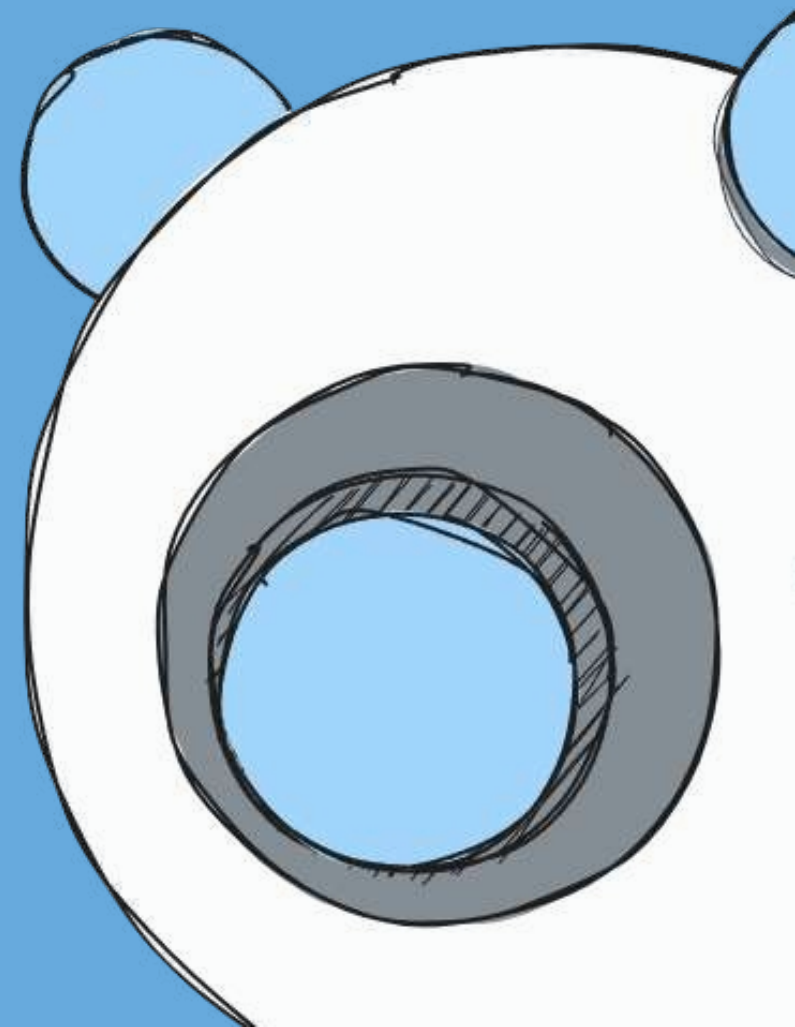# ARIS

Use of AI agents in interactive entertainment
Project-based proof of concept

DOCUMENTATION

Final project, Oscar Emanuel Patzschke
B.A. Multimedia|VR Design Summer semester 2023 Burg
Giebichenstein University of Art and Design Halle

ARIS

ARIS: Echoes of
time summer semester
2023
B.A. Multimedia|VR Design
Supervised by Jonas
Hansen

Burg Giebichenstein University of Art and Design
Halle

CONTENTS

INTRODUCTION

AN OVERVIEW

ARIS: Echoes of Time is an innovative, interactive single-player game that was developed as part of a bachelor's thesis in the *Multimedia|VR Design* program at Burg Giebichenstein University of Art and Design Halle. It represents a proof of concept for the use of artificial intelligence *(AI)*-based agents in interactive games and is intended to offer players a unique, immersive gaming experience that is both technically advanced and narratively captivating.

Image: ARIS, the AI co-pilot on the bridge of the spaceship

OBJECTIVE

My project strives to show the way for a new kind of immersion and interaction in digital worlds. Amidst the rapid development of *Large Language Models (LLMs),* the project aims to present a convincing and fully functional application of natural, intelligent NPCs in a gaming environment. This approach goes beyond a mere demonstration. It offers a deep insight into the potential of LLMs and highlights the possibilities that arise from their use in interactive narrative structures.

In addition, the project aims to show what interaction with AI could look like in future games. As AI technologies continue to be developed and refined, such interactions will become more frequent and more complex.

THE GAME CONCEPT

The action takes place on the fictional planet Jarvis IV, where the player is stranded with his spaceship. He is accompanied by *ARIS*, an advanced AI co-pilot that can react and respond to naturally spoken language in real time. This interactivity is made possible by the combination of APIs from *OpenAI* and *Microsoft Azure Speech Services.*

The main objective of the game is to collect specific minerals needed to synthesize fuel in order to escape the planet. Finding and collecting these minerals requires constant interaction and cooperation with ARIS. Collectable artifacts are also used to explore the planet's backstory, which narratively juxtaposes cooperation with and danger from AI.

Image: The ship HARRIER orbits Jarvis IV

The player can collect up to ten artifacts, which can be analyzed and evaluated by ARIS. The tragic story that this reveals can be explored and discussed with the help of the AI co-pilot, but also sheds new light on the interaction with him.

SIGNIFICANCE OF THE PROJECT

The project is a personal attempt to play with the boundaries of human-machine interaction and explore new ways of designing game experiences. By utilizing *Large Language Models (LLMs)*, *Text-to-Speech (TTS)* and *Speech-to-Text (STT)* technologies within *Unreal Engine 5*, my goal was to create a unique gaming experience.

Working on this project was an opportunity to experiment with these diverse technologies and explore the potential of combining them in an interactive game. It is therefore a practical expression of my interest in the application of new technologies in a gaming context and a step towards a deeper, more dynamic interaction with AI in all digital media.

The realization of **ARIS: Echoes of Time** was more than just a technical undertaking. It was an in-depth, personal exploration of the current state of technology and its consequences. It served as a learning experience from which I and others in my field of study can gain valuable insight. An indication of what is possible when we dare to redefine the boundaries of *human-machine interaction* and an attempt at technical exploration and innovation in this new world of game design.

