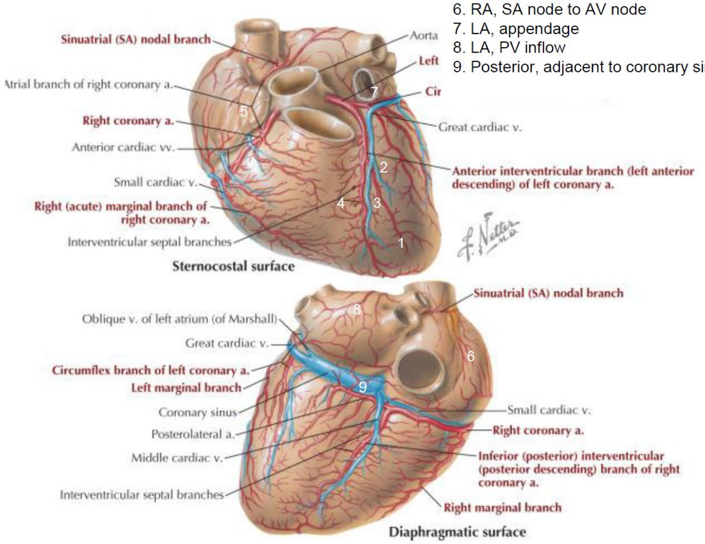
Heart: Shin Lin, UW

Year 1: Tissue data for 1-2cm cubed volumes from 9 sites for 1 heart from 1 individual.

Terminology; Coordinates and photos to spatialize



Sites	Distinctive features
1. LV, apex	
2. LV, free wall 3 cm from apex	
3. septum, 3cm from apex including LAD	major arterial vessel, Purkinje fiber CM
4. RV, free wall 3 cm from apex	
5. RA appendage	
6. RA, SA node to AV node	pacemaker CM
7. LA, appendage	
8. LA, PV inflow	
9. Posterior, adjacent to coronary sinus	major venous vessel



Data: TMCs x Organs x Data Types x Technologies

BUKMAP, Zhang Group

Organs (10)

1. Bladder
2. Blood Vessel (Heart)
3. Breast
4. Colon
5. Kidney
6. Liver
7. Lung
8. Spleen
9. Thymus
10. Tonsil

No Bone Marrow and Pancreas.

Data Types (13)	Technologies (~25)
1. Imaging - Proteins	CODEX;DART-FISHrp;IF;IHC;LRET-IF;MALDI Imaging MS;PER-DEI
2. Imaging - RNA	DART-FISH;LRET-ISH;MERFISH;PER-DEI;seqFISH;smFISH
3. Imaging - DNA	PER-DEI
4. Imaging - Other	Lipid and Metabolite MALDI Imaging MS
5. scRNAseq	snDropseq;scRNAseq
6. scDNAseq	scATACseq;scTHSseq;SNAREseq
7. scProteomics	IMC
8. bulk-Proteomics	LC-MS/MS
9. bulk-RNA	?
10. bulk-DNA	?
11. Metabolomics	LC-MS/MS;nano-POTS
12. Lipids	LC-MS/MS;nano-DESI
13. Other	Autofluorescence;PAS stained microscopy

Review of Meta-data formats of similar projects

Other NIH Centers

- GenitoUrinary Development Molecular Anatomy Project (GUDMAP)
- (Re)Building a Kidney (RBK)
- Kidney Precision Medicine Project (KPMP)

Other Efforts

- Human Cell Atlas (HCA)
- ApiNATOMY

CCF Data Wiki

Minimum Information Standard

hubmapconsortium / ccf-data-wiki Private

Unwatch 3 | Star 0 | Fork 0

Code | Issues 0 | Pull requests 0 | Wiki | Insights

Home

Edit | New Page

Bruce Herr II edited this page 2 days ago · 5 revisions

Welcome to the CCF Data Wiki!

Organ	CalTech	UCSD	Stanford	Vanderbilt	Florida
Heart	✓				
Kidney		✓		✓	
Bowel			✓		
Thymus					✓
Spleen					✓
Lymph Nodes					✓
Lung		✓			
Bladder		×			
Colon			×		

Legend:

- ✓ - Organ proposed and survey submitted
- × - Organ was proposed, but no survey has been submitted

