## Briggs vs Elliott

AUD

## The Story

Briggs vs Elliott was a 1951 case which originated in Clarendon County around a lack of transportation for African American school children who sometimes had to walk up to 8 miles to school every day. It was argued unsuccessfully before federal district court in Charleston against a 3 panel judge, and taken to the Supreme Court on appeal as advised by the dissenting judge who advised Thurgood Marshall from the NAACP that the current ruling of "Separate but Equal" (Plessy v Ferguson) was inherently unconstitutional. It was the first of five cases consolidated into Brown v Board of Education for joint argument, resulting in the elimination of segregation in public schools. Many members of the community who participated were fired or forced from their homes, and in some of the more extreme cases, their homes or churches were burned to the ground.

#### Briggs vs Elliot Experiences

VR Visitors Center

### VR Home

Charleston Visitors Center Attraction using Oculus Quest

#### VR through Google Cardboard, Oculus, Sony VR, etc.

Augmented Reality
 through Mobile
 devices & Tablets.

Augmented

Reality

## VR/AR Educational Initiative

Part of the goal for the creation of the VR and AR experiences is to provide access to emerging technology and introduce curricula to South Carolina students that will help prepare them for working in a variety of industries that use VR and AR technologies including aerospace, automotive, manufacturing, and others. By teaching them in a medium that excites them and helping them learn how to develop their own content (in this case, having a strong civics and historical impact), they will develop the necessary skillsets. Briggs vs Elliott Virtual Reality (VR) Experience "

The Power of VR is that it gives the viewer a unique sense of empathic connection to people and events.

- Jake Silverstein @NYT

#### VR Charleston Visitors Center

For the 1 million+ visitors who come through Charleston locally, the Briggs vs Elliott VR Visitors Center experience will open up an immersive, visceral, cinematic VR experience to virtually live through elements of the case and the community activism that led to it. Visitors will feel like they are part of the courtroom hearings, walk along the side of the road with black school children, see the difference between black and white schools of the time, and see some of the repercussions the local community went through for pushing for their most basic rights of equality.



### Meet Thurgood Marshall

See Thurgood Marshall, an instrumental part of the case working for the NAACP, up close and lifelike as he delivers compelling oration in the courtroom.

\* This is our current 3D model of Thurgood

### Meet Reverend Joseph De Laine

Reverend De Laine was one of the primary local activists who helped organize the community to sign petitions and be plaintiffs. Experience some of his struggle as he organizes and ultimately his church and home were burned to the ground, and he was ultimately driven out of South Carolina for good.

\* This is our current 3D model of Reverend De Laine.



### Meet Judge Waties Waring

See Judge Waties Waring, the son of a Confederate Soldier as he presides over the courtroom and listens to Thurgood's impassioned oration.

\* This is our current 3D model of Judge Waring

# Experience the walk to school while buses pass.

Experience what it was like for African American school children as they walk along the side of the road in all kinds of weather as buses full of White children pass by and spit and jeer at them.

\*These are a variety of storyboards, art, reference, and our 3D experience in the process of development.





## Courtroom Experience

Sit in the front row of a packed 83 Broadstreet courthouse while watching Thurgood Marshall orate part of the trial to Judge Waties Waring. Look around the courtroom and watch peoples' reactions and more.



The courtroom has been heavily optimized for the Quest and with about 3 dozen people (not lit or textured as they will end up being – we are heavily working on optimization currently). Some of the characters in the back will be "cards".

This is the before optimization.

- Over 5 million triangles
- 252 Batches (less is better)
- 173 SetPass calls (less is better)
- Lighting needs work



This is after optimization

- 10K 120K Triangles around 2% of the original size)
- Chairs were particularly high and since there were many, so we reduced from 4500 to 3400.
- 45 Batch calls
- 35 SetPass calls
- Better Lighting





## **Other Characters**



#### Other Experiences

There will be multiple other experiences available that are associated with and part of the story of the case. These experiences include being there during the burning down of Reverend De Laine's church, exploring the difference in African American vs White schools of the time, and more.



For our different types of schools, we have the exterior models. Here they are without lighting and scenery (the textures will also potentially change – couple of changes still needed). Summerton Graded on the left (White School) vs Liberty Hill Colored on the right





#### VR Briggs v Elliot Home Edition

The purpose of the VR home edition is to help teach more about the history of everyone involved as well as experience more of the time period through the use of traditional media and reading in addition to a unique type of gallery in which you can experience through local music and additional types of experiences.





