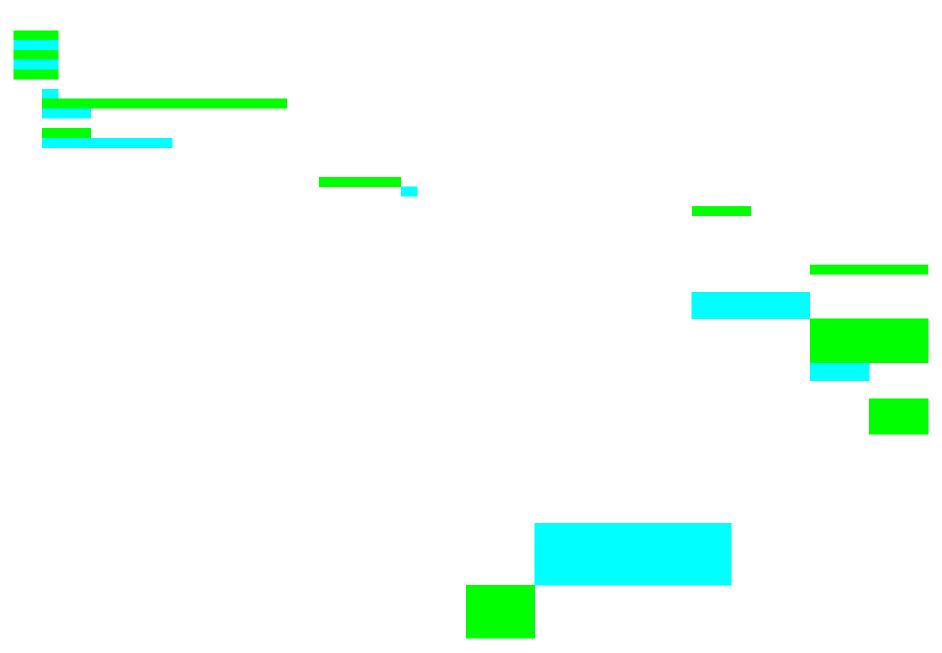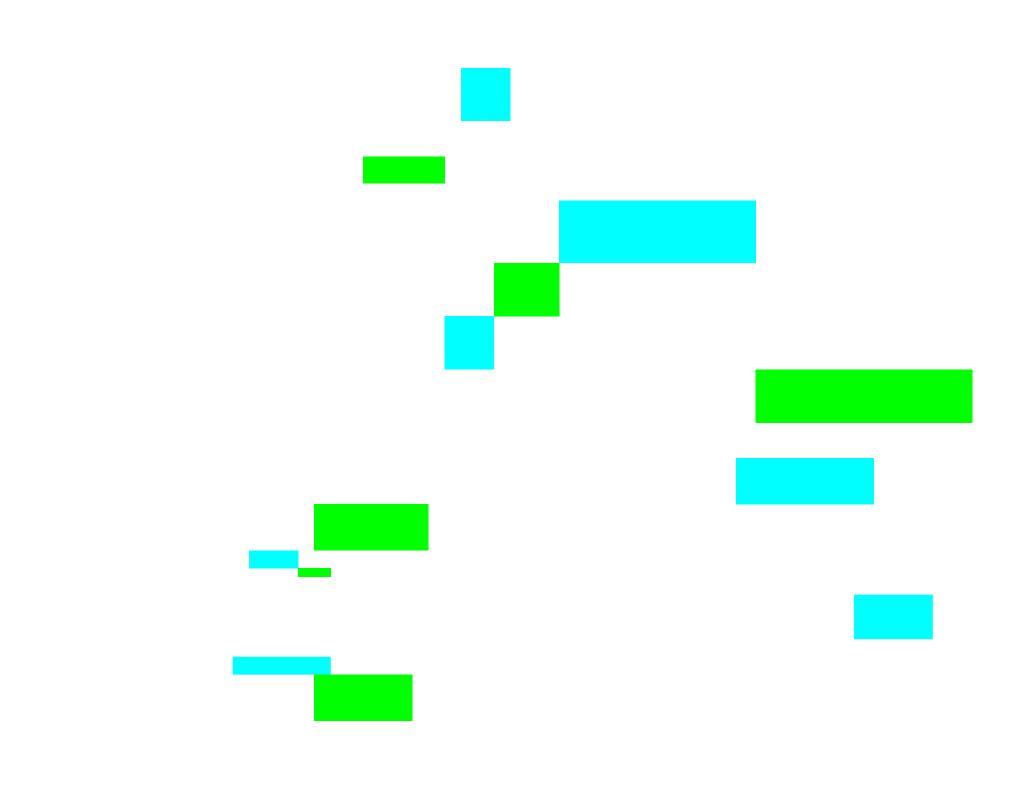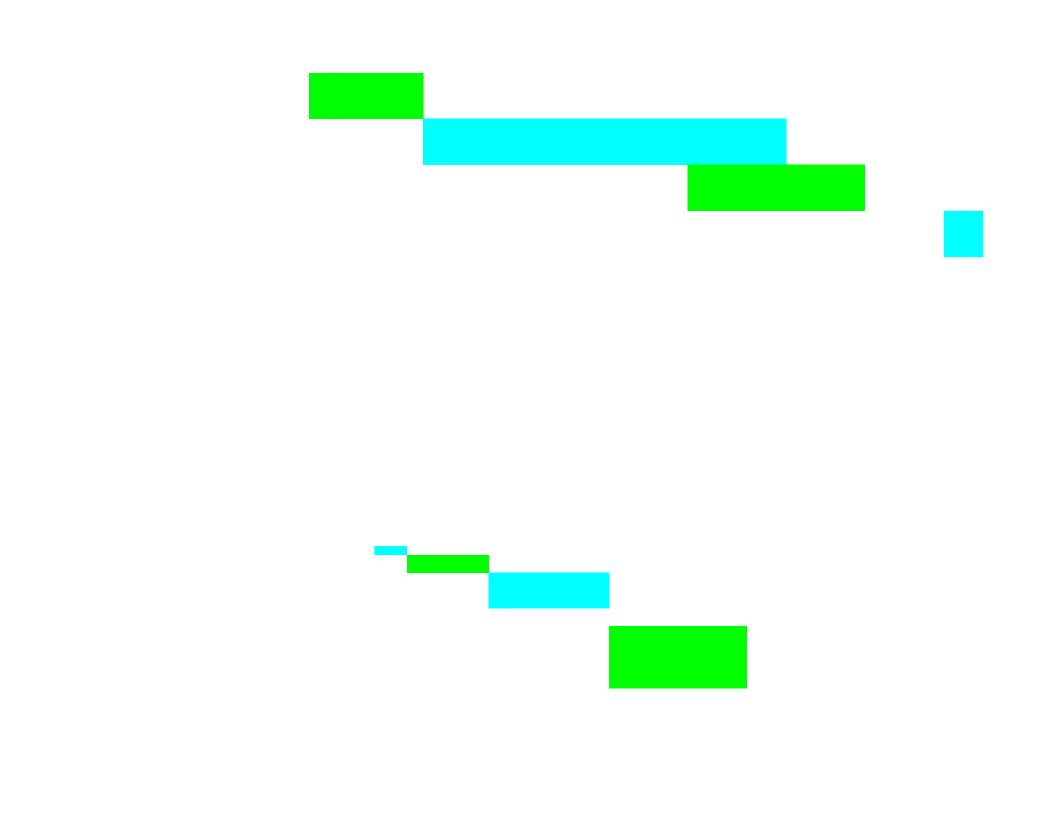| Task Number	Top Level Module	Task Name	Subtask Description (If Needed)	Description (If Needed)	Task Dependencies	Task Metrics	Date	Length (days)	End Date	Participants	hrs/week/person	Assigned To
1	Generate Requirements											
1.1		Advisor Dr. Zambreno for				N/A	8/31/2020	0	8/31/2020	6	7	All
1.2		empatize with users				types of users explored, use	8/31/2020	2	9/2/2020	6	13	All
2	Market Research					Completed Out of 5				6		
2.1		AR Glasses			1.2	and explored	9/2/2020	9	9/11/2020	6	12	All
2.2		Computer Vision			1.2	and explored	9/2/2020	9	9/11/2020	6	12	All
2.3		Chess Engine			1.2	and explored	9/2/2020	9	9/11/2020	6	12	All
2.4		Protocols			1.2	and explored	9/2/2020	9	9/11/2020	6	12	All
2.5		Existing Mobile Backends			1.2	and explored	9/2/2020	9	9/11/2020	6	12	All
3	Define Solution					Completed Out of 4						
3.1		Select AR Glass Device			2.1	Selected? (Y/n)	9/11/2020	0	9/11/2020	6	7	All
3.2		Software and Libs			2.2	Selected? (Y/n)	9/11/2020	14	9/25/2020	2	30	All
3.3		Select Chess Engine			2.3	Selected? (Y/n)	9/11/2020	2	9/13/2020	2	4	All
3.4		Select Where Backend Will Live				Completed out of 2						
3.4.1			Selection		2.3 , 3.1	Selected? (Y/n)	9/11/2020	3	9/14/2020	6	7	All
3.4.2			selection		2.3 , 3.2	Selected? (Y/n)	9/11/2020	7	9/18/2020	6	7	All
1	AR Glass Application					Completed Out of 8						
1.1		Project Creation				Completed out of 2						
1.1.1			Studio and Select Design Layout,		N/A	Completed? (Y/n)	9/28/2020	5	10/2/2020	1	3	Jake
1.1.2			Profile		1.1.1	Completed? (Y/n)	10/3/2020	2	10/4/2020	1	1	Jake
1.2		Welcome Activity				Completed Out of 2						
1.2.1			seen upon Glass Power On		1.1	Completed? Communication	10/19/2020	3	10/21/2020	1	2	Jake
1.2.2			devices. This many not be		1.1 , 1.2.1 , 1.3.2	How many devices are saved	11/7/2020	7	11/13/2020	1	5	
1.3		Initial Setup				Completed Out of 2						
1.3.1			setup including potentially		1.1	completed? Interfaced with	11/4/2020	10	11/13/2020	1	7	Brett