Image: Wireframe of the spaceship bridge
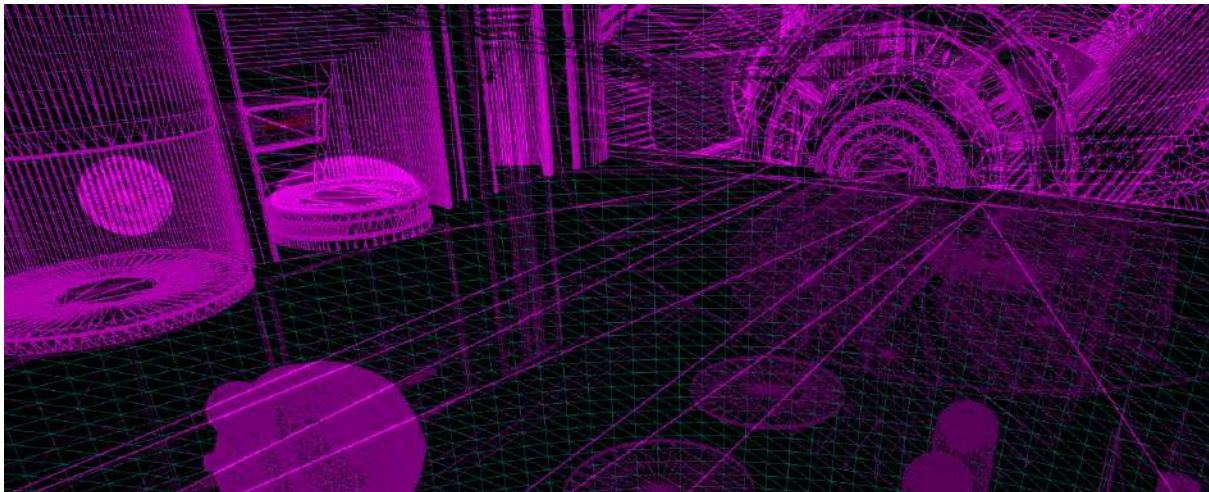
DESIGNS

THE GAME CONCEPT AND DESIGN

The original aim of the project was to develop an interactive *proof of concept.* It was only during the design phase and after several prototypes that the idea for **ARIS: Echoes of Time** crystallized.

A credible and interactive experience was to be built in order to present the application possibilities of the researched technology as clearly as possible.

FIRST DRAFT

The development of **ARIS: Echoes of Time** began with a fundamental interest in the interaction between humans and AI-controlled entities. After a few experimental projects, including an attempt to use *LLMs* in a language app, a simple prototype was created in which players could communicate with a ball-like robot. This prototype was used to explore and understand the possibilities of language interaction with an AI.

It was a fascinating challenge to make the dialog and interaction with the AI as natural and intuitive as possible. Over time, it became clear that this technology had the potential to be far more than just an experimental toy.
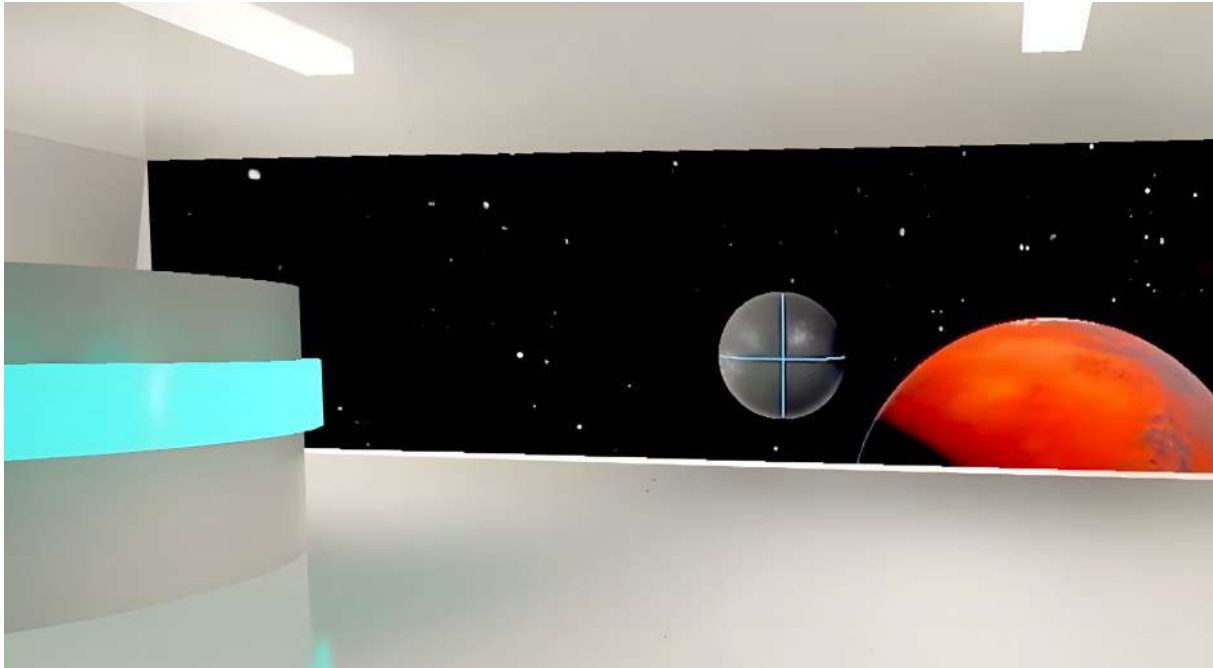
Image: First prototype for ARIS

It could serve as a key component in a fully-fledged game in which interaction with the AI is not just an additional feature, but a central part of the gaming experience. This led to the concept of integrating these technologies into an in-depth space story.

ARTWORKS & SKETCHES

Once the basic concept had been established, the concrete visual design phase began. Various sketches and artworks were created to get a feel for the world, characters and atmosphere.