## STATE JOURNAL SCHOOL SEGRECATION BANNE



Gallery Anv an interactive polery with unique thiages and evhlots from the Briggs v Bilot care.



Cinema Watch old and repurposed foot space while overlooking character

\*Placeholder Menu

### Explore the Gallery full of music and other media

Sectioned into different types of rooms, explore things like the "Freedom Room" that shows additional images and music around protests of the time. Meet the full NAACP team, all of the local activists, and more. The gallery will potentially have other "experiences" embedded such as minireenactments of marches.



### Meet everyone who was involved and learn their history and role.

Explore the Gallery full of music and other media

Sectioned into different types of rooms, explore things like the "Freedom Room" that shows additional images and music around protests of the time. Meet the full NACP team, all of the local additista, and more. The gallery will potentially have other "experiences" embadded such as minireenactments of marches.



well as other media that pertains specifically to them.



## AUGMENTED REALITY (AR) EXPERIENCE

"

Simply put, we believe augmented reality is going to change the way we use technology forever.

- CEO Tim Cook @apple

#### Mobile AR Experience

While at the physical courthouse where Briggs vs Elliott was decided, visitors can "open" up additional media experiences including virtually witnessing legal testimony, family videos, and additional media around the actual events much in the same way you can do with the VR home version, but on your mobile phone or tablet.



In the future, prepare to experience sites as they existed at the time.

By using your phone or tablet at any of the designated historical locations (tbd), simply point it at each historical location in order to unlock a vast amount of additional content including written, visual, and audio content of the time.

\*Planned for the future



#### Additional Media Unavailable Elsewhere

In addition to witnessing key portions of the trial, you will be able to navigate between other historic locations as well as listen to narration, view imagery of the time, and watch interviews as well as a variety of other media. Users will also be provided step by step GPS and navigation to additional sites.

\*Planned for the future





#### Contact

CDMI is a 501.c.3 Not For Profit company. For more information on the Briggs vs Elliot VR & AR experiences, please contact us at info@pgprojects.org.

## Marinship : How a Shipyard Built a City.

## The Story

In the early 1940s, many African Americans migrated from Southern states in search of shipbuilding work, after being excluded from higher-paying industrial jobs back home. It was not uncommon for a shipbuilder to make in an hour what they formerly made in a day in the South. Shipbuilding had gained a reputation as steady work that paid generous wages and included family housing. The town of Marin City was founded in 1942, when housing was built for employees who worked at the nearby Marinship Corporation during World War II, building ships for the war effort. At the height of Marinship's production, a new ship was produced every thirty days. After the war, many of the jobs were lost and African Americans continued to be discriminated against. This is their story.

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## Educational Initiative

The goals of the combined effort to introduce Virtual and Mixed Reality to Tam High School students in Marin City involve both creating a sense of excitement for students around learning and being involved with emerging technology and local history as well as helping them develop the foundational skillsets that comprise these technologies.

The programs will provide access to emerging technology will help prepare students for working in a variety of industries that use VR and Mixed Reality technologies including aerospace, automotive, manufacturing, and others. By teaching them in a medium that excites them and helps them learn how to develop their own content (in this case, having a strong civics and historical impact), they will develop the necessary skillsets.

## VR Skillsets and Lifecycle

Students will learn the foundational skills of what it takes to create a VR experience and determine which aspects and skills they want to more fully develop educationally and ultimately pursue as an occupation. Working together, they will develop VR modules that can attach to a core project. Every student will learn each skill, but will ultimately be responsible for only a single aspect of each module, working together as a team.



Multiple student "hubs" or groups can work independently or together to create different modules for the overall VR experience, making it not just evergreen in terms of the overall experience, but students can also work across groups for larger modules once they are defined.





## Marin City VR Experiences

The VR Marin City experiences that will be developed will tell the stories of the history of Marin City, including it's founding, the wartime effort, and the post wartime effort. People will have the ability to experience the migration, the shipyard, the workers, the ships that were built, the community that the workers lived in, and more. "

The Power of VR is that it gives the viewer a unique sense of empathic connection to people and events.

- Jake Silverstein @NYT

## Marin City Virtual Reality (VR) Experience

### Virtually Explore the Marinship Shipyard

Explore the shipyard and watch as WWII ships are rapidly built. Experience the workers building portions of the ships, both to scale and accurately reflected for the time period.

