

# WHISPERS

## of Mostar

Architecture and Technology in Contested Terrain:  
An Application of Machine Learning in Interactive Spaces

**Malka Logo**

## **ABSTRACT**

This thesis investigates the potential application of Machine Learning in architecture to help mitigate contested terrain.

The process is defined by research and insights retrieved from it. The initial analysis includes a historic overview of Mostar, as well as a status analysis of the current socio-political climate in the town, after which a brief introduction of Machine Learning lays the groundwork for the potential application in architecture, in order to achieve the objective of mitigating contested terrain.

The final result is a design project in the shape of a Center for Contemporary Art that hosts an exhibition space that, with the help of Machine Learning, aims to take people out of their filter bubbles by exposing them to art/messages that they would not have been inclined to take part of on their own.

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# INTRODUCTION

## Whispers of Mostar

“Can technology in architecture mitigate contested terrain?”

Mostar, Bosnia and Herzegovina, has undergone many transformations throughout history. The war in the 1990s labelled the people according to religious affiliation, and still holds its grip of them, creating a division between one people encapsulated in their filter bubbles.

However, in the midst of all this are voices of peace and unity, the whispers of Mostar. These unfiltered whispers are the street art, which can be spotted in the writings on walls, fences and ruins all over the town, but lack the protection and stability they need to survive. The whispers need to be rooted in the town and seen by everyone in Mostar.

Therefore, I have chosen to introduce a Center for Contemporary Art, which hosts an exhibition space that aims to take people out of their filter bubbles to help unify the town. In order to achieve this in an unbiased manner, Machine Learning is introduced to the space to analyze the behavior of the visitors to establish anti-paths, aiming to guide people towards the artwork/messages they would not have been inclined to see on their own.

This thesis is divided into three main parts; Part I deals with an overview of Mostar, Part II discusses the potential application of Machine Learning in architecture, and Part III describes the building design. A final discussion concludes the report.



VIEW FROM INSIDE THE EXHIBITION SPACE

# PART I

## Understanding Mostar and Discovering its Whispers



Bosnia and Herzegovina is a country with a history marked by war and where political agendas have been disguised as religious rights. Some of the first settlers in the country were refugees who had been banned from the Roman Empire because of their refusal to acknowledge the cross as a religious symbol (Huseinovic and Babic, 2002, pp. 47-49). Later in the 1400s the Ottoman Empire introduced Islam as a political strategy to ensure their hold of the Balkan Peninsula. Estate owners were given the choice to either convert to Islam and keep their goods or remain irreligious and face fines and taxes (Huseinovic and Babic, 2002, pp. 62-65).

Back in the 1800s the people of Bosnia and Herzegovina were officially divided into religious categories by the Ottoman Empire (Huseinovic and Babic, 2002, p. 120), thus creating different ethnic groups within the country. It is believed that one of the main causes of the civil war in Bosnia and Herzegovina in the 1990s was this division of the people. Now, 23 years after the declaration of peace the religious identity has grown even stronger within the population as a result of it being the only thing that determined their fate during the war. Despite the overall peaceful atmosphere in the country, there are those in Bosnia and Herzegovina who still consider themselves divided and this division takes different shapes, one of the most apparent being in Mostar.

Mostar is famous for its 'New-Old-Bridge' and the town's name derives from the Bosnian word for bridge, 'most'. The geographical conditions of the town naturally divide it into two parts; the river Neretva runs through the town and cuts it in half. This condition marks the bridge as an important communication element in the urban context, and due to its impressive appearance, it is also an important symbol of pride for the entire country. Today, there is an unofficial division of Mostar, where Muslim settlers have appropriated one side of Neretva and the Catholics have seized the other. Even though both ethnic groups appear on both sides of

the bridge the two sides are often referred to as "ours" and "theirs" in day to day speech.

In what follows is a historic overview of Mostar. Following that, a status analysis of the current climate in the town is presented. From this, a strategically selected site is introduced, after which the street art platform is described. And finally, the chosen function and its objective are defined.

**I.1 MOSTAR IN HISTORY**

In order to understand the current climate in Mostar, one needs to understand its history.

**~10 000 (AD)**  
**EARLY HISTORY**

The area of Bosnia and Herzegovina was originally populated by a number of different people; Illyrians, Celts, Bogumils, Romans etc. As a result of the Roman conquest people from all over the Roman Empire settled in the area. (Huseinovic and Babic, pp. 45-50).