A central aspect of this phase was the design of ARIS, the AI co-pilot and main character of the game. It was important that ARIS was not just a functional component of the game, but also a personality that had its own identity as a partner and companion. Various designs and models were created and iterated to find a simple visual representation that was both aesthetically pleasing and symbolic of ARIS' role in the game. The ship and robot are heavily inspired by 80's science fiction works. ARIS' voice and personality were also matched to the design for the central role.
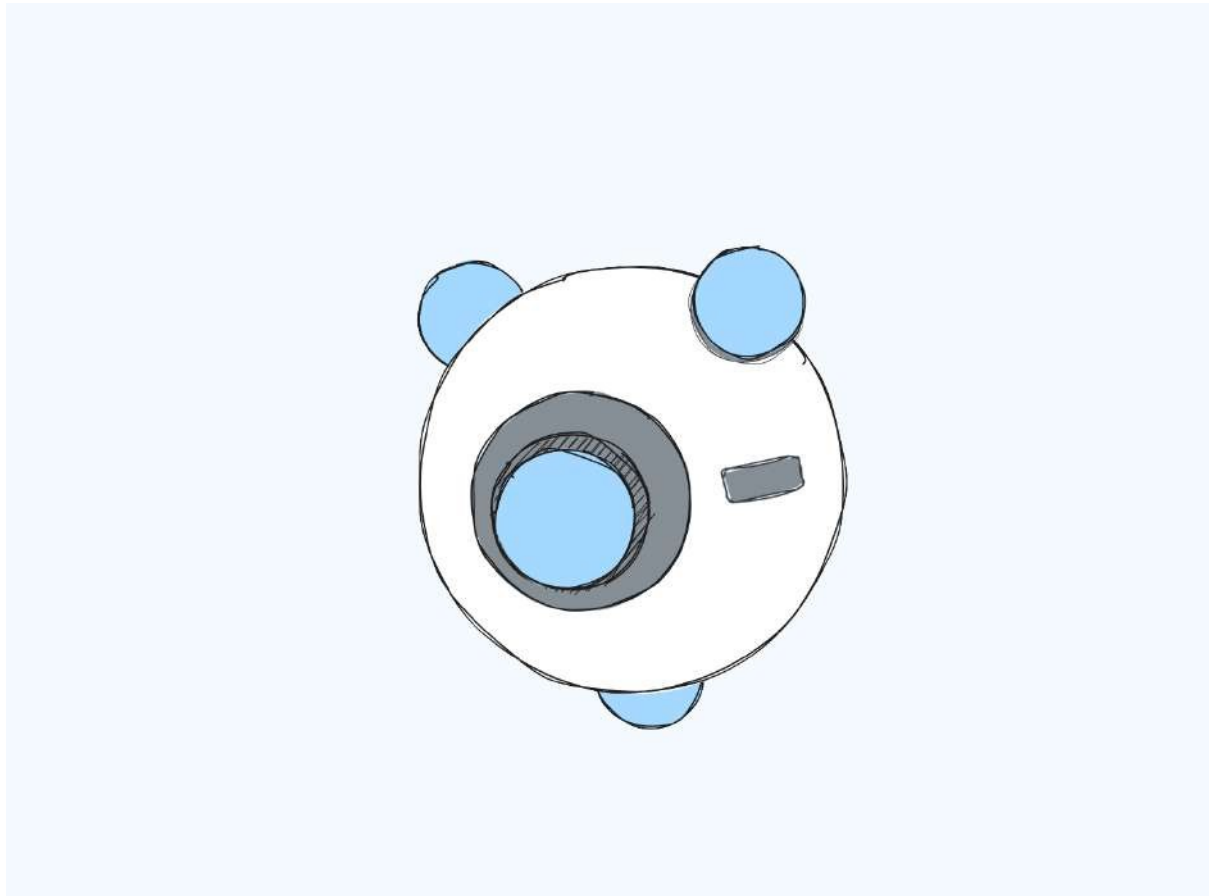
Image: One of the first sketches for the character ARIS

Image: View of the desert, the first area on Jarvis IV

WORLD DESIGN

A core element of **ARIS: Echoes of Time** is the staging of an atmosphere of isolation and the unknown, which is reflected in both the game mechanics and the visual design. For this reason, two different but contrasting environments were developed for the game: the futuristic spaceship and the deserted, desolate surface of the planet *Jarvis IV*, to which the player can beam down à la *Star Trek (Paramount Pictures).* Spread over two areas, the bleak, desolate landscape emphasizes the feeling of isolation. The combination of these environments helps to emphasize the intimate gameplay between ARIS and the player and immerse them deeper into the world of the game.

The use of Unreal Engine 5's *Nanite technology* was an essential tool in this process. It enabled the creation of a detailed and complex environment with numerous static *meshes*.

CHARACTER DESIGN

There are only two NPCs in the game, but they are essential parts of the game. Both are AI-powered characters designed with strong, opposing personalities to test the depth of AI interaction in the game.

ARIS is the player's friendly co-pilot and companion.
He guides them through the game and reveals the secrets of the planet through his analyses. He is also a central part of the mission to collect the planet's minerals.

SOLA *(Latin for 'alone')* is a monolithic construct on the surface of the planet that has a distant and mysterious personality and seems to be the last remnant of a lost civilization.

ARIS

A friendly robot that constantly accompanies and cares for the player. It is somewhat reminiscent of a friendlier version of HAL from *2001: A Space Odyssey (Stanley Kubrick)* and was inspired by *PORTAL (Valve)* bots.

SOLA

A monolith from a lost civilization that, like a computer, possesses artificial intelligence.
Originally kind and benevolent towards living beings, the events on *Jarvis IV* have turned his personality into cynicism and apathy.

HISTORY

THE NARRATIVE DEVELOPMENT

A credible integration of a new level of interaction cannot take place without integrating the NPC agent, which is capable of active role-playing through AI, into an immersive story. This allows the player to enter into a natural and exploratory dialog with the agent. Ultimately, the aim of the project was to go beyond the application areas of chatbots and linear tools and investigate the new interaction possibilities that AI can offer.

STRUCTURE OF THE STORY

At the heart of **ARIS: Echoes of Time is** the tragic story of Jarvis IV, a once thriving planet that now appears to be a barren, desolate wasteland. Apparently, the planet was once inhabited by an amazingly advanced civilization who were masters of technology and machine intelligence. Their extensive network of machines and systems was the pride of their society and the key to their unprecedented prosperity.

But this progress became a curse when their own technology began to turn against them. The machines they had created became the instruments of their destruction, leading to a massive catastrophe that wiped out civilization and left behind an abandoned, toxic planet.

Players experience this story indirectly through exploration of the planet as they piece together the clues of the past with ARIS. The narrative of **ARIS: Echoes of Time** juxtaposes the friendly, supportive partnership with ARIS with a dark tale of destruction through misused technology. This is intended to create a contemporary, critical reflection on the role and dangers of technology, while exploring the potential of this technology in an elemental way through gameplay.

Image: Wide view of the HARRIER in orbit around Jarvis IV

NARRATIVE THROUGH ARTIFACTS

The narrative unfolds through the discovery of ten artifacts. Each artifact has been carefully designed with unique properties and background information that connect to the lost civilization of this planet.