\* This is an example 3D shipyard and doesn't accurate reflect what Marinship looked like.



#### Meet The Liberty Ship *William A. Richardson*

On June 27<sup>th</sup>, 1942, work began on the Liberty ship *William A. Richardson* which was the first ship to be built after only 3 months from the onset of construction on the Marinship shipyard.

\* This is an example of a WWII Liberty Ship and is not intended to accurately reflect the Willliam A. Richardson.



### Meet Thurgood Marshall

See Thurgood Marshall, an instrumental part of James vs. Marinship argue successfully that African Americans who were forced to join a unit did not have to pay dues or else be fired. This ultimately led to the decision that unions could not discriminate based on race or other arbitrary conditions.

\* This is our current 3D model of Thurgood





## **Other characters**



#### **Other Experiences**

There will be multiple other experiences available that are associated with and part of the development of the city. These experiences include the discrimination while the African American community was working to help their country during wartime, exploration of the shipyard, and housing and other aspects of Marin City's residents' lifestyles.



### Explore a virtual gallery full of music and other media

Sectioned into different types of rooms, explore additional 2D media like photographs and videos of Marin City throughout the years while listening to music during the differing time periods.



### Contact

For more information on Marin City VR and educational experiences, please contact us at info@pgprojects.org.

## Proposal for Virtual Reality Curriculum based on History for Middle and High Schoolers



#### **Class: Introduction to Mixed Reality**

#### Grade/Level: 7-8, 9-12 Standards: TBD

Timeline: 4-8 Weeks	Standards: TBD				
Unit 1: Differences between Augmented Reality, Virtual Reality, Holograms, and Mixed Reality					
Standards/Description Introduction of the various types of emerging technologies and where each type is currently being used in verticals such as entertainment, science, manufacturing, etc.		Connective/Additional Subject Material			
Materials Students: Notetaking materials	Terminology Mixed Reality Augmented Reality Virtual Reality Holograms Immersion Location Based	Assignments	Assessments		
Unit 2: Delivery Platforms, Head	sets, and Capabilities	across mixed reality.			
<b>Standards/Description</b> Introduction to the various types of hardware that supports each category of mixed reality from low-end hardware (Google Cardboard, etc) to high-end home/commercial hardware, to commercial only hardware.			Connective/Additional Subject Material		
<b>Materials</b> Students: Notetaking materials Teachers: Example Hardware (Cardboard, Oculus Rift, etc)	Terminology	Assignments	Assessments		
Unit 3: Mixed Reality Developme	ent Platforms				
<b>Standards/Description</b> Introduction to the various types of software that supports each category of mixed reality and how to build experiences that bridge multiple categories and are available for multiple platforms.		Connective/Additional Subject Material			
<b>Materials</b> Students: Notetaking materials Teachers: Example Software (Unity, Unreal, ARCore, etc)	Terminology	Assignments	Assessments		

Unit 4: Traditional Build and Deployment Cycles in Mixed Reality with a focus on Virtual Reality						
Standards/Description		Connective/Additional Subject Material				
In depth discussion of the life-cyc	le of building a Mixed	Reality experience				
with an emphasis on Virtual Reali	ty. Outline the cycle fr	om Idea to				
Deployment, and outline all of the	e varying skillsets invo	lved, focusing on				
super-categories of skillsets that f	fall under these umbre	ellas:				
<ol> <li>Experience Ideation/Story</li> </ol>	ytelling					
<ol><li>Art/Concept/Design</li></ol>						
3) 3d Modeling/Animation						
4) Programming/Animation						
5) Project Management						
6) Quality Assurance						
in order to prepare students for c	levelopment of an actu	ual project.				
Materials	Terminology	Assignments	Assessments			
Students: Notetaking materials	Art Bible					