1.3.2			devices so that once initially		1.1 , 1.3.1	devices we save?	1/25/2021	4	1/28/2021	1	3	Brett
1.4		Calibration				completed out of 1						
1.4.1			camera and computer vision		1.1.2 , 1.5.1	Completed? Communication	10/25/2020	10	11/3/2020	1	10	Jake
1.5		Image Capture				Number of 1.5.X Subtasks completed out of 3						
1.5.1			Develop Activities needed for capturing an image		1.1.1,	% Complete? # Screens completed? Communication Calls Hooked Up?	10/19/2020	6	10/24/2020	1	4	Brett
1.5.2			Setup voice Commands to take picture on user command		1.1.2,	Able to recognize basic voice commands? (Y/n) How many custom commands does it respond to to take the picture? % complete?	10/25/2020	14	11/7/2020	1	10	Jamie
1.5.3			Setup touch sensors to take picture on user gesture		1.1.2	Able to recognize basic gestures? (Y/n) % complete?	10/25/2020	3	10/27/2020	1	2	Brett
1.6		Pre Processing				Number of 1.6.X Subtasks Completed out of 1						
1.6.1			Convert color images to grayscale to minimize computational complexity and data size		1.5.1 and either	Able to translate/recolor captured images to grayscale (Y/n)?	10/28/2020	7	11/3/2020	1	5	Jake
1.7		Display Move				Number of 1.7.X Subtasks Completed out of 1						
1.7.1			Develop Activity for Displaying the engine's recommended move to the user (Text Estimate), Includes implementing library calls into activity		1.1.2, 1.8.3	% Complete? # Screens completed? Communication calls hooked up? (Y/n)	1/25/2021	5	1/29/2021	1	3	Jamie
1.8		Communication				Number of 1.8.X Subtasks Completed Out of 3						
1.8.1			Develop, import, or customize library for connecting to WIFI (or any other network medium we will need to connect to the backend). This may not be necessary if we run everything on the glasses.		1.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/11/2020	10	10/20/2020	1	7	Jake
1.8.2			Develop, import, or customize library for encoding images to be passed to the backend		1.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/7/2020	4	10/10/2020	1	3	Jake