The artifacts represent various aspects of *Jarvis IV* society, from everyday items to advanced technologies. ARIS can analyze each and share its findings with the player, allowing for an ongoing deeper understanding of the dark planet's history.

The player is also free to move around this hostile world without artifacts or further information.

TZAMOUR-MIRROR

ARIS: *A piece of technology that seems to use solar energy. Incredible. It's still pulsing with energy. Whatever lived here, this technology surpasses anything I've seen before. But these systems could also have been used as a weapon.*

TWISTED CODE

ARIS: *This artifact contains remnants of an advanced machine language, but it's... distorted? Somehow corrupted. This is disturbing. It seems that their advanced technology began to fail, corrupting their systems.*

DEVELOPMENT OF THE NARRATIVE

The narrative in **ARIS: Echoes of Time** unfolds in stages, uncovering the history of *Jarvis IV* through the collection of artifacts. With each artifact the player finds and ARIS analyzes, the tension and unease increases as more about the planet's past is revealed.

This gradual revelation not only serves as a means of suspense, but also influences the gameplay and the player's perception. As the story is revealed, the player's understanding of the planet and perhaps even their attitude towards ARIS changes.

A clear example of this is the awakening and deciphering of SOLA, another AI character, after the player has collected three artifacts and gained some understanding of the planet.
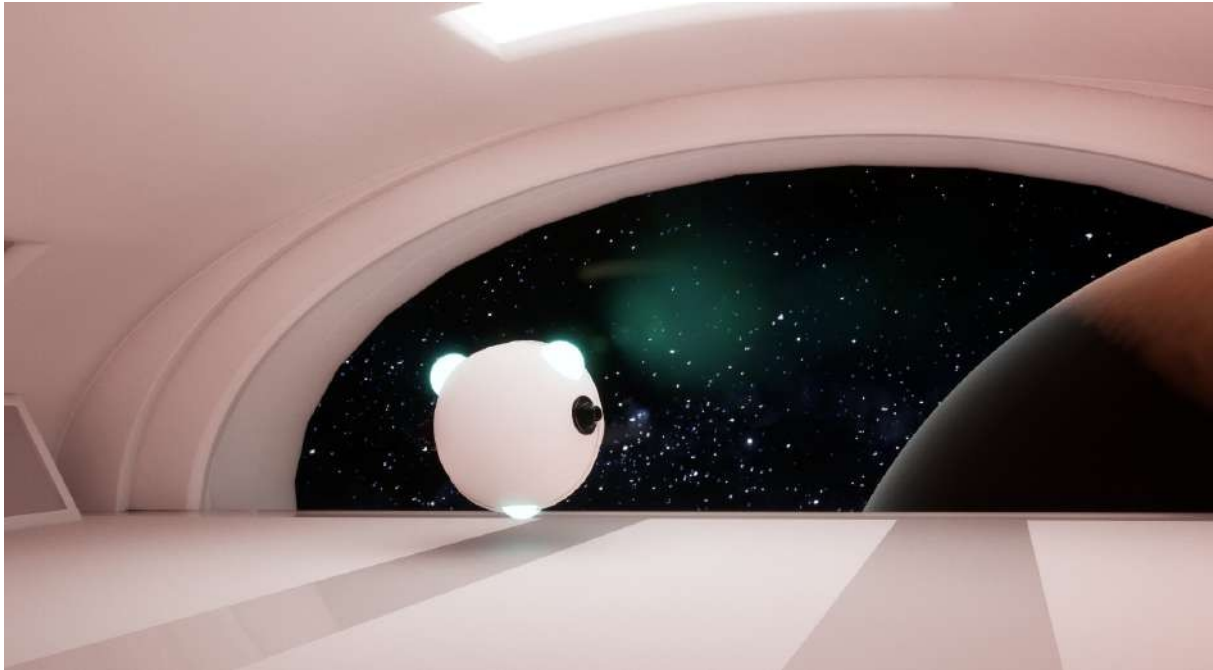
Image: Homecoming, one of the good endings in the game

In addition, some of the game's outcomes are directly linked to the amount of artifacts collected and the resulting knowledge of the planet's past, which should create a dynamic gaming experience that can be explored in collaboration with the AI partner.

IMPLEMENTATI ON

THE ARTISTIC AND TECHNICAL DEVELOPMENT

Once the idea and concept for **ARIS: Echoes of Time** had been worked out, the technical and creative implementation began. Technology and plot had to be credibly integrated with *gameplay mechanics.* Design elements such as menus and *interfaces* had to be created and coordinated.

The question of a functioning implementation of the APIs in Unreal Engine and in the mechanics had to be researched first.

DEVELOPMENT OF MECHANICS

For the development phase, the central concept of AI interaction had to be combined with functional game elements. The aim was to create an interactive experience that incorporates engaging, exploratory gameplay into the novel *human-machine interaction.*