Class: Immersive VR Timeline: 12 Weeks

#### Grade/Level: 7-8, 9-12 Standards: TBD

Unit 1: Basics of a Virtual Reality Immersive Experience						
<b>Standards/Description</b> Introduction to the basic setup of building a Virtual Reality Experience using Unity3d with a heavy focus on the core concepts of camera setup and usage, the render pipeline, and types of lighting.		Connective/Additional Subject Material				
Materials Students: Notetaking materials, Desktop/Laptop (shared or sole), Unity3d, VR device(s). Teachers: Desktop/Laptop, Unity3d, VR device(s)	Terminology Field of View LOD Carding Billboards Culling Rendering Pipeline Spotlight Point Light Directional Light Area Light Baked Light	Assignments	Cumulative Assessments			
Unit 2: Physics inside of a Virtual Reality Environment						
Standards/Description Introduction to Physics inside of a Virtual Reality environment that both emulate the real world (gravity/zero-gravity, water, particles) and defy it (create your own physics).		Connective/Additional Subject Material				
Materials Students: Notetaking materials, Desktop/Laptop (shared or sole), Unity3d, VR device(s). Teachers: Desktop/Laptop, Unity3d, VR device(s)	Terminology	Assignments	Cumulative Assessments			
Unit 3: Basics of Modeling Terrai	n, Infrastructure, and Charact	ers				
Standards/Description Introduction to modeling an environment including terrain placement, Infrastructure, vehicles, and character creation as well as skinning, texturing, and shading to alter the appearance of each model.		Connective/Additional Subject Material				
Materials	<b>Terminology</b> Terrain Painting	Assignments	Cumulative Assessments			

Students: Notetaking materials, Desktop/Laptop (shared or sole), Unity3d, VR device(s). Teachers: Desktop/Laptop, Unity3d, VR device(s) Unit 4: Basics of Animation and I Standards/Description Introduction to bringing your term animation and physics.	Rigs Bones Models Skinning Shaders Texturing <b>Motion</b> rain, vehicles, and characters to	o life through	Connective/Additional Subject Material
<b>Materials</b> Students: Notetaking materials, Desktop/Laptop (shared or sole), Unity3d, VR device(s). Teachers: Desktop/Laptop, Unity3d, VR device(s)	<b>Terminology</b> Animation Cycle Move To Pathing	Assignments	Cumulative Assessments
Unit 5: Lighting, Environmental,	and Advanced Shader Effects		
<b>Standards/Description</b> Introduction to advanced usage of lighting on a per world or per object basis, environmental effects such as snow, rain, and advanced shader effects on objects such as glow.			Connective/Additional Subject Material
Materials Students: Notetaking materials, Desktop/Laptop (shared or sole), Unity3d, VR device(s). Teachers: Desktop/Laptop, Unity3d, VR device(s)	Terminology	Assignments	Cumulative Assessments

Class: Advanced VR Experiences		Grade/Level: 7-8, 9-12			
Timeline: 12 Weeks		Standards: TBD			
Project Unit: Build Historical Modules in Virtual Reality about Marin City's History					
<b>Standards/Description</b> Build historical modules that align with Marin City's History and compile into a broader Virtual Reality Experience.		Connective/Additional Subject Material			
Materials	Terminology	Assignments	Assessments		

Heirs Property VR Budget - Phases I & II						
Software Licenses	URL/Description	Units/Hours	Price Per	Total Cost		
Autodesk Education (need school to request if they don't have it)	https://www.autodesk.com/education/home	15	\$-	\$-		
Adobe Photoshop (if school doesn't have it)	https://www.adobe.com/products/photoshop.html	15	\$ 40.00	\$ 600.0	)0	
Unity3d Personal (may not be able to do Student version)	https://store.unity.com/#plans-individual	15	\$ -	\$-		
Google Classroom	http://classroom.google.com	15	\$-	\$-	ļ	
Zoom	http://zoom.us	15	\$-	\$-		
Github	http://github.com	1	\$ 200.00	\$ 200.0	)0	
Make Human	http://www.makehumancommunity.org/	15	\$-	\$-		
AR/VR Device(s)						
Oculus Quest 2 Headset 64gb	https://www.oculus.com/quest-2/	15	\$ 299.00	\$ 4,485.0	)0	
Assorted Mixed Reality Devices	For instructional use/demonstration only	1	\$-	\$-		
Instruction						
In class		30	\$ 125.00	\$ 3,750.0	)0	
Instruction Prep		150	\$ 125.00	\$ 18,750.0	)0	
Assessment Writing/Recording		60	\$ 125.00	\$ 7 <i>,</i> 500.0	)0	
Detailed Curriculum		150	\$ 125.00	\$ 18,750.0	)0	
			<b>.</b>			
Office Materials for Instructional Packets		1	\$ 100.00	\$ 100.0	)0	
Mailing costs for headsets to/from Students/School		20	Ş 50.00	\$  1,000.0	)0	
Project Coordination		50	\$ 100.00	\$ 5,000.0	00	
Story Development						
Writing - Legal			\$ 7,500.00	\$ 15,000.0	)0	
Writing - Creative			\$ 7,500.00	\$ 15,000.0	)0	
			Tota	l \$ 75,135.0	)0	