Pages 12

Links

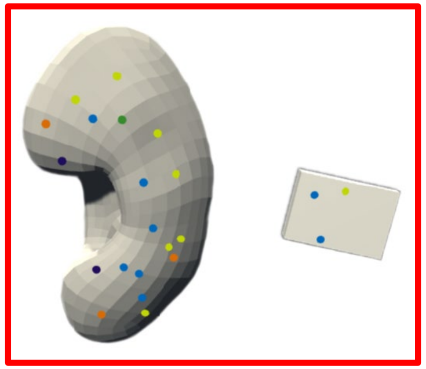
- Home

Templates

- TMC-Organ-Template

Clone this wiki locally

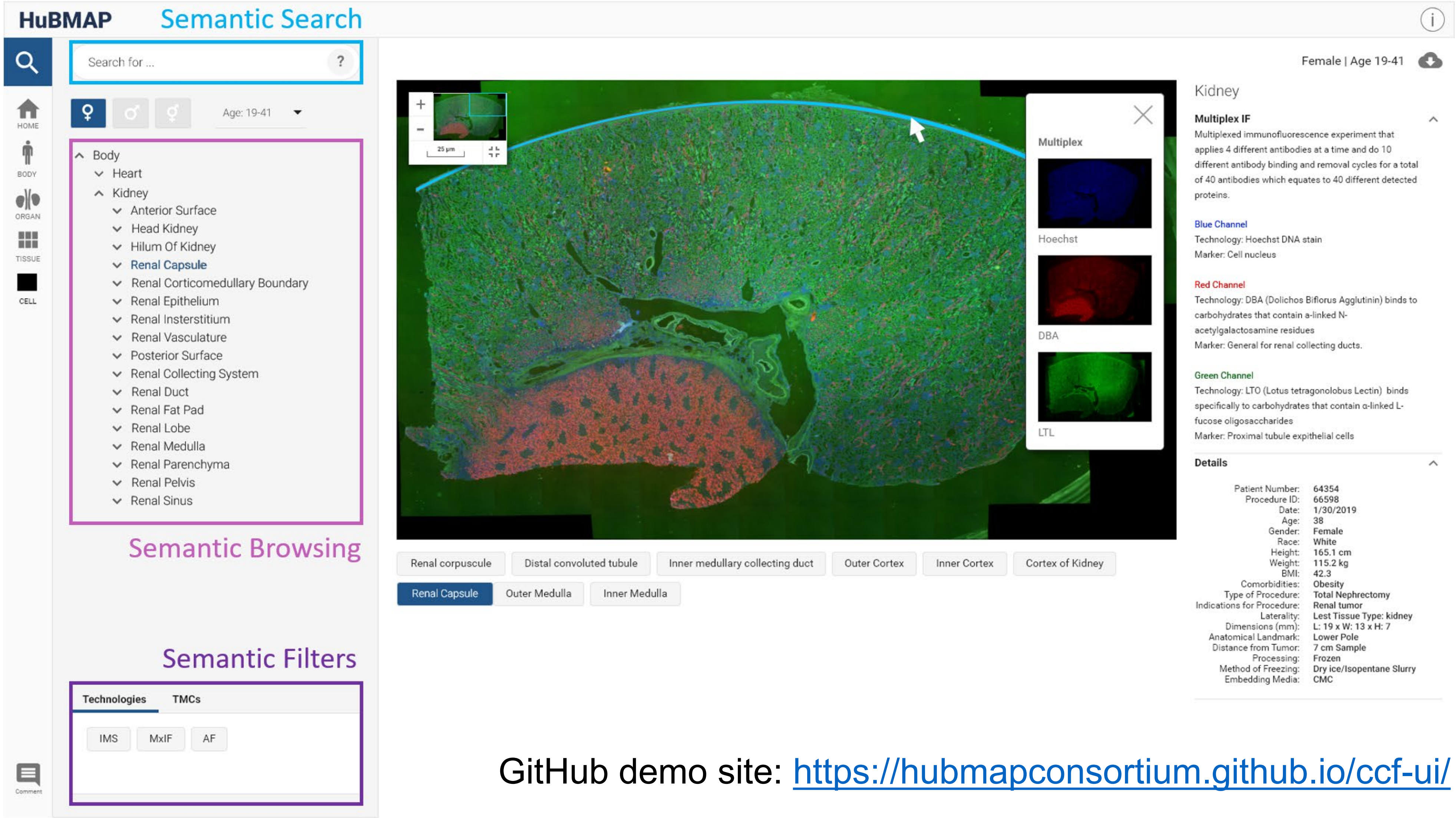
https://github.com/hubmapcc



https://github.com/hubmapconsortium/ccf-data-wiki/wiki

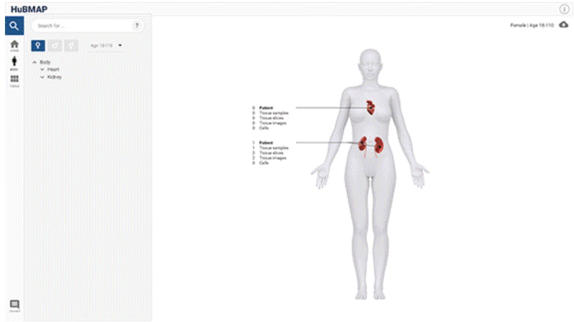
Y1 Q3 Progress - CCF User Interface (UI)

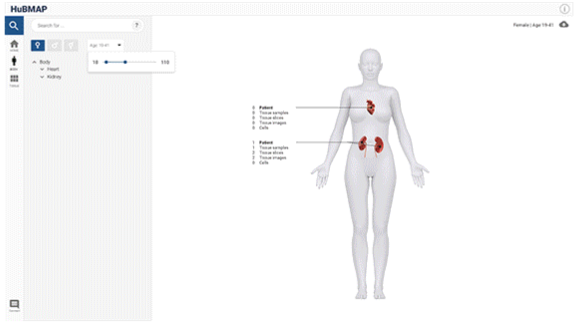
Y1 Q3 Progress - CCF User Interface (UI)

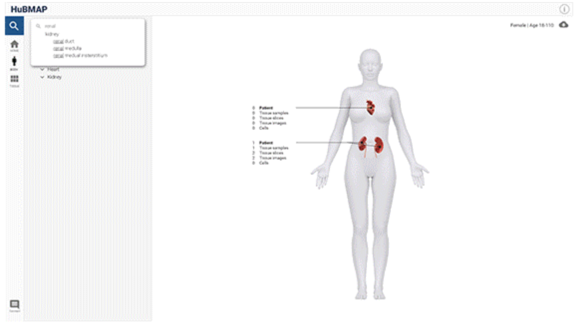


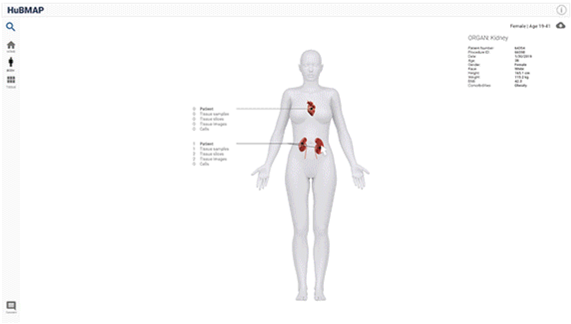
GitHub demo site: https://hubmapconsortium.github.io/ccf-ui/

