BME Design-Fall 2026 - Pierson TRAPSKIN
Project Information/Progress Reports/Progress Report 9 - 11/5

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Ava Hodgson - Nov 05, 2026, 2:23 PM CST

Title: Radiographic Radiomics Phantom Progress Report 9

Date: 10/30 - 11/5

Client: Dr. Jennie Crosby
Advisor: Yang Lu

Team:

Last Name	First Name	Role	E-mail	Phone	Office Room/Building
Trapskin	Pierson	Leader	Pierson Trapskin	(608) 335-7986	
Hodgson	Ava	Communicator	Ava Hodgson	(289) 968-7479	
Stellflue	Presley	BSAC	Presley Stellflue	(847) 224-7803	
Pionek	Sonja	BWIG	Sonja Pionek	(608) 622-2590	
Casas	Matthew	BWIG	Matthew Casas	(262) 290-8734	
Ma	Allie	BPAG	Allie Ma	(781) 990-8825	

Problem Statement

The goal of this project is to design and construct a radiomics benchmarking phantom for radiographic imaging systems that includes multiple clinically relevant textures, accommodates both small- and large-anatomy imaging protocols via a removable core or interchangeable sizing, and uses materials stable enough for repeated use over multiple years.

Brief Status Update

This week the team focused on planning our fabrication process which will continue over the next few weeks before show and tell. We are still waiting for our client to provide us with confirmation of the grant proposal so we can accurately plan based of our budget.

Difficulties / Advice Requests

Do you have an updated budget from the grant committee?

Current Design

The phantom features a removable core, allowing the same shell to represent both large and small anatomy by swapping in modular phantom texture inserts. Phantom materials and textures are still undecided, but shall mimic either the physical texture or electron density of anatomical tissues.

Materials and Expenses

Item	Description	Vendor	Part #	Qty	Cost each [$]	Total [$]
Cast acrylic blank, shell	Clear cast PMMA, 410 × 310 × 165 mm (or bonded slabs)	[TBD]	[TBD]	1	$440-1,130 est.	600
Cast acrylic blank, core	Clear cast PMMA, 190 × 190 × 165 mm	[TBD]	[TBD]	1	130-320 est.	200
Weld-On 40 cement	Two-part reactive acrylic cement, 1 pt kit (only if slabs are bonded)	ePlastics	IPS40-PT	1	46.71	46.71
PLA filament	1.75 mm, 1 kg, single lot	[TBD]	[TBD]	[3]	70	210
ABS filament (optional)	1.75 mm, 1 kg	[TBD]	[TBD]	[1]	50	50
Machine shop and annealing	CNC mill or router, lathe, and oven time	ECB Lab or Wendt Lab	N/A	1	$0	$0
Miscellaneous	-	[TBD]	N/A	[TBD]	$300	$300
					Total	1406.71

Goals

Major Team Goals for the Next Week (11/5-11/13)

1. Take show and tell feedback and adjust our plan accordingly.
2. Start manufacturing based on fully defined CAD models

Next Week's Individual Goals (11/5-11/13)

- Pierson Trapskin: Fabricate phantom core, order necessary materials after client meeting.
- Ava Hodgson: Help with final round of testing for cylindrical inserts, help create testing plans to ensure base is compatible with imaging environment
- Presley Stellflue: begin fabricating the base/acrylic parts of the phantom and make decisions regarding dimensions of the removable core.
- Matthew Casas: Continue individual research on CT phantom testing methods and assist with evaluating texture inserts as the team begins fabrication.
- Sonja Pionek: Finalize insert designs/dimensions and prepare for final 3D print
- Allie Ma: Order necessary materials and assist in phantom core fabrication.

PDS: Completed

Timeline

Task	Sep				October					November				December	
	4	11	18	25	2	9	16	23	30	6	13	20	27	4	11
Project R&D															
Empathize	X	X	X	X											
Background…			X	X	X	X									
Prototyping						X	XX	X							
Testings															
Deliverables															
Progress Reports	NA	X	X	X	X	X	X	X							
Prelim presentation					X										
PDS			X												
Design Matrix				X											

Preliminary report						x									
Decide on final design						x									
Final Poster															
Meetings															
Client			x	x			x	x							
Advisor	x	x		x	x	x	x	x							
Website															
Update	x	x	x	x	x	x	x	x							

Filled boxes = projected timeline

X = task was worked on or completed

Detailed accomplishments

Previous week's goals and accomplishments by individual

Pierson Trapskin: Completed individual research and helped prepare materials needed to begin fabricating phantom core.

Ava Hodgson: Competed individual research on how to ensure cylindrical inserts are best tested, edited previow texture insert CAD designs.

Presley Stellflue: Began downloading Mastercam for CNC fabrication and doing tutorials on how to use it. Found an HDPE cylinder that could be used as the head/core if we don't order more acrylic. Attended show and tell and shared progress with others.

Sonja Pionek: This week, I took the feedback from Dr. Crosby regarding the 3D printed inserts and CAD modeled additional insert designs to be used in our final product that will be more useful in the CT scanner. I also attended Show and Tell and completed my required trainings.

Matthew Casas: This week, I completed individual research on how 3D-printing infill patterns affect CT attenuation and how biological phantoms can be used to test radiomic feature stability.

Allie Ma: Conducted more individual research on acrylic phantoms and fabrication protocols for binding & cutting acrylic.