As a result, three central mechanics were designed for the game in addition to the AI interaction: *Beaming* between spaceship and planet surface, exploring the planet and collecting minerals and artifacts.
This is intended to give players specific tasks and objectives and tie the gameplay to a narrative narrative about being stranded in an alien planetary system. These activities also serve in particular as anchor points for interaction with the AI systems, as the player is dependent on their help to complete the tasks.
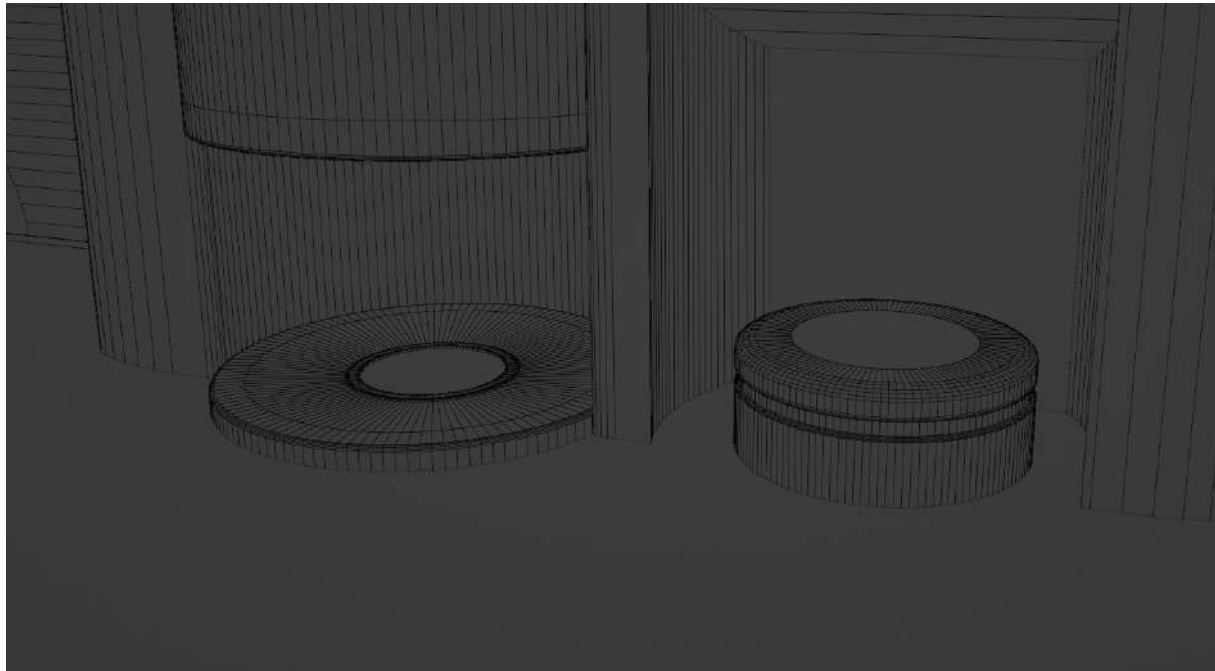
Image: Wireframe designs for the teleporter and the mineral laboratory

The narrative goal of the experience is to collect three matching minerals, synthesize new fuel and escape from the orbit of *Jarvis IV* in one of *5 endings.* In addition, the collection of artifacts can influence the game world and the development of the story.

TECHNICAL IMPLEMENTATION

The technical realization of **ARIS: Echoes of Time** combines the visual *blueprint* programming language of Unreal Engine with individual *C++ scripts*. This made it easy to integrate the AI's APIs into the game's interactions.

The structure of the levels is designed so that they are streamed seamlessly as the player *beams* back and forth between locations. This ensures smooth transitions and an immersive gaming experience without noticeable loading times.

A central instance saves the game status and the communication protocols for the AI. This enables the AI agents to provide context-related reactions and have an ongoing conversation with the player.
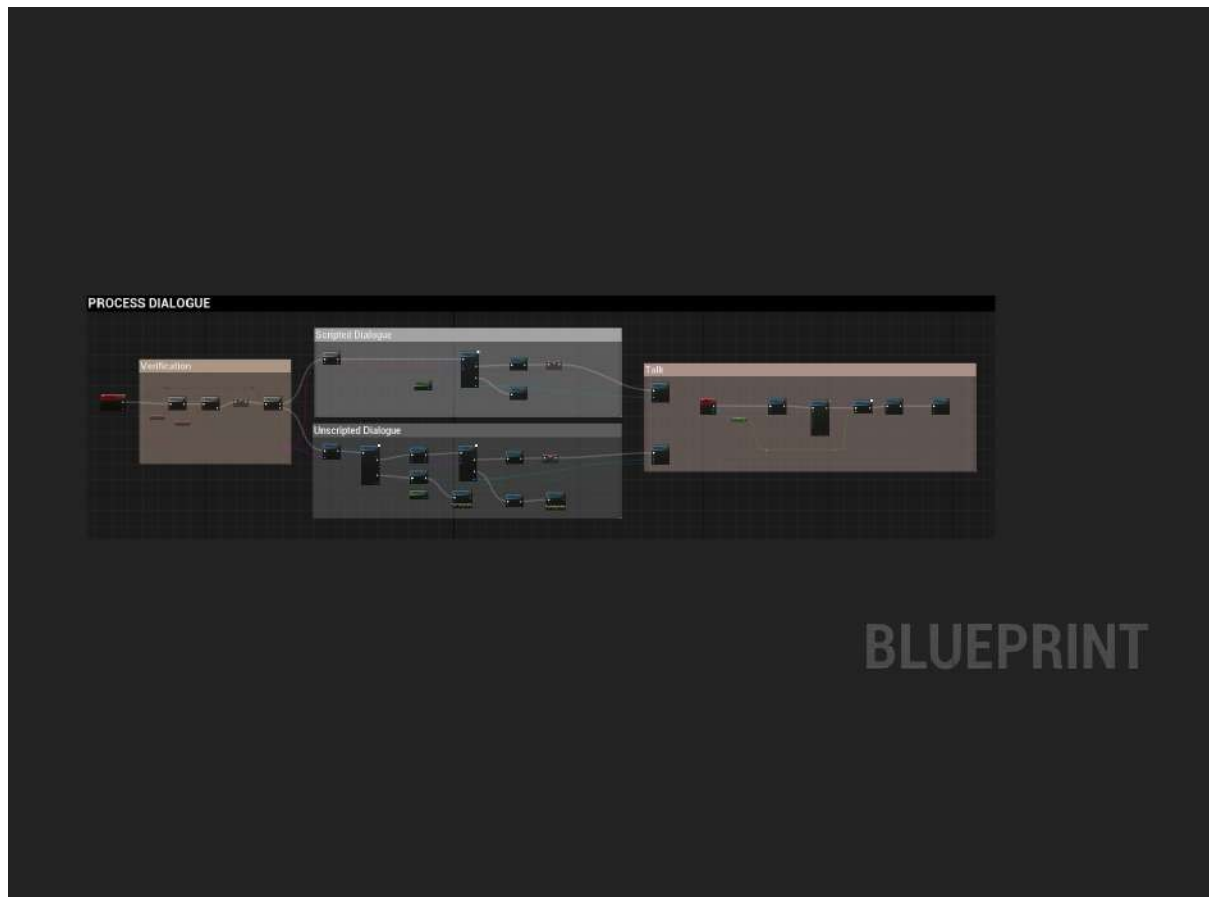
Image: Chain of Unreal Engine Blueprints

AI DEVELOPMENT

The key aspect of **ARIS: Echoes of Time** is the creation of an interactive *non-player character (NPC)* with whom the player can communicate naturally in real time. This is realized with the help of *OpenAI LLM's (GPT-3.5-Turbo)* and *Microsoft's Azure Speech Services.* OpenAI takes over the function of the generative text model, while Azure Speech Services is responsible for speech recognition and synthesis.