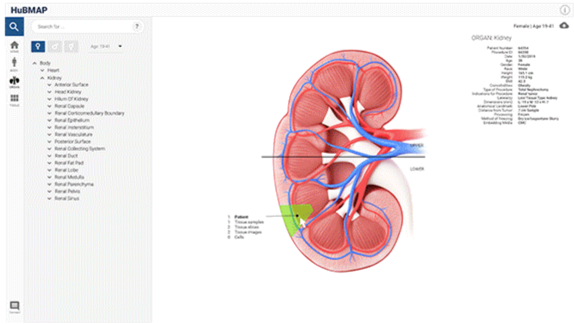
Y1 Q3 Progress - CCF User Interface (UI)

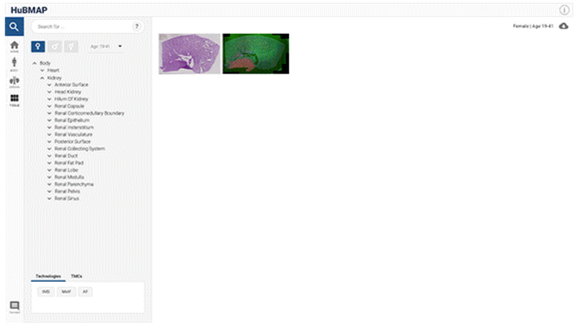


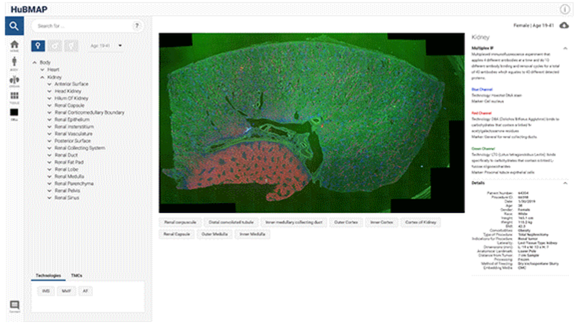


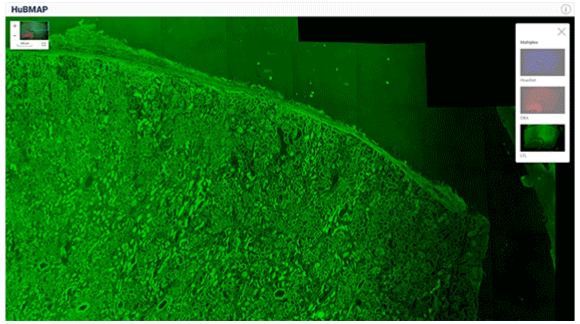


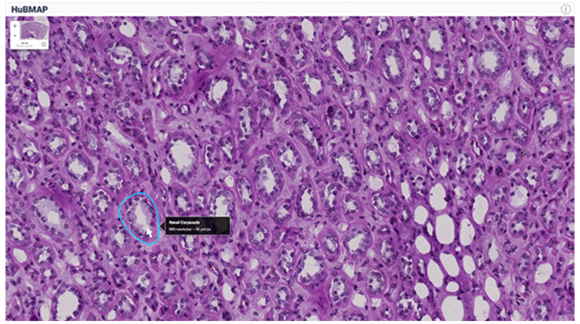












Y1 Q3 Progress - CCF User Interface (UI)

MC-IU has released CCF user interface v0.5.0, a proof-of-concept version of the CCF UI.
The user interface supports:

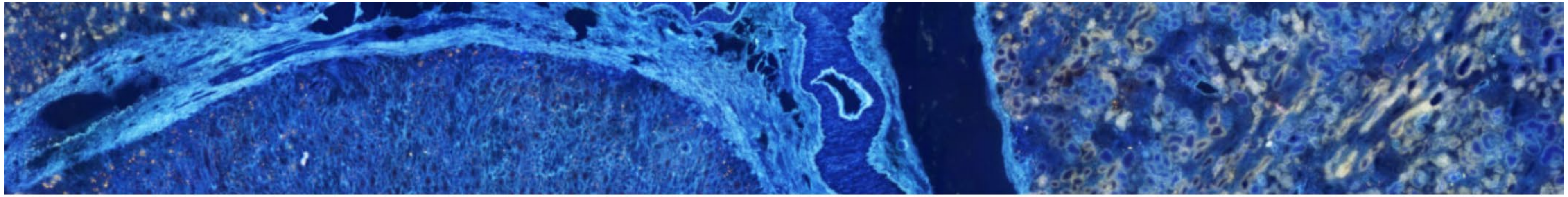
- Visual browsing of tissue samples and metadata at the whole body, organ, tissue, and cell level.
- Filtering by metadata (age, gender, TMC, and technology), results are presented at all views.
- Submission of questions and comments on the CCF UI.
- Semantic search by ontology, results are presented at all levels.
- Data download at the whole body, organ, tissue, and cell level, i.e., link to https://sampledata.hubmapconsortium.org.

See also:

Recorded demo: https://www.youtube.com/watch?v=rWMqKQc_00w&feature=youtu.be
GitHub link to code: https://github.com/hubmapconsortium/ccf-ui
GitHub demo site: https://hubmapconsortium.github.io/ccf-ui/
Original specs: https://drive.google.com/open?id=1tqUzmVLxwqcGprtRIevfY86YvHHPEsDR

Live Demo!