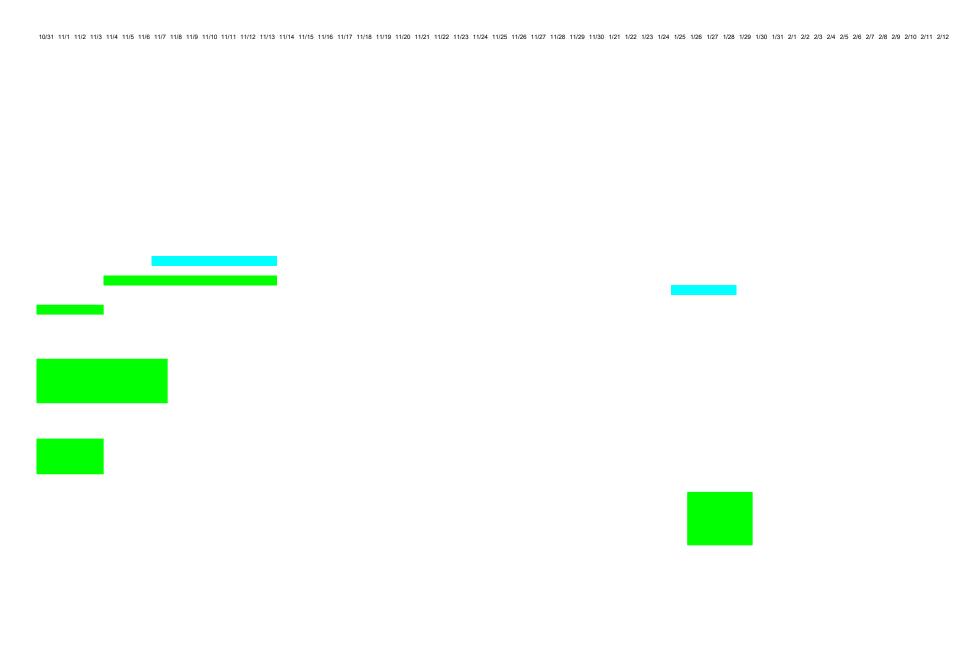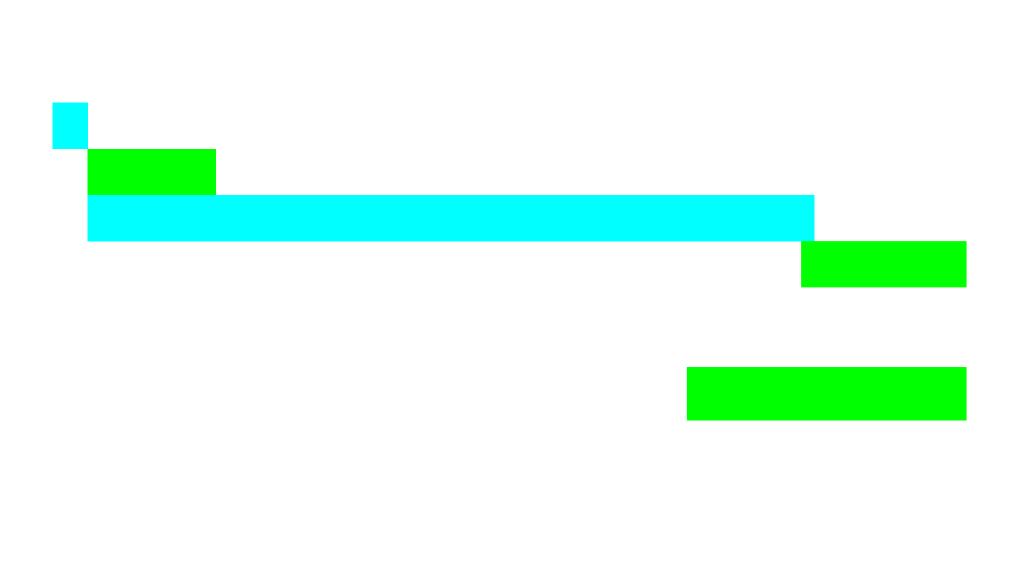| ID	Task	Description	Dep	Metric/Status	Start	Dur	End	#	Pts	Owner
1.8.3		Develop, import, or customize library for encoding and decoding text passed to or from the backend	1.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/4/2020	3	10/6/2020	1	2	Jake
2	Backend									
2.1	Project Creation			Number of 2.X Subtasks Completed out of 4 Number of 2.1.X Subtasks Completed out of 1						
2.1.1		Create the project within Android Studio and select the Design Layout and .gitignore	N/A	Completed? (Y/n)	9/28/2020	5	10/2/2020	1	3	
2.2	Communication			Number of 2.2.X Subtasks Completed out of 4						
2.2.1		Develop, import, or customize library for connecting to WIFI (or any other network medium we will need to connect to the frontend). This may not be necessary if we run everything on the glasses.	2.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/10/2020	10	10/19/2020	1	7	Jamie
2.2.2		Develop, import, or customize library for decoding images passed from the front end	2.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/6/2020	4	10/9/2020	1	3	Jamie
2.2.3		Develop, import, or customize library for encoding and decoding text passed to or from the frontend	2.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/3/2020	3	10/5/2020	1	2	Jamie
2.2.4		Develop, import, or customize library for communicating with the game engine	2.1.1, 2.4.2	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/20/2020	10	10/30/2020	1	7	Jamie
2.3	Computer Vision			Number of 2.3.X Subtasks Completed out of 4						
2.3.1		Initial Setup		Number of 2.3.1.X Subtasks Completed out of 4						
2.3.1.1		Ensure we can recieve images transmitted by the frontend	1.8.1, 2.1, 2.2.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	10/19/2020	6	10/25/2020	1	4	CV Team
2.3.1.2		Create a dataset for use in board state determination (May not be explicitly required if we do not use nn/ml)	N/A	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	9/25/2020	6	10/1/2020	1	4	CV Team
2.3.1.3		Set up codebase location in team Gitlab repository	N/A	Completed? (Y/n)	9/21/2020	2	9/23/2020	1	1	CV Team
2.3.1.4		Set up OpenCV .gitignore	2.3.1.3	Completed? (Y/n)	9/24/2020	1	9/25/2020	1	1	CV Team
2.3.2		Calibration		Number of 2.3.2.X Subtasks Completed out of 2						
2.3.2.1		Ensure the images we receive are in a standardized format (file type, size, orientation, etc.)	2.3.1.1	Completed? (Y/n)	10/25/2020	3	10/28/2020	1	2	CV Team
2.3.3		Image Processing		Number of 2.3.3.X Subtasks completed out of 3						
2.3.3.1		Setup python notebook and Generic OpenCV IO	2.3.1.3	Completed? (Y/n)	9/20/2020	5	9/25/2020	1	3	CV Team
2.3.3.2		Implement generic edge/contour detection of an image	2.3.3.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	9/25/2020	5	9/30/2020	1	3	CV Team
2.3.4		Board State Determination	2.3.3	Number of 2.3.4.X Subtasks Completed out of 8						