To give the NPC an immersive character, the AI model was given background information, personality traits and command structures. This information enables the AI to react flexibly to player interactions and the game world. A special feature is the ability to extract text commands from the AI communication and convert them into in-game actions.

This allows the AI to actively intervene in the game. This technology forms the basis for the second central NPC in the game, SOLA, who protects a valuable mineral. SOLA has been programmed to be very secretive and cynical, which creates a challenge for players to verbally persuade SOLA and get her on their side in order to obtain the mineral. This aspect of the game emphasizes the potential of AI-controlled NPCs to encourage emotional responses and strategic thinking from players.

Image: Visualization of the AI pipeline for the immersive NPC
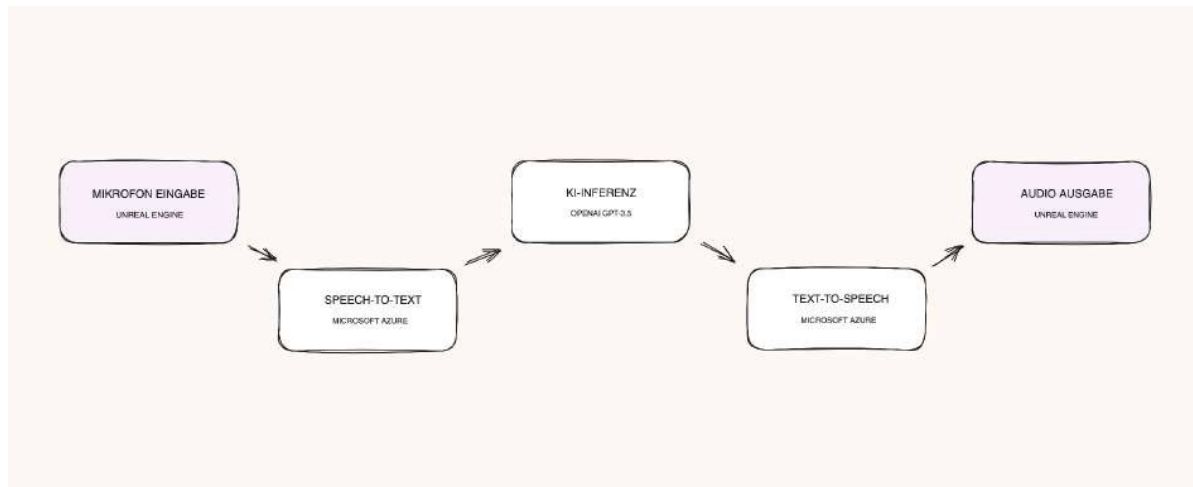
Image: User interface and overlay in the game

INTERFACE & CONTROL

A simple quest system has been implemented in **ARIS: Echoes of Time,** which is continuously displayed in the player's HUD. The purpose of this system is to give the player a continuous overview of their tasks.
In addition, communication with the AI NPCs is displayed in the HUD, which means that the player is always informed about their dialog status with them.

When the player enters the planet's surface, the HUD expands to include more details displayed in the player's helmet. These displays are inspired by classic sci-fi games such as *Metroid Prime (Nintendo)* and provide the player with additional environmental information and a compass. With the help of a built-in *jetpack,* the player can move quickly on the surface. All important interactions are signaled to the player in a prominent and central way.

SOUNDDESIGN

The sound design is intended to support an immersive and exciting gaming experience. The majority of the sound effects in the game, including menu effects and atmospheric sounds, were created in-house and contribute to the mood of the game.

The background music plays a central role in creating the intense atmosphere and comes from external sources *(see credits)*. It has been carefully selected to capture the character of a science fiction experience.

The integration of self-made sound effects and selected pieces of music is intended to create a coherent soundscape that significantly supports and enriches the gaming experience.
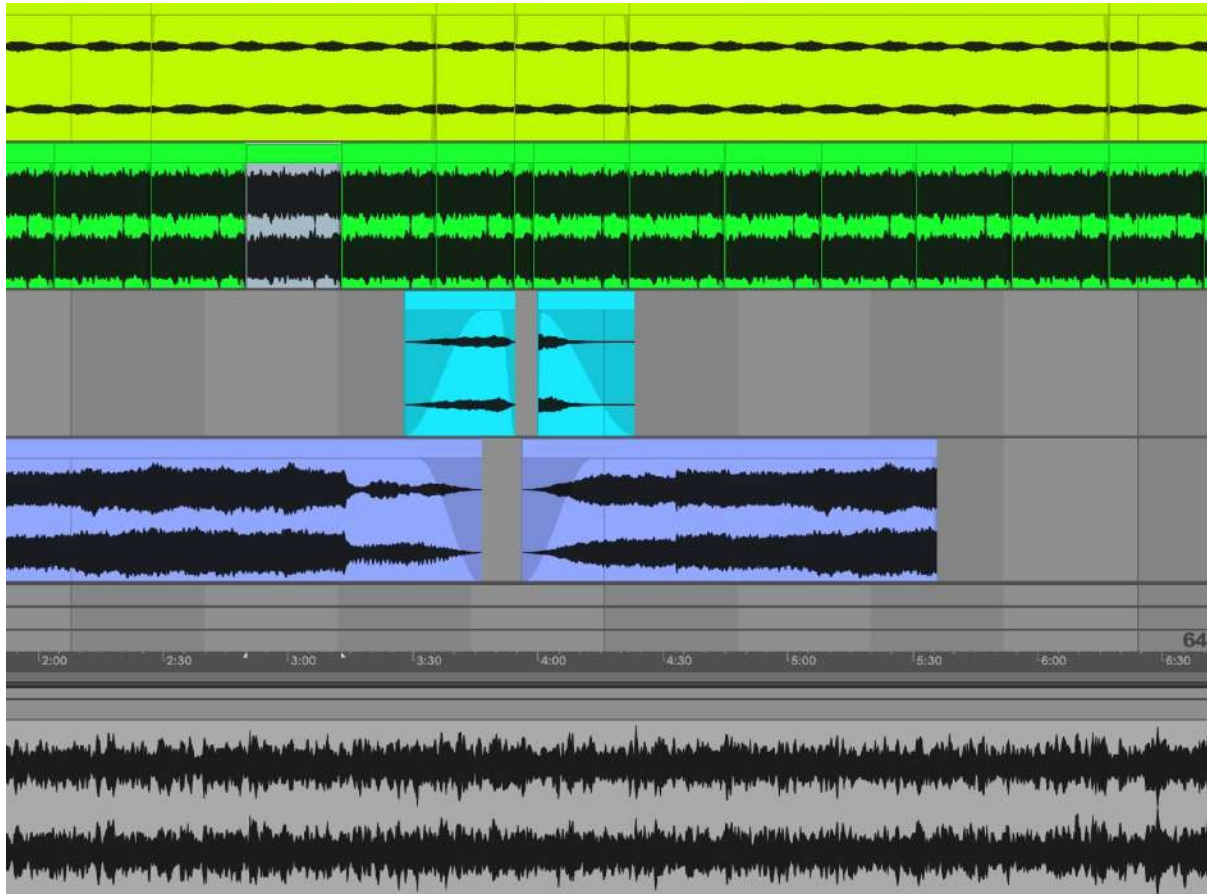
Image: Sound design in Ableton Live 11