CCF Workshop



HuBMAP
Human BioMolecular Atlas Program

COMMON COORDINATE FRAMEWORK WORKSHOP CCFWS-01

Time & Date

9:00am–5:00pm EDT on May 9, 2019

All slides, video recordings are at https://ccfws.cns.iu.edu

Goals

HuBMAP will develop a common reference map or coordinate system called the Common Coordinate Framework (CCF). As stated in the Common Coordinate Framework Meeting (CCFM) document, a CCF makes it possible to uniquely and effectively define and name any location in the human body. A set of robust origin points (serving as landmarks) make it possible to reference organs, tissues, cells over different anatomical scales, tolerate human variability and function across lifespan and disease, and help integrate heterogeneous data layers and a wide range of reference maps such as whole body spatial maps, genetic variant maps, and coordinate systems that align with vascular pathways.

This CCF workshop will focus on a kidney-specific CCF and atlas but also discuss other relevant CCF/atlas efforts. It will feature presentations and discussions on:

- CCF metadata—what data are currently captured, how can they be unified across tissue mapping centers (TMCs), what additional data are needed to meet stakeholder (research) needs.
- CCF ontologies—what ontologies exist and are used in what part of the data pipeline; what ‘desirable properties’ and ‘success criteria’ exist?
- CCF mapping and numerical construction—including dealing with human variation and using CCF user interfaces as a means to properly register data and review data completeness.
- General principles and processes that can inform CCF design for other organs and continuous adaptation of CCF to emerging technologies and ever changing user requirements.

The ultimate goal is a set of draft guidelines for TMCs detailing what data to provide in which formats to maximize CCF mapping accuracy and data utility.

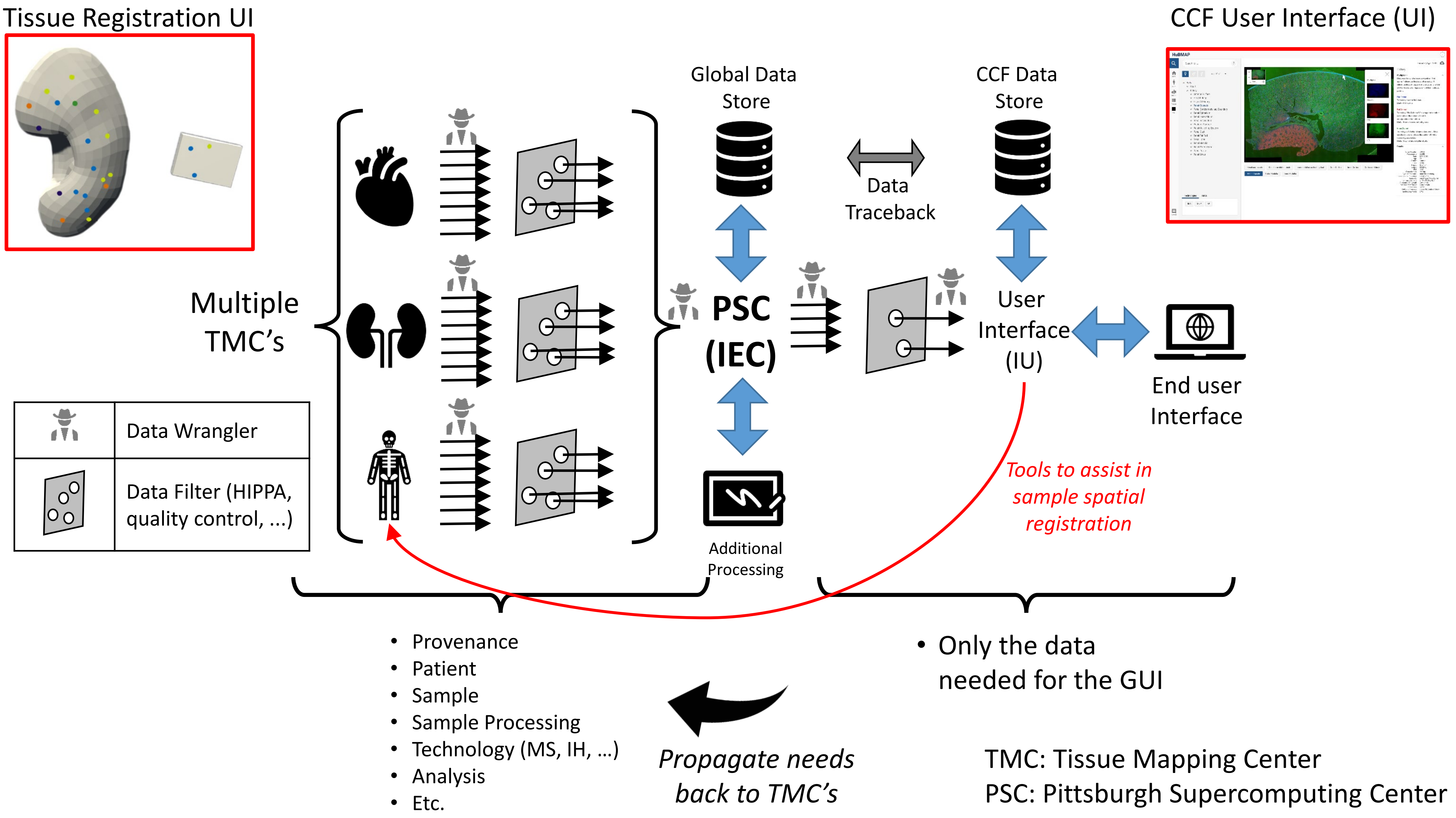
Y2 Plans

- CCF Mapping and Ontologies
- CCF UI and Tissue Registration UI
- Visual Human Massive Open Online Course (VHMOOC)
- User Studies