Activities

Name	Date	Activity	Time (h)	Week Total (h)	Sem. Total (h)
Pierson Trapskin	9/14 and 9/15	Individual research on existing designs and materials.	2	2	4
Pierson Trapskin	9/16	Notebook update and progress report 2.	1	3	5
Presley Stellflue	9/16	Research on possible materials and dimensions. Began drafting PDS	3	3	4
Ava Hodgson	9/14-9/16	Research on competing designs, pre-existing patents, and standards	5	5	5

		used to create previous competing designs			
Ava Hodgson	9/17	Adding to draft of PDS	1	6	6
Matthew Casas	9/17	Added progress report to website. Individual research on existing radiomics phantom designs and potential materials/textures.	2	2	4
Allie Ma	9/11-9/17	Began filling PDS information. Researched on standards for phantom development.	1.5	1.5	1.5
Presley Stellflue	9/17-23	Worked on and edited PDS, completed individual research, and created a SolidWorks model for a design idea.	7	7	11
Pierson Trapskin	9/18	Developed an appropriate CAD model for both full size and small scale model size of our front-running design. Researched appropriate sizing based of competing design and client recommendations.	6	6	10
Allie Ma	9/18	Finished editing PDS. Uploaded PDS under "Project Information >> Team Activities >> Design Process". Any further updates to the PDS will be uploaded in that folder too.	1	1	2.5
Allie Ma	9/18-9/24	Wrote up design matrix template. Began editing design matrix grades and reasoning. Annotated key literature provided by client.	3	4	5.5
Ava Hodgson	9/21	Individual research on biological components of CT scans, possible materials and/or texture ideas for phantom	2	2	8
Ava Hodgson	9/18-9/23	Developed CAD design as preliminary design idea for presentation, uploaded to design matrix	6	8	14
Matthew Casas	9/18-9/24	Individual research on 3D-printed materials for CT phantoms and the effects of texture patterns on radiomic features. I also added the progress report to the website.	2	2	6
Ava Hodgson	9/29-10/01	Individual research on CT physics, attenuation & the possibility of 3D	4	4	18

		printing tissue like materials to gain better understanding of the machine the phantom will be used on.			
Pierson Trapskin	9/29	3D printed our model making use of the Design and Innovations Lab at Wendt.	1	1	11
Ava Hodgson	9/29-9/30	Created slides and notes for Preliminary Design presentation for the Background and Competing Designs.	2	2	20
Pierson Trapskin	9/30	Continued research and brainstorming on materials and costs. Specifically on what materials could help eliminate airgaps and grey matter from scans.	3	4	15
Presley Stellflue	9/29-10/1	Worked on preliminary presentation and edited slides. Conducted individual research on fabrication processes of phantoms and gathered information on competing designs.	4	4	15
Matthew Casas	9/28-10/1	Completed individual research on CT phantom designs and radiomic texture features. Created slides and prepared for the Preliminary Design Presentation. Uploaded the progress report and preliminary presentation slideshow to Canvas and the team website.	4	4	10
Pierson Trapskin	10/3-10/6	For the preliminary report, I researched and wrote the Introduction and Background sections.	6	6	21
Pierson Trapskin	10/4-10/5	I built up a big part of the report's reference list, and researched the team's choice to focus on physical texture and use an acrylic body with PLA inserts.	3	9	24
Presley Stellflue	10/5-10/7	I wrote the design specifications, client description, design 1, HU, and the preliminary report conclusion. I also made final edits on grammar and to the cost table. conducted additional and topic-specific research to cite in the report.	7	7	23
Matthew Casas	10/7	Conducted individual research on CT phantom materials, tissue-	3	3	13

		equivalent properties, and alternative fabrication methods. Reviewed studies involving PLA, plaster, castable materials, and iodine-ink printing. Updated project research documentation.			
Pierson Trapskin	10/12	Conducted research regarding infill percentage and how the CBCT will read the data.	2	2	26
Ava Hodgson	10/08-10/13	Individual research on what textures, densities, etc affect t eh features extracted from CT scans, what ones produce the best results, etc	4	4	24
Ava Hodgson	10/13-10/15	Rough AutoCAD designs for textural inserts	4	8	28
Matthew Casas	10/13-10/15	Conducted individual research on CT phantom materials, texture patterns, and fabrication methods to help evaluate potential designs for our phantom.	2	2	15
Ava Hodgson	10/19-10/21	Individual research for how to 3D print phantoms for medical imaging (compatibility)	2	2	30
Ava Hodgson	10/18-10/22	Created preliminary texture inserts for phantom in OnShape AutoCAD	6	8	36
Presley Stellflue	10/21	Completed research, planning fabrication	2	2	25
Pierson Trapskin	10/18 and 10/20	Created texture models in SolidWorks	3	3	29
Matthew Casas	10/22	Conducted individual research on CT radiomics reproducibility, imaging parameters, and 3D-printed liver phantom designs to help guide texture selection and testing procedures.	2	2	17
Pierson Trapskin	10/23	Talked through prototyping plans to maximize yield of our materials.	2	2	31
Presley Stellflue	10/23	Inquired about fabrication plans with ECB staff and began downloading software	2	2	27
Matthew Casas	10/28	Conducted individual research on low-cost CT phantom fabrication methods and radiomic feature reproducibility across different CT	2	2	19

		scanners to help guide our design and testing procedures.			
Presley Stellflue	11/5	Downloaded CNC software and began learning it	5	5	32
Matthew Casas	11/5	Researched 3D-printing infill patterns, CT attenuation, and radiomic feature stability to help improve phantom design and testing.	2	2	21
Ava Hodgson	11/3-11/5	Individual research on testing inserts in medical imaging environment	2	2	38
Ava Hodgson	11/2-11/5	Edited previous texture insert CAD designs, prepared for final print	3	5	41