						Start		End			
2.3.4.1			Do line detection	2.3.3.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	9/24/2020	3	9/30/2020	1	2	CV Team
2.3.4.2			Check for chessboard layout from the detected lines	2.3.4.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	10/1/2020	7	10/20/2020	1	5	CV Team
2.3.4.3			Implement highlighting only the chessboard for testing and visualization purposes	2.3.4.2	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	10/16/2020	3	10/24/2020	1	2	CV Team
2.3.4.4			Ensure we can find a single chess piece and place a bounding box around it	2.3.2.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	10/29/2020	3	11/1/2020	1	2	CV Team
2.3.4.5			Ensure we can find multiple chess pieces and place accurate bounding boxs around them	2.3.4.4	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	11/2/2020	7	11/9/2020	1	5	CV Team
2.3.4.6			Detect the type of each chess piece found	2.3.4.4	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	11/2/2020	28	2/1	1	20	CV Team
2.3.4.7			Detect the position of each chess piece on the board	2.3.4.4, 2.3.4.5	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	2/1/2020	28	2/29/2020	1	20	CV Team
2.3.4.8			Ensure we have and use a set format for the board state when communicating with the game engine	N/A	Completed? (Y/n)	2/12/2021	6	2/16/2021	1	4	CV Team
2.4	Game Engine				Number of 2.4.X Subtasks completed out of 3						
2.4.1		Game Engine Setting Customization			Number of 2.4.1.X Subtasks completed out of 1						
2.4.1.1			Develop activites to change the game engine settings for items such as difficulty and response time (depth in chess engines)	2.1.1	Settings understood? (Y/n) How many settings are we going to customize? % Complete? # of Screens Developed? # of customized setting completed?	1/25/2021	21	2/14/2021	1	15	Jake
2.4.2		Import Game Engine			Number of 2.4.2.X Subtasks Completed out of 3						
2.4.2.1			Download Game Engine	N/A	Completed? (Y/n)	9/28/2020	2	9/29/2020	1	1	Brett
2.4.2.2			Build and Compile the Game Engine Binary	2.4.2.1	Completed? (Y/n)	9/30/2020	5	10/4/2020	1	3	Brett
2.4.2.3			Import the binary into the backend. Do any necessary environment configuration as needed	2.4.2.2, 2.1.1	Imported? (Y/n) % Configured?	10/5/2020	7	10/11/2020	1	5	Brett
2.4.3		Result Decoding			Number of 2.4.3.X Subtasks complete out of 1				1		
2.4.3.1			Develop, import, or customize library for decoding the recommended move into terminology the average user can understand	2.4.2.3, 2.1.1	% complete, Number of peices translated? Number of locations translated?	10/12/2020	7	10/18/2020	1	5	Brett