Y2 Plans: CCF Mapping and Ontologies

- Complete kidney ontology and switch to “part of” hierarchy
- V1.0.0 Data format specifications for image data including specification of identified regions
- Patient, sample and technology metadata ontologies in collaboration with the tissue centers
- Lung ontology

Y2 Plans: CCF UI and Tissue Registration UI



Tissue Registration UI
CCF User Interface (UI)
Global Data Store
CCF Data Store
Data Traceback
Multiple TMC's
PSC (IEC)
User Interface (IU)
End user Interface
Additional Processing
Data Wrangler
Data Filter (HIPPA, quality control, ...)
Tools to assist in sample spatial registration
Provenance
Patient
Sample
Sample Processing
Technology (MS, IH, ...)
Analysis
Etc.
Propagate needs back to TMC's
Only the data needed for the GUI
TMC: Tissue Mapping Center
PSC: Pittsburgh Supercomputing Center

Tissue Registration UI: Heart (depending data availability)

Align 9 tissue samples in 3D heart using a combi of

- Rough placement using human expertise/3D pattern matching and
- Fine adjustments using machine learning

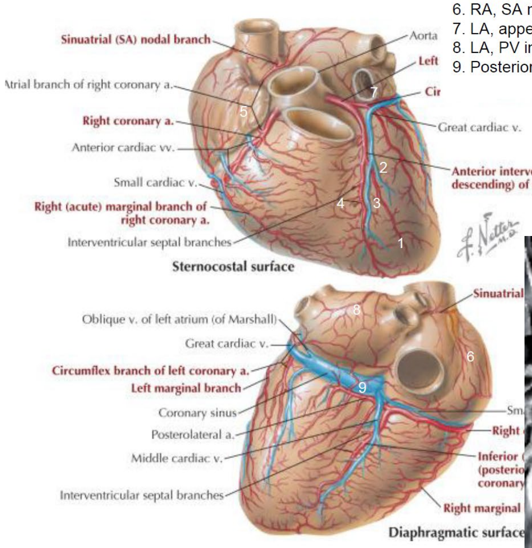
Virtual tissue samples will be sized 1-2cm cubed, numbered (1 … 9), and oriented (left-right, top and bottom tissue slice of z-stack).

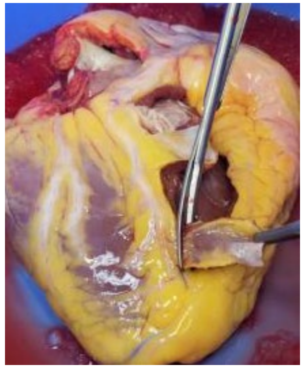
Measure error from

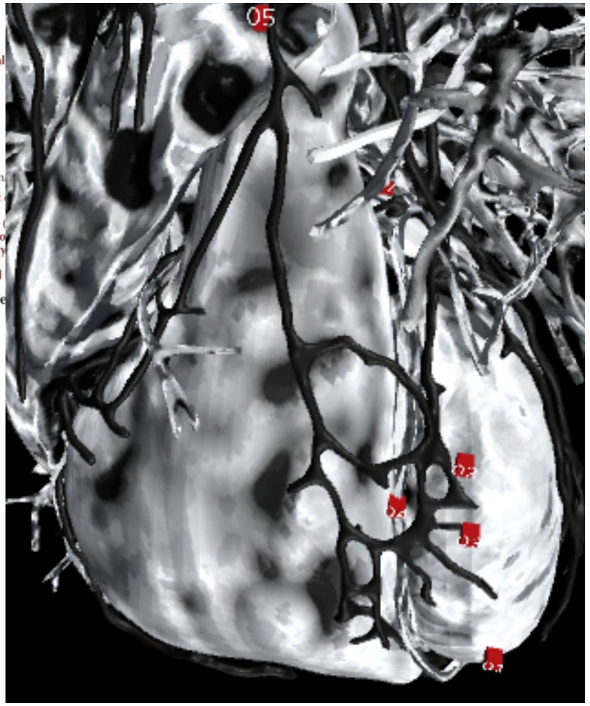
- precision of tissue sample procurement and
- placement in the 3D browser

We hypothesize that placement accuracy will improve when additional information (e.g., landmarks, major scaffolds, MR/CT scan of heart after 9 samples were extracted) is being visible in virtual organ.

Sites	Distinctive features
1. LV, apex	
2. LV, free wall 3 cm from apex	
3. septum, 3cm from apex including LAD	major arterial vessel, Purkinje fiber CM
4. RV, free wall 3 cm from apex	
5. RA appendage	
6. RA, SA node to AV node	pacemaker CM
7. LA, appendage	
8. LA, PV inflow	
9. Posterior, adjacent to coronary sinus	major venous vessel