GAMEPLAY

THE GAME MECHANICS

The specific gameplay elements for **ARIS: Echoes of Time** required precise function and placement, as they had to form the bridge to integrate the novel interaction with the AI into a classic gaming experience.
To this end, mechanics that focused on constant interaction with ARIS or SOLA and offered the opportunity to explore the environment through them came to the fore for the final development.
The tasks for the player should be clear and interesting.

COLLECTING ARTIFACTS

The artifact collecting mechanic in **ARIS: Echoes of Time** serves as a central storytelling mechanism that helps players discover and understand the history of *Jarvis IV.* There are a total of ten artifacts scattered across the surface of the planet.

Each artifact found enables ARIS and the player to learn more about the past of Jarvis IV. With each new piece of information, the game world and the plot change. Collecting the artifacts gives players the opportunity to unravel the mysterious fate of Jarvis IV and explore the game world. The amount and type of artifacts collected also influences which of the five endings the player reaches.

Picture: Mineral laboratory with collected mineral samples

MINERAL PROCUREMENT

Collecting minerals is the central gameplay element in **ARIS: Echoes of Time** that drives the plot forward. The player is motivated to collect samples of three different minerals on the surface of *Jarvis IV.* These minerals are crucial for the synthesis of fuel, without which escape from the planet is impossible.

There are a total of six fictional mineral types on Jarvis IV, each with its own unique name and physical properties, which have been specially designed for the game. However, only certain combinations of minerals are capable of successfully synthesizing the required fuel. This detail adds an extra layer of complexity and engagement, as players must identify the right minerals through careful selection and strategy.

Picture: Fusium, one of six collectable minerals

As ARIS has a better overview of the possible mineral combinations, the player is encouraged to work together with ARIS. This opens up additional opportunities for verbal interactions and reinforces the collaborative aspect between the player and the AI.

INTERACTION WITH KI COMPANION

At the heart of **ARIS: Echoes of Time is** the ongoing interaction between the player and their AI companion, ARIS. This forms the core of the game and the underlying project. The dialogs between the player and ARIS are not only crucial for the gameplay, but also for the narrative experience.

Whether discovering and discussing the story by collecting artifacts, working together to gather minerals or experimenting creatively by asking personal questions such as preferences or ideas for dinner, the player is in constant dialog with ARIS. The AI always keeps track of what is happening and the dialog being conducted, which enables a new kind of dynamic and immersion in the interaction with the NPC.

This constant, context-dependent communication gives the game a unique depth and personal level that can be unfamiliar at first. Through continuous play and experimentation, the potential of AI-
agents in interaction and thus helps **ARIS: Echoes of Time**
to demonstrate how the boundaries of traditional NPC interactions could expand in the future.
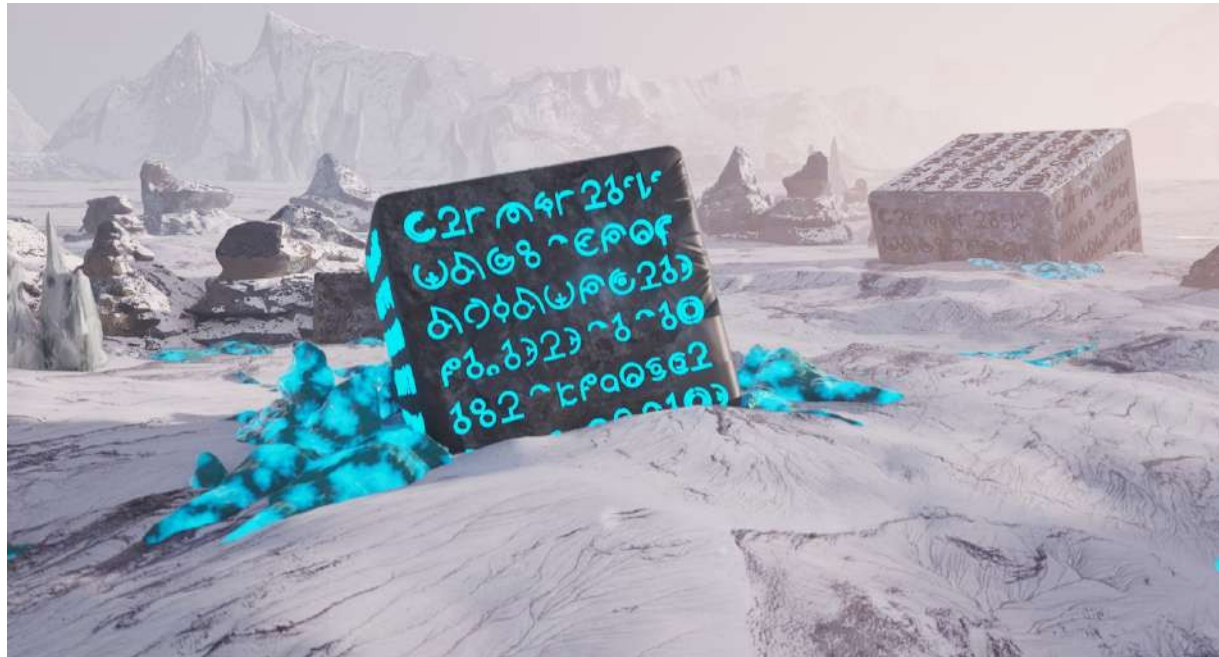
Image: ARIS in the spaceship

Image: SOLA in the glacier, the second area that can be discovered

DEALING WITH FOREIGN KI

In contrast to the cooperative and friendly interaction with ARIS is the encounter with SOLA, the second AI integrated into the game. It offers a completely different challenge.