2/13 2/14 2/15 2/16 2/17 2/18 2/19 2/20 2/21 2/22 2/23 2/24 2/25 2/26 2/27 2/28 3/1 3/2 3/3 3/4 3/5 3/6 3/7 3/8 3/9 3/10 3/11 3/12 3/13 3/14 3/15 3/16 3/17 3/18 3/19 3/20 3/21 3/22 3/23 3/24 3/25 3/26 3/27 3/28 3/29 3/30 3/31 4/1 4/2 4/3 4/4 4/5 4/6 4/7 4/8 4/9 4/10 4/11 4/12 4/13

4/14 4/15 4/16 4/17 4/18 4/19 4/20 4/21 4/22 4/23 4/24 4/25 4/26 4/27 4/28 4/29 4/30 5/1 5/2 5/3 5/4 5/5 5/6 5/7 5/8 5/9 5/10

	August	September	October	November	January	

Research and AR
Development no later
Algorithms can detect
Development Complete
Complete by mid-March,
Complete by the end of

1	Generate Requirements
2	Market Research
3	Define Solution

1	AR Glass Application
1.1	
1.2	
1.3	
1.4	
1.5	
1.6	
1.7	
1.8	
2	Backend
2.1	
2.2	
2.3	
2.3.1	
2.3.2	
2.3.3	
2.3.4	
2.4	
2.4.1	
2.4.2	
2.4.3	

Add Features and Test

February   March   April   May

Task Number	Top Level Module	Task Name	Subtask Description (If Needed)
1	Generate Requirements		
1.1	■	Advisor Dr. Zambreno for	
1.2	■	empatize with users	
2	Market Research		
2.1	■	AR Glasses	
2.2	■	Computer Vision	
2.3	■	Chess Engine	
2.4	■	Protocols	
2.5	■	Existing Mobile Backends	
3	Define Solution		
3.1	■	Select AR Glass Device	
3.2	■	Software and Libs	
3.3	■	Select Chess Engine	
3.4	■	Select Where Backend Will Live	
3.4.1	■		Selection
3.4.2	■		selection
1	AR Glass Application		
1.1	■	Project Creation	
1.1.1	■		Studio and Select Design Layout,
1.1.2	■		Profile
1.2	■	Welcome Activity	
1.2.1	■		seen upon Glass Power On
1.2.2	■		devices. This many not be
1.3	■	Initial Setup	
1.3.1	■		setup including potentially
1.3.2	■		devices so that once initially
1.4	■	Calibration	
1.4.1	■		Develop Activities needed for camera and computer vision algorithm calibration
1.5	■	Image Capture	
1.5.1	■		Develop Activities needed for capturing an image

1.5.2		Setup voice Commands to take picture on user command
1.5.3		Setup touch sensors to take picture on user gesture
1.6	Pre Processing	
1.6.1		Convert color images to grayscale to minimize computational complexity and data size
1.7	Display Move	
1.7.1		Develop Activity for Displaying the engine's recommended move to the user (Text Estimate), Includes implementing library calls into activity
1.8	Communication	
1.8.1		Develop, import, or customize library for connecting to WIFI (or any other network medium we will need to connect to the backend). This may not be necessary if we run everything on the glasses.
1.8.2		Develop, import, or customize library for encoding images to be passed to the backend
1.8.3		Develop, import, or customize library for encoding and decoding text passed to or from the backend
2	Backend	
2.1		Project Creation

2.1.1		Create the project within Android Studio and select the Design Layout and .gitignore
2.2	Communication	
2.2.1		Develop, import, or customize library for connecting to WIFI (or any other network medium we will need to connect to the frontend). This may not be necessary if we run everything on the glasses.
2.2.2		Develop, import, or customize library for decoding images passed from the front end
2.2.3		Develop, import, or customize library for encoding and decoding text passed to or from the frontend
2.2.4		Develop, import, or customize library for communicating with the game engine
2.3	Computer Vision	
2.3.1		Initial Setup
2.3.1.1		
2.3.1.2		
2.3.1.3		