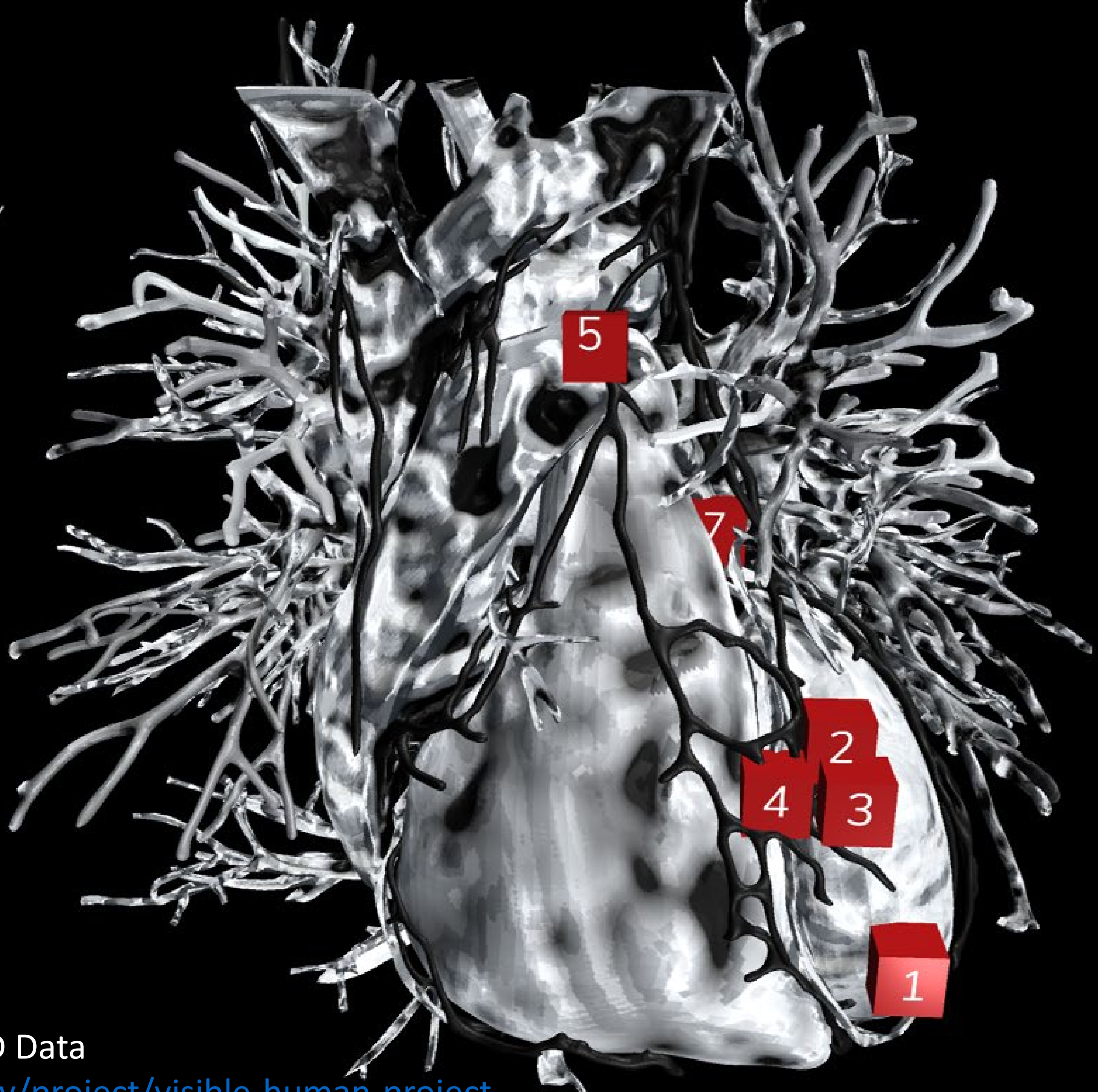


Human heart with data overlay
Developer: Andreas Bueckle

Show/hide

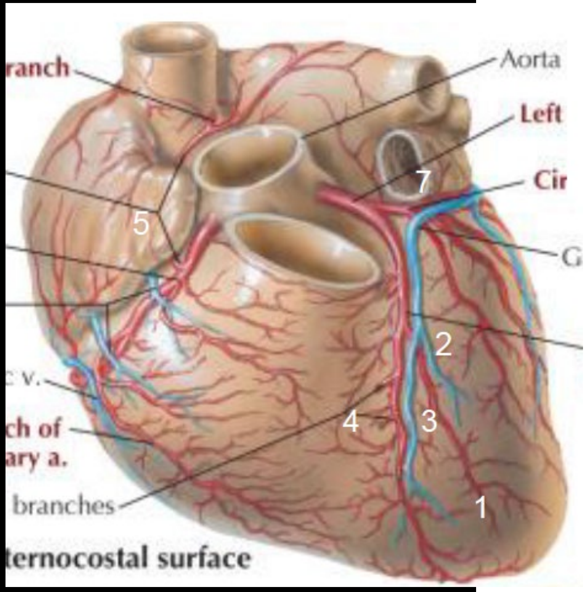
- ☑ Coronary arteries
- ☑ Coronary veins
- ☑ Left atrium
- ☑ Left ventricle
- ☑ Right atrium
- ☑ Right ventricle
- ☑ Markers

Adjust camera speed



Currently Selected

Please click any of the red markers!



Heart model from NLM3D Data
https://lhncbc.nlm.nih.gov/project/visible-human-project

Tissue Registration UI: Kidney

(depending data availability)

- Exploit human pattern recognition and fine motor skills (by surgeons) to register tissue in organs.
- Add info on anatomical landmarks, cell types, molecular data to support alignment.
- LATER: Use human alignment data as training data for machine learning algorithms, to better support manual alignment OR to possibly fully automatize alignment.