Students will need: Computers Wifi

Marin City VR Budget - Phases I & II						
Software Licenses	URL/Description	Units/Hours	Price Per	To	Total Cost	
Autodesk Education (need school to request if they don't have it)	https://www.autodesk.com/education/home	10	\$-	\$	-	
Adobe Photoshop (if school doesn't have it)	https://www.adobe.com/products/photoshop.html	10	\$ 40	\$	400	
Unity3d Personal (may not be able to do Student version)	https://store.unity.com/#plans-individual	10	\$-	\$	-	
Google Classroom	http://classroom.google.com	10	\$-	\$	-	
Zoom	http://zoom.us	10	\$-	\$	-	
Github	http://github.com	1	\$ 200	\$	200	
Make Human	http://www.makehumancommunity.org/	10	\$-	\$	-	
AR/VR Device(s)						
Oculus Quest 2 Headset 64gb	https://www.oculus.com/quest-2/	11	\$ 299	\$	3,500	
Assorted Mixed Reality Devices	For instructional use/demonstration only	1	\$-	\$	-	
Instruction						
In class		40	\$ 125	\$	5,000	
Instruction Prep		175	\$ 125	\$	21,875	
Assessment Writing/Recording		100	\$ 125	\$	12,500	
Office Materials for Instructional Packets		1	Ś 100	) Ś	100	
Mailing costs for headsets to/from Students/School		20	\$ 50	) Ś	1.000	
				•	,	
Story Development						
Writing		1	\$ 7,500.00	) \$	7,500.00	
Drogram						
Program Management/Coordination		1	\$ 10.000	, ć	10.000	
Program Management/Coordination		1	\$ 10,000		7 500	
rk/ marketing		1	\$ 7,500.0U	ı Ş	7,500	
			Tota	al \$	69,575.00	

Students will need: Computers Wifi

## **Other Products and Technologies**

Our team has a strong history in technology development across a variety of industries, industry verticals, hardware and software platforms (including custom platforms), languages, and scenarios. Some of our underlying capabilities and/or projects are:

- VR/AR We have experience with bleeding edge technologies such as Google Tango, Cardboard, Oculus, Vive, Leap, Short Throw, and others.
- Theme Parks/Digital Experiences We've worked with some of the largest to bring our comprehensive technical backgrounds and underlying technologies to create some unique experiences.
- **Mobile and Social –** Experience across all social and most standard mobile platforms, either using native development or using cross-platform development solutions.
- **Personalized Animation** Using both industry standard animation platforms (Maya, Blender, etc) as well as our personalized animation platform for avatar creation and high speed rendering.
- Education We have a strong background in understanding the education markets, and our e2030 virtual world intends on bringing adaptive, personalized learning to that market.
- Game Development (Mobile, Console, Computing) We have many years of experience with extremely technical knowledge of mobile and console gaming, Unity, Unreal, and others.
- **Virtual Worlds** In addition to gaming in general, we have experience in the overall market vertical around virtual world creation.

## ອີໂຣນະອຸ Tokyo - (Goofy's playhouse) – Theme Parks

#### Tech Highlights

- Custom Hardware
- Overlapping multi-projection
- 24x7 uptime
- Hundreds of real time deformations per second.

#### <u>Disney Tokyo Goofy's Paint-n-Play</u> <u>Playhouse</u>

Taking inspiration from old water-shooter carnival games, the installation immerses visitors into one of several interactive scenes. Virtual paint splotches from each of the six custom guns burst in bright colors on the room's physical furnishings, triggering exciting animations and transformations. Five overlapping projectors and seven speakers create a seamless 3D, surround sound environment.

## ອົາຣາຍອຸ Test Track - Drive Table

Tech Highlights • Custom Hardware • Overlapping multi-projection • Real time GL object creation • RFID and show control integration • Custom messaging, physics, and shaders



#### <u>Test Track – Driving Table</u>

After creating your very own car by designing it freeform with deformation andother elements, race your virtual car on a custom racetrack!