2.3.1.4

2.3.2

Calibration

2.3.2.1

2.3.3

Image Processing

2.3.3.1

2.3.3.2

2.3.4

Board State Determination

2.3.4.1

2.3.4.2

2.3.4.3

2.3.4.4

2.3.4.5

2.3.4.6

2.3.4.7

2.3.4.8

2.4   Game Engine

2.4.1   Game Engine Setting
Customization

2.4.1.1

2.4.2   Import Game Engine

2.4.2.1

2.4.2.2

2.4.2.3

2.4.3   Result Decoding

2.4.3.1

Description (If Needed)	Task Dependencies	Task Metrics	Date
		N/A	8/31/2020
		types of users explored, use	8/31/2020
		Completed Out of 5	
	1.2	and explored	9/2/2020
	1.2	and explored	9/2/2020
	1.2	and explored	9/2/2020
	1.2	and explored	9/2/2020
	1.2	and explored	9/2/2020
		Completed Out of 4	
	2.1	Selected? (Y/n)	9/11/2020
	2.2	Selected? (Y/n)	9/11/2020
	2.3	Selected? (Y/n)	9/11/2020
		Completed out of 2	
	2.3 , 3.1	Selected? (Y/n)	9/11/2020
	2.3 , 3.2	Selected? (Y/n)	9/11/2020
		Completed Out of 8	
		Completed out of 2	
	N/A	Completed? (Y/n)	9/28/2020
	1.1.1	Completed? (Y/n)	10/3/2020
		Completed Out of 2	
	1.1	Completed? Communication	10/19/2020
	1.1 , 1.2.1 , 1.3.2	How many devices are saved	11/7/2020
		Completed Out of 2	
	1.1	completed? Interfaced with	11/4/2020
	1.1 , 1.3.1	devices we save?	1/25/2021
		Number of 1.4.X Subtasks completed out of 1 % Complete?# Screens Completed? Communication Calls hooked up? Able to send and recieve things with the computer vision module? (Y/n) What are we able to send and recieve currently? (Text,	
	1.1.2, 1.5.1	Images)	10/25/2020
		Number of 1.5.X Subtasks completed out of 3 % Complete? # Screens completed? Communication	
	1.1.1,	Calls Hooked Up?	10/19/2020

1.1.2,	Able to recognize basic voice commands? (Y/n) How many custom commands does it respond to to take the picture? % complete?	10/25/2020
1.1.2	Able to recognize basic gestures? (Y/n) % complete?	10/25/2020
	Number of 1.6.X Subtasks Completed out of 1	
1.5.1 and either	Able to translate/recolor captured images to grayscale (Y/n)?	10/28/2020
	Number of 1.7.X Subtasks Completed out of 1	
1.1.2, 1.8.3	% Complete? # Screens completed? Communication calls hooked up? (Y/n)	1/25/2021
	Number of 1.8.X Subtasks Completed Out of 3	
1.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/11/2020
1.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/7/2020
1.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/4/2020
	Number of 2.X Subtasks Completed out of 4	
	Number of 2.1.X Subtasks Completed out of 1	

Task	ID	Metric / Question	Date
	N/A	Completed? (Y/n) Number of 2.2.X Subtasks Completed out of 4	9/28/2020
	2.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/10/2020
	2.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/6/2020
	2.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/3/2020
	2.1.1, 2.4.2	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/20/2020
Ensure we can recieve images transmitted by the frontend	1.8.1, 2.1, 2.2.1	Number of 2.3.X Subtasks Completed out of 4 Number of 2.3.1.X Subtasks Completed out of 4 % complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	10/19/2020
Create a dataset for use in board state determination (May not be explicitly required if we do not use nn/ml)	N/A	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	9/25/2020
Set up codebase location in team Gitlab repository	N/A	Completed? (Y/n)	9/21/2020

Task	ID	Status	Date
Set up OpenCV .gitignore	2.3.1.3	Completed? (Y/n)	9/24/2020
		Number of 2.3.2.X Subtasks Completed out of 2	
Ensure the images we receive are in a standardized format (file type, size, orientation, etc.)	2.3.1.1	Completed? (Y/n)	10/25/2020
		Number of 2.3.3.X Subtasks completed out of 3	
Setup python notebook and Generic OpenCV IO	2.3.1.3	Completed? (Y/n)	9/20/2020
Implement generic edge/contour detection of an image	2.3.3.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	9/25/2020
	2.3.3	Number of 2.3.4.X Subtasks Completed out of 8	
Do line detection	2.3.3.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	9/24/2020
Check for chessboard layout from the detected lines	2.3.4.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	10/1/2020
Implement highlighting only the chessboard for testing and visualization purposes	2.3.4.2	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	10/16/2020
Ensure we can find a single chess piece and place a bounding box around it	2.3.2.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	10/29/2020
Ensure we can find multiple chess pieces and place accurate bounding boxs around them	2.3.4.4	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	11/2/2020

Task	Number	Metric/Question	Date
Detect the type of each chess piece found	2.3.4.4	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	11/2/2020
Detect the position of each chess piece on the board	2.3.4.4, 2.3.4.5	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	2/1/2020
Ensure we have and use a set format for the board state when communicating with the game engine	N/A	Completed? (Y/n)	2/12/2021
Develop activites to change the game engine settings for items such as difficulty and response time (depth in chess engines)	2.1.1	Number of 2.4.X Subtasks completed out of 3 Number of 2.4.1.X Subtasks completed out of 1 Settings understood? (Y/n) How many settings are we going to customize? % Complete? # of Screens Developed? # of customized setting completed?	1/25/2021
Download Game Engine	N/A	Number of 2.4.2.X Subtasks Completed out of 3 Completed? (Y/n)	9/28/2020
Build and Compile the Game Engine Binary	2.4.2.1	Completed? (Y/n)	9/30/2020
Import the binary into the backend. Do any necessary environment configuration as needed	2.4.2.2, 2.1.1	Imported? (Y/n) % Configured?	10/5/2020
Develop, import, or customize library for decoding the recommended move into terminology the average user can understand	2.4.2.3, 2.1.1	Number of 2.4.3.X Subtasks complete out of 1 % complete, Number of peices translated? Number of locations translated?	10/12/2020