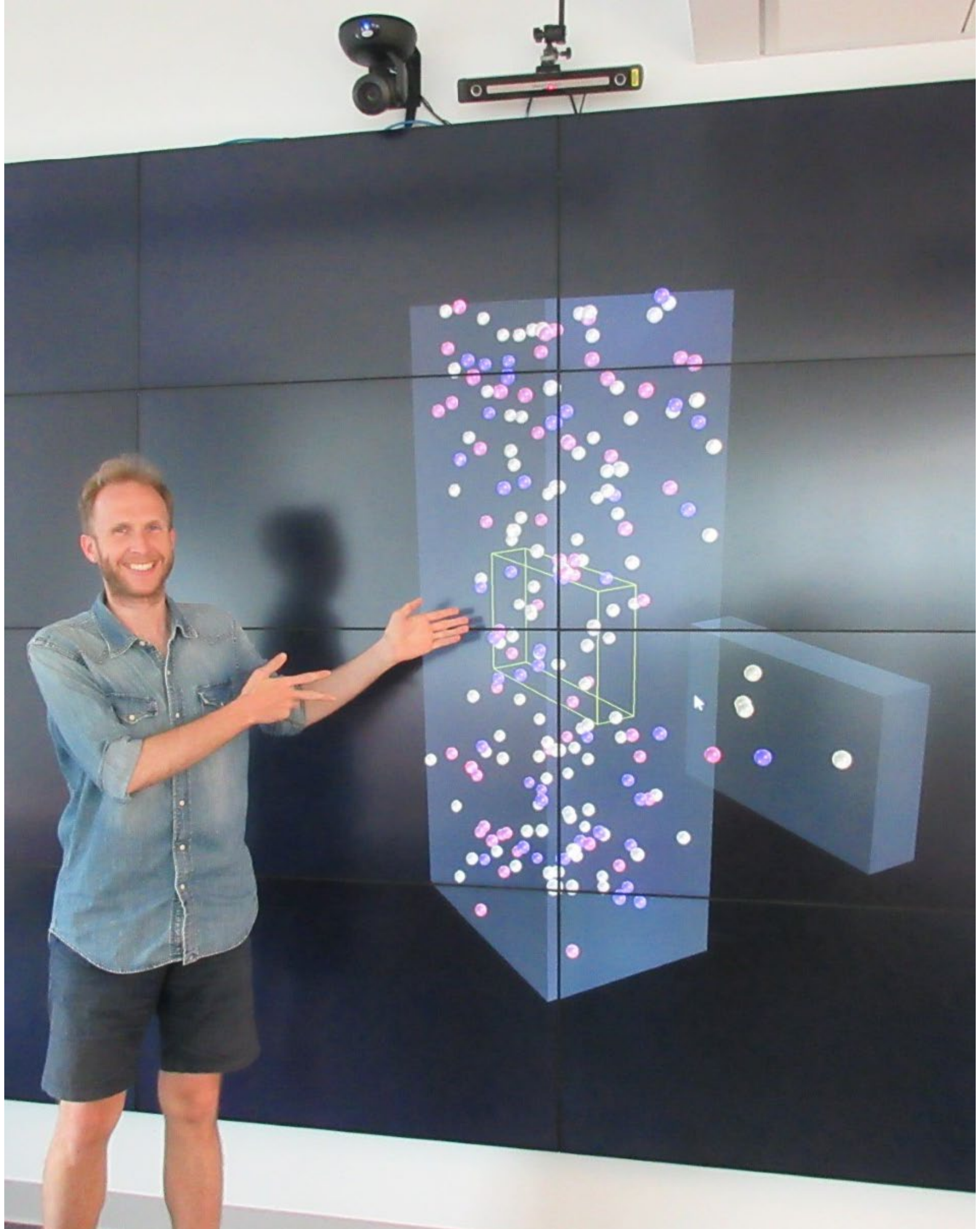
VIVE™ | VIVE Virtual Reality System

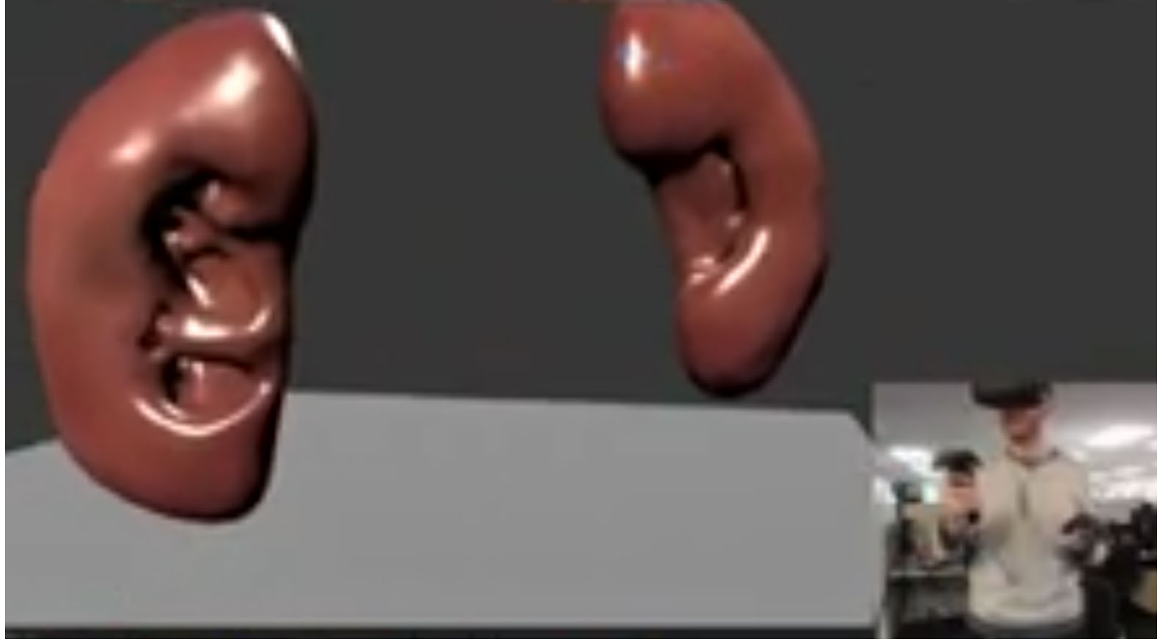
vive.com

How many of you have used a VIVE or space mouse?