#### Tech Highlights

- Virtual Reality
- Augmented Reality
- Compensation for natural lighting
- Next-Gen Hardware from Google ATAP (Tango)



#### <u>Transformers 4 Google IO/Comic Con</u> <u>Tango Experience</u>

At Google IO, attendees witnessed a clash between Optimus Prime and Grimlock in virtual reality, just inches from where they stood. Comic Con attendees could walk around an augmented reality Optimus as he struck intimidating poses near the conference entrance. Both projects leveraged Google's next-gen Project Tango devices, for which Pandoodle is a preferred, early access partner.

## • Oculus VR Experiences



#### **Dragon Run Oculus VR Game**

If Temple Run and Skyrim had a baby, this would be it. Can you outrun the dragon? Navigate a perilous virtual landscape from within the immersive Oculus Rift headset. The dragon isn't real, but you'll still find your heart pumping after a close call.

#### **AR Experiences**

armac

#### Tech Highlights

- Virtual Reality
- Augmented Reality
- In Store GPS with pathing
- Gamification of live shopping



#### Aisle411 + Walgreens Tango Experience

Have you ever struggled to find something at the store? With the Aisle411 AR shopping experience, looking on the wrong aisle is a thing of the past. Use your phone to search for a product, then follow the arrow! See special offers and other incentives highlighted along your route.

### Recommendation Platform (WishStix)

#### **ORIGINAL CONTENT**



### Personalized Animation Platform (Doodletank)



### **Educational Online Worlds**

#### **Tech Highlights**

- Online interactive world
- Personalized Characters
- Adaptive learning
- Social networking
- Transmedia & cross-platform

Maximize on Play Stats Gizmo

AvatarBuilder
 Christmas
 Clubhouse
 Cowboys and A
 Editor
 Editor Default R
 Fonts

GUISkin001

Login B Login Materials PandoodleCha

QuestIt
 Resources
 Riverland
 Scenes
 Scripts

BlackishGU GUIFeature

e Blob-Shadow icon Invaders Ass

Fonts

Mesher

Prefabs

BlinkTex

Bounda

Bunker

Button

CoinCo

NoFogLi



#### e2030 Virtual World

Experience the future of education in the exciting online world of e2030. Designed to run on everything from iPad to Xbox, e2030 immerses students in their lessons. Learning about the Wild West? Why not take a virtual field trip back in time? Reading a new book? Why not host a conference call with the author? e2030 reimagines the nature of the classroom for the 21<sup>st</sup> century student.

#### Game Development



#### Game Development



#### Wild Wild Train

All aboard! Wild Wild Train is a fast-paced train simulation and puzzle game for iOS. Route your trains to deliver different cargo, but watch out for bombs and damsels in distress! IGN gives it an 8/10 "Impressive" review, and with hundreds of thousands of hours logged globally, clearly its players do too. Available now in the App store!



#### **Founders Bios**

Debra Rosen created the SC Film Commission in 1980 under Governor Richard Riley's administration and became its first director. She attained a US Commerce grant to create a film production technicians training program in SC. Ms. Rosen created a grip and electric company supplying the film industry in South Carolina. She worked with MUSC on a grant through the US Dept. of Education attaining a grant for research in movement disorder analysis (a film process) to analyze Parkinson patients' movement. Ms. Rosen worked on a film and studio effort in Albuquerque New Mexico and a digital media program in Santa Fe. Ms. Rosen is a lawyer and presently is focused on financing and producing films and working on Augmented and Virtual Reality experiences.

Tarz Ludwigsen has over 25 years of experience developing technology and business solutions in multiple industries including robotics, 3D animation, healthcare, finance, advertising, education, retail, and entertainment with a specialization in operations and research and development for emerging technology and solutions. Among other positions he's held, he was the Chief Architect for barnesandnoble.com specializing in the formation and integration of multiple business units as well as developing industry standards. He was the Vice President of Information Technology at Grey Healthcare Group, a multinational healthcare advertising company, where he was responsible for overseeing software and hardware. He's worked on architecture for museums, stock trading systems in the finance industry, assembly line robotics for the auto industry, software for education, and more recently as the President/CTO for Pandoodle, which specialized in emerging technology from companies like Google in AI, Computer Vision and Machine Learning, Disney Theme Park experiences, and mixed reality experiences.