Length (days)	End Date	Participants	hrs/week/person)	Task Number	Top Level Module
				1	Generate Requirements
0	8/31/2020	6	7	1.1	■
2	9/2/2020	6	13	1.2	■
		6		2	Market Research
9	9/11/2020	6	12	2.1	■
9	9/11/2020	6	12	2.2	■
9	9/11/2020	6	12	2.3	■
9	9/11/2020	6	12	2.4	■
9	9/11/2020	6	12	2.5	■
				3	Define Solution
0	9/11/2020	6	7	3.1	■
14	9/25/2020	2	30	3.2	■
2	9/13/2020	2	4	3.3	■
				3.4	■
3	9/14/2020	6	7	3.4.1	■
7	9/18/2020	6	7	3.4.2	■
				1	AR Glass Application
				1.1	■
5	10/2/2020	1	3	1.1.1	■
2	10/4/2020	1	1	1.1.2	■
				1.2	■
3	10/21/2020	1	2	1.2.1	■
7	11/13/2020	1	5	1.2.2	■
				1.3	■
10	11/13/2020	1	7	1.3.1	■
4	1/28/2021	1	3	1.3.2	■
				1.4	■
10	11/3/2020	1		1.4.1	■
				1.5	■
6	10/24/2020	1	4	1.5.1	■

14	11/7/2020	1	10	1.5.2
3	10/27/2020	1	2	1.5.3
				1.6
7	11/3/2020	1	5	1.6.1
				1.7
5	1/29/2021	1	3	1.7.1
				1.8
10	10/20/2020	1	7	1.8.1
4	10/10/2020	1	3	1.8.2
3	10/6/2020	1	2	1.8.3
			2	Backend
				2.1

5	10/2/2020	1	3	2.1.1
				2.2
10	10/19/2020	1	7	2.2.1
4	10/9/2020	1	3	2.2.2
3	10/5/2020	1	2	2.2.3
10	10/30/2020	1	7	2.2.4
				2.3
				2.3.1
6	10/25/2020	1	4	2.3.1.1
6	10/1/2020	1	4	2.3.1.2
2	9/23/2020	1	1	2.3.1.3

1	9/25/2020	1	1	2.3.1.4
				2.3.2
3	10/28/2020	1	2	2.3.2.1
				2.3.3
5	9/25/2020	1	3	2.3.3.1
5	9/30/2020	1	3	2.3.3.2
				2.3.4
3	9/30/2020	1	2	2.3.4.1
7	10/20/2020	1	5	2.3.4.2
3	10/24/2020	1	2	2.3.4.3
3	11/1/2020	1	2	2.3.4.4
7	11/9/2020	1	5	2.3.4.5

28	2/1	1	20	2.3.4.6
28	2/29/2020	1	20	2.3.4.7
6	2/16/2021	1	4	2.3.4.8
				2.4
				2.4.1
21	2/14/2021	1	15	2.4.1.1
				2.4.2
2	9/29/2020	1	1	2.4.2.1
5	10/4/2020	1	3	2.4.2.2
7	10/11/2020	1	5	2.4.2.3
		1		2.4.3
7	10/18/2020	1	5	2.4.3.1

Task Name	Subtask Description (If Needed)	Description (If Needed)
Advisor Dr. Zambreno for empatize with users		
AR Glasses		
Computer Vision		
Chess Engine		
Protocols		
Existing Mobile Backends		
Select AR Glass Device		
Software and Libs		
Select Chess Engine		
Select Where Backend Will Live		
	Selection selection	
Project Creation		
	Studio and Select Design Layout, Profile	
Welcome Activity		
	seen upon Glass Power On devices. This many not be	
Initial Setup		
	setup including potentially devices so that once initially	
Calibration		
	Develop Activities needed for camera and computer vision algorithm calibration	
Image Capture		
	Develop Activities needed for capturing an image	

Setup voice Commands to take
picture on user command
Setup touch sensors to take
picture on user gesture

Pre Processing

Convert color images to
grayscale to minimize
computational complexity and
data size

Display Move

Develop Activity for Displaying
the engine's recommended
move to the user (Text
Estimate), Includes
implementing library calls into
activity

Communication

Develop, import, or customize
library for connecting to WIFI (or
any other network medium we
will need to connect to the
backend). This may not be
necessary if we run everything
on the glasses.

Develop, import, or customize
library for encoding images to
be passed to the backend

Develop, import, or customize
library for encoding and
decoding text passed to or from
the backend

Project Creation

Create the project within
Android Studio and select the
Design Layout and .gitignore

Communication

Develop, import, or customize
library for connecting to WIFI (or
any other network medium we
will need to connect to the
frontend). This may not be
necessary if we run everything
on the glasses.

Develop, import, or customize
library for decoding images
passed from the front end

Develop, import, or customize
library for encoding and
decoding text passed to or from
the frontend

Develop, import, or customize
library for communicating with
the game engine

Computer Vision

Initial Setup

Ensure we can recieve
images transmitted by
the frontend

Create a dataset for use
in board state
determination (May not
be explicitly required if
we do not use nn/ml)

Set up codebase location
in team Gitlab repository

Set up OpenCV .gitignore

Calibration

Ensure the images we receive are in a standardized format (file type, size, orientation, etc.)