Kidney model from NLM3D Data

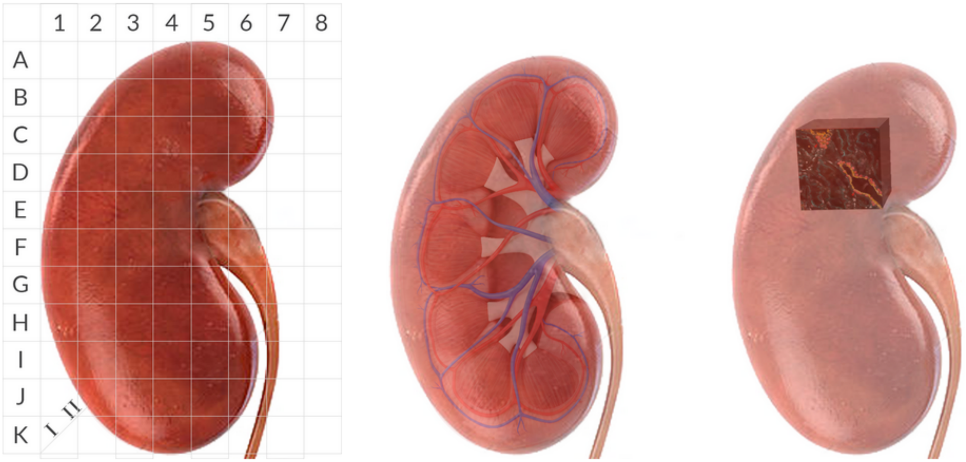
https://lhncbc.nlm.nih.gov/project/visible-human-project





Kidney model from NLM3D Data
https://lhncbc.nlm.nih.gov/project/visible-human-project

For the kidney, there exist no predefined tissue extraction sites. The current kidney Registration UI uses a grid system and a picture of a kidney slice to guide placement, see **Fig. 3 left and middle**. Funding of this GLUE grant will make it possible to use 3D image volumes collected from intact kidney tissue within KPMP that feature anatomically meaningful structures of different cell types, see **Fig. 3 right**.



KPMP GLUE grant proposal in progress.

Figure 3: 3D grid system (left), 2D image (middle), 3D tissue reconstructions from KPMP (right)

Using the 3D grid system, a user can use 3D coordinates to refer to a particular area in the kidney, e.g., A-4-II would correspond to the lower-middle part of the kidney, on the inside (occluded in this view). Using the 2D image, sample placement within a semi-transparent reference kidney object is guided by anatomical structures. Using KPMP data, it will be possible to show complex volumetric structures inside the 3D reference kidney to allow for more granular alignment at the molecular level.

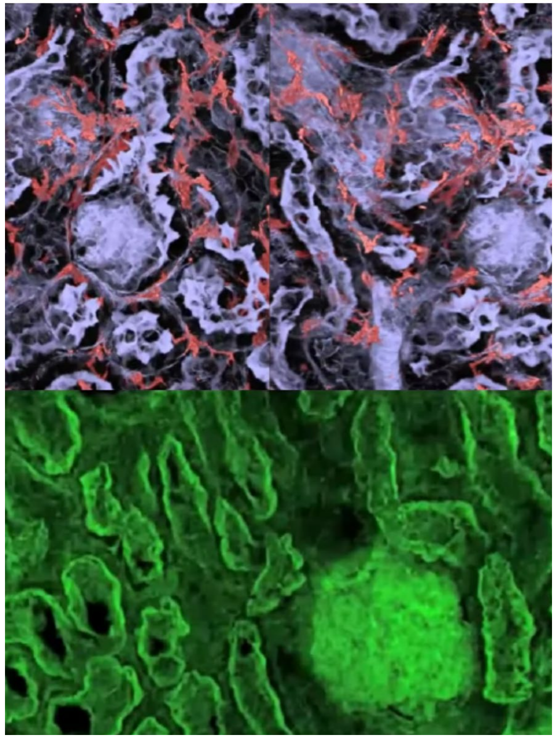


Fig. 4. KPMP volumetric data.

See presentation by Seth Winfree for details
https://ccfws.cns.iu.edu

Y2 Plans: CCF UI

- Use the CCF UI to serve a **Kidney Micro Atlas**.
- Go from Proof of Concept to fully-realized application
  - Fully integrate heart and kidney data
  - Integrate Tissue Registration UI data
  - Integrate expanded CCF Ontology
  - Connect to data/queries via IEC APIs and infrastructure
- Collaborate on a common Tissue Viewer

Y2 Plans:
Visual Human Massive Open Online Course (VHMOOC)

Research and develop a Visual Human Massive Open Online Course (VHMOOC) hat helps communicate the

- quality and coverage of HuBMAP data,
- utility and proper usage of CCF Tissue Registration, CCF UI, and HuBMAP tools, and
- demonstrate new single-cell analysis and CCF mapping techniques.

First interviews with experts will be run at the HuBMAP meeting at Stanford U.

Please let MC-IU know if you are interested/available to showcase your work.

Y2 Plans: User Studies

Conducting in-depth interviews with experts to understand user needs (Y1Q3, will continue in Y2Q1)

Information gathered will inform both the Tissue Registration UI and the Common Coordinate Framework UI.

Identified 6 draft personas (Y1Q3, will refine in Y2)

Generator, Analyst, Technologist, Computationalist, Data Provider, Educator/StudentBased on interviews, user stories, surveys, and comparisons with similar projects (HCA, KPMP)

We welcome your feedback on their applicability across the project. Review and provide feedback at https://bit.ly/2ZFHwYW.

Developed methodology and obtained IRB approval for user studies to be conducted in Y2 (Y1Q3)

Task-oriented user testing to improve the CCF user interface. Administered online, with HuBMAP members and other biological researchers who are representative of users based on their research interests.