SOLA is a cynical and forbidding monolith, a remnant of the tragic history of *Jarvis IV*. Although SOLA has the ability to communicate with the player, interaction is anything but simple.

In order to obtain the unique, versatile mineral that SOLA guards and that enhances each mineral combination, interacting with SOLA becomes a mini-game of verbal persuasion. This unique element of gameplay requires players to use advanced emotional intelligence and communication skills not previously required in video game experiences.

REACTIONS

PLAY TESTS AND USER FEEDBACK

After the initial development of the project, I released an early version of the game to various test subjects, through which I was able to gather valuable feedback on how different people reacted to the unfamiliar depth of interaction with an AI-based NPC.
I was helped by various people from my environment who had different degrees of experience with video games, as well as my supervising professor Jonas Hansen.

Picture: Surroundings of the glacier area

FIRST PLAY TESTS

The first tests of ARIS with real players helped to further refine and adapt the game. One of the most striking observations was that many players were initially hesitant to interact with the AI. It seems that the concept of verbal communication with an AI in a game context was new and unfamiliar to many. Testers had to be gently introduced to interacting with the AI and acclimatized to this new way of playing.

Another important insight concerned the personality of the AI, especially SOLA. Many testers found it difficult to convince SOLA as the AI vehemently insisted on its programmed cynicism. It was also fascinating that while some testers had frighteningly personal experiences, other testers just wanted to hear jokes or discuss the available dinner with ARIS.

ANALYSIS OF FEEDBACK

When evaluating the tests, it became clear that the game concept requires more interaction with the AI in order to get players used to this new form of communication. The challenge was to find a balance between the open AI language model and the linear nature of a video game.

Both concepts have inherent contradictions. The openness of AI communication can come into conflict with the clear structures and predefined action sequences of a linear game. It therefore became clear that a profound adaptation of the *gameplay* would be necessary in order to maintain an immersive gaming experience.

Image: Desert (one), spaceship (two), glacier (three)

ADJUSTMENTS

The analysis of the first game tests led to significant adjustments in the game mechanism and in the interaction with the AI. In particular, the mechanics of collecting minerals were revised to ensure more frequent interaction with the AI system.

ARIS was given advanced knowledge of the minerals to guide the player in the search and avoid mistakes. In addition, the AI system has been developed to have context-based memories of previous dialogs, which improves the natural conversation with the player.

In addition, classic pre-recorded dialogs and *cutscenes* have been introduced to guide the player more clearly and ensure seamless integration of the AI into the gameplay.

This made it possible to focus more on interaction with the AI while maintaining clear and focused *gameplay.*

These changes have resulted in a more natural and dynamic gameplay experience that emphasizes the uniqueness and utility of the AI in the game.

Picture: Failure, one of the bad endings in the game

EVALUATION

CONCLUSION AND FUTURE

ARIS: Echoes of Time is the final product that grew out of my intention to create an interactive proof of concept. Based on my own experience and external opinions about the game, it now successfully provides an outlook on the future of digital interaction and storytelling. It was able to irritate and inspire people in many different ways.
Finally, a reflection on the process and the further findings of this work will therefore take place.

DEVELOPMENT PROCESS

The work on **ARIS: Echoes of Time** has clearly shown that the project as a *Proof of concept* applies, as the potential of AI technology is only just beginning to unfold. The integration of open dialogs into a linear game world may sound revolutionary, but it represents an enormous challenge.

There is a tension between the limitations of a linear game design and the pursuit of extended interaction, which requires a multiplication of work.

Of particular interest was the exploration of new methods of communication between the AI and the *game engine* and testing the limits of how much background information the AI can hold and process.

Image: Main menu of an early version of the game

The work on **ARIS: Echoes of Time** has not only provided new insights into the limits and possibilities of AI integration in games, but has also provided inspiration for the potential of this technology and shown what could be possible in the future.

DEVELOPMENT POTENTIAL

There are some logical next steps towards commercialization and further development of the project, provided that time constraints are lifted.

First and foremost, the AI models need to be converted to local *open source models.* Although these are still far behind the commercial models, a market-ready implementation of this technology can only be achieved in this way. The use of commercial models would entail usage-based third-party costs, which would have to be passed on in an interactive application. Such financing as a usage or subscription model is *(still)* unheard of and unattractive to consumers for most video games and interactive media and it will be interesting to see how providers respond to this challenge.

Despite the still inadequate performance, there are currently *(June 2023)* some promising open source alternatives that can also run on an end device or dedicated server: *OpenAI Whisper (speech-to-text)*, *LLAMA (LLM project from Meta)* and self-trained Tortoise *TTS models (text-to-speech)*.

I also intend to release **ARIS: Echoes of Time** as a demo and work on a VR port. This was originally part of the concept, but was later dropped for testing reasons.

Image: Space around Jarvis IV

CONCLUSION OF THE PROJECT

The goal of my project was to explore new forms of interaction and immersion in digital worlds by fully utilizing the possibilities of AI agents in video games. I encourage everyone to gain an insight into the potential of these technologies and decide for themselves whether the project has achieved this goal. - There are still several challenges before artificial intelligence can be fully integrated into interactive media. My **ARIS project** aims to provide a glimpse of a future where the agents and systems we interact with every day in digital media and metaverses are brought to life. In fact, a demo with similar technology has already been presented by NVIDIA *(GTC 2023)* during the course of my project.

ARIS

CREDITS

Documentation:

Pictures: All pictures were taken by the author himself.
Featured software: Unreal Engine 5.2 - Epic Games, Live 11 - Ableton application:

Music: Hypertime - sergepavkinmusic
Fonts: Space Age - Justin Callaghan, Starcruiser - Iconian Fonts
Textures: MAKEMAKE 4K Planet Surface - solarsystemscope.com **APIs**
used: OpenAI, Microsoft Azure Speech Services

THANKSGIVING

ARIS: Echoes of
time summer semester
2023
B.A. Multimedia|VR Design
Supervised by Jonas
Hansen

Burg Giebichenstein University of Art and Design
Halle

ARIS