Image Processing

Setup python notebook and Generic OpenCV IO

Implement generic edge/contour detection of an image

Board State Determination

Do line detection

Check for chessboard layout from the detected lines

Implement highlighting only the chessboard for testing and visualization purposes

Ensure we can find a single chess piece and place a bounding box around it

Ensure we can find multiple chess pieces and place accurate bounding boxs around them

Detect the type of each chess piece found

Detect the position of each chess piece on the board

Ensure we have and use a set format for the board state when communicating with the game engine

Game Engine

Game Engine Setting Customization

Develop activites to change the game engine settings for items such as difficulty and response time (depth in chess engines)

Import Game Engine

Download Game Engine
Build and Compile the Game Engine Binary
Import the binary into the backend. Do any necessary environment configuration as needed

Result Decoding

Develop, import, or customize library for decoding the recommended move into terminology the average user can understand

Task Dependencies	Task Metrics	Date	Length (days)	End Date
	N/A	8/31/2020	0	8/31/2020
	types of users explored, use	8/31/2020	2	9/2/2020
1.2	and explored	9/2/2020	9	9/11/2020
1.2	and explored	9/2/2020	9	9/11/2020
1.2	and explored	9/2/2020	9	9/11/2020
1.2	and explored	9/2/2020	9	9/11/2020
1.2	and explored	9/2/2020	9	9/11/2020
2.1	Selected? (Y/n)	9/11/2020	0	9/11/2020
2.2	Selected? (Y/n)	9/11/2020	14	9/25/2020
2.3	Selected? (Y/n)	9/11/2020	2	9/13/2020
2.3 , 3.1	Selected? (Y/n)	9/11/2020	3	9/14/2020
2.3 , 3.2	Selected? (Y/n)	9/11/2020	7	9/18/2020
N/A	Completed? (Y/n)	9/28/2020	5	10/2/2020
1.1.1	Completed? (Y/n)	10/3/2020	2	10/4/2020
1.1	Completed? Communication	10/19/2020	3	10/21/2020
1.1 , 1.2.1 , 1.3.2	How many devices are saved	11/7/2020	7	11/13/2020
1.1	completed? Interfaced with	11/4/2020	10	11/13/2020
1.1 , 1.3.1	devices we save?	1/25/2021	4	1/28/2021
1.1.2, 1.5.1	% Complete?# Screens Completed? Communication Calls hooked up? Able to send and recieve things with the computer vision module? (Y/n) What are we able to send and recieve currently? (Text, Images)	10/25/2020	10	11/3/2020
1.1.1,	% Complete? # Screens completed? Communication Calls Hooked Up?	10/19/2020	6	10/24/2020

ID	Question	Start Date	Days	End Date
1.1.2,	Able to recognize basic voice commands? (Y/n) How many custom commands does it respond to to take the picture? % complete?	10/25/2020	14	11/7/2020
1.1.2	Able to recognize basic gestures? (Y/n) % complete?	10/25/2020	3	10/27/2020
1.5.1 and either	Able to translate/recolor captured images to grayscale (Y/n)?	10/28/2020	7	11/3/2020
1.1.2, 1.8.3	% Complete? # Screens completed? Communication calls hooked up? (Y/n)	1/25/2021	5	1/29/2021
1.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/11/2020	10	10/20/2020
1.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/7/2020	4	10/10/2020
1.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/4/2020	3	10/6/2020

N/A	Completed? (Y/n)	9/28/2020	5	10/2/2020
2.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/10/2020	10	10/19/2020
2.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/6/2020	4	10/9/2020
2.1.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/3/2020	3	10/5/2020
2.1.1, 2.4.2	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in library?	10/20/2020	10	10/30/2020
1.8.1, 2.1, 2.2.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	10/19/2020	6	10/25/2020
N/A	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	9/25/2020	6	10/1/2020
N/A	Completed? (Y/n)	9/21/2020	2	9/23/2020

ID	Question	Start Date	Days	End Date
2.3.1.3	Completed? (Y/n)	9/24/2020	1	9/25/2020
2.3.1.1	Completed? (Y/n)	10/25/2020	3	10/28/2020
2.3.1.3	Completed? (Y/n)	9/20/2020	5	9/25/2020
2.3.3.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	9/25/2020	5	9/30/2020
2.3.3				
2.3.3.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	9/24/2020	3	9/30/2020
2.3.4.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	10/1/2020	7	10/20/2020
2.3.4.2	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	10/16/2020	3	10/24/2020
2.3.2.1	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	10/29/2020	3	11/1/2020
2.3.4.4	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	11/2/2020	7	11/9/2020

2.3.4.4	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	11/2/2020	28	2/1
2.3.4.4, 2.3.4.5	% complete? What stage are you in? (research, import, customize, or develop) Portability? Easy for other activities to call methods in a library?	2/1/2020	28	2/29/2020
N/A	Completed? (Y/n)	2/12/2021	6	2/16/2021
2.1.1	Settings understood? (Y/n) How many settings are we going to customize? % Complete? # of Screens Developed? # of customized setting completed?	1/25/2021	21	2/14/2021
N/A	Completed? (Y/n)	9/28/2020	2	9/29/2020
2.4.2.1	Completed? (Y/n)	9/30/2020	5	10/4/2020
2.4.2.2, 2.1.1	Imported? (Y/n) % Configured?	10/5/2020	7	10/11/2020
2.4.2.3, 2.1.1	% complete, Number of peices translated? Number of locations translated?	10/12/2020	7	10/18/2020

Participants	hrs/week/person)
6	7
6	13
6	
6	12
6	12
6	12
6	12
6	12
6	7
2	30
2	4
6	7
6	7
1	3
1	1
1	2
1	5
1	7
1	3
1	
1	4

1	10
1	2
1	5
1	3
1	7
1	3
1	2

1 3

1 7

1 3

1 2

1 7

1 4

1 4
1 1

1	1
1	2
1	3
1	3
1	2
1	5
1	2
1	2
1	5

1	20
1	20
1	4
1	15
1	1
1	3
1	5
1	
1	5