**500-1400**  
**MIDDLE AGES**

During the Middle Ages the Early Slavs made their entrance to the Balkans. They were composed by small tribal units of either Orthodox or Catholic religious beliefs. (Huseinovic and Babic, pp. 59-65)

Kingdom of Bosnia is formed. **1377**

**1463-1878**  
**THE OTTOMAN EMPIRE**

During the rule of the Ottoman Empire Islam was introduced in the area and most of the original Bogumils (Bosnian Church) converted to the religion. Mostar was established and grew into a regional center. The country went through a range of socio-political changes; one of which was social differentiation by religious affiliation. (Huseinovic and Babic, pp. 67-72, 117-120)

**1463**  
Conquered by the Ottoman Empire.

**1566**  
30m long  
4m wide  
20 above water



**1873**  
The First Orthodox church in Mostar.

**1866**  
The first Catholic church in Mostar.

**1878-1918**  
**THE AUSTRO HUNGARIAN RULE**

The new regime came to agreement with the Bosnians in most parts of the country. However, the tensions remained in the South, which resulted in a rising South Slav nationalism. This was reflected in the assassination of Archduke Franz Ferdinand of Austria, which marked the start of WWI. (Huseinovic and Babic, pp. 124-127)

**1918-1941**  
**THE KINGDOM OF YUGOSLAVIA**

Bosnia and Herzegovina joined the Kingdom of Yugoslavia right before WWI. (Huseinovic and Babic, p. 127)

W  
W  
I

W

W

II

**1941-1945**

Nazi forces conquered the area during WWII. Strong Catholic forces acknowledged Islam and Catholicism as national religions and wanted to rid Bosnia of its Orthodox population. (Huseinovic and Babic, pp. 225-228)

**Josip Broz** formed the multiethnic resistance group, the partisans.

**1945-1992**  
**SOCIALIST FEDERATIVE REPUBLIC OF YUGOSLAVIA**



**1993**  
Bridge destroyed

March 3rd 1992, Bosnia and Herzegovina declared independence and received international recognition. This was challenged by the Christian groups who rather saw a "Greater Croatia" and "Greater Serbia" in the area. (Huseinovic and Babic, pp. 432-436)

What followed were 3 years of war, 100 000 deaths (2/3 of which were Muslim) and the displacement of 2.2 million people (from all ethnic groups). (Huseinovic and Babic, pp. 432-436)

**1992-1995**  
**BOSNIAN WAR**

**1994**  
Conflict between Muslims and Catholics ends.

**1995-**



**2004**  
Bridge rebuild

Today, the country is divided into two parts: The Federation of Bosnia and Herzegovina and Republika Srpska. The two parts function under the same government but have separate elections.

The division of the people based on religious affiliation is described in the constitution and the chair of Presidency alternates between 3 candidates (based on religious affiliation) every 8 months during a period of 4 years. However, the highest political authority is the High Representative, appointed by the European Union. The HR can bypass elected parliamentary and remove elected officials. The country will be under international supervision until deemed to uphold and maintain a politically and democratically sustainable system.

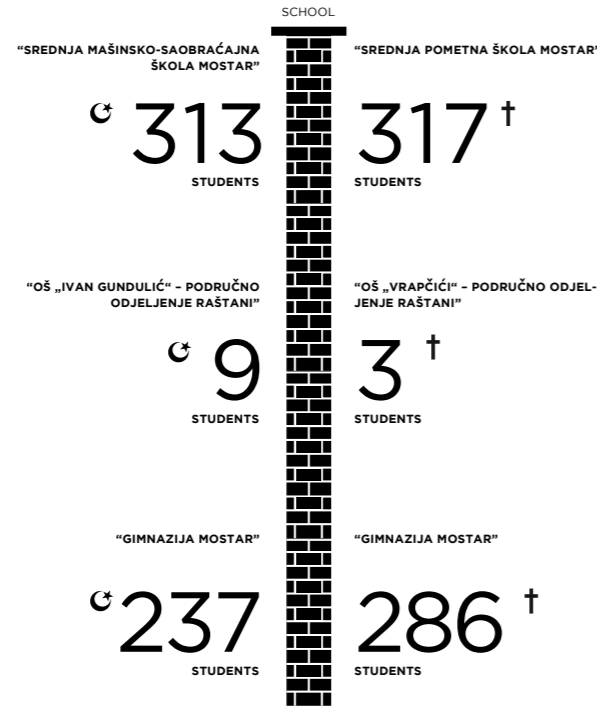
### I.2 DIVIDED SCHOOLS

“Dvije skole pod jednim krovom” (lit. two schools under the same roof) is the concept of one building hosting two different schools; one intended for Catholic students, and the other for Muslim students. There are three schools of this type in Mostar, and a total of 1165 (out of 15,705) of Mostar’s youth is enrolled at one of them. (JZS, 2017)

The nature of these schools feed the segregation in the town to the younger population, which becomes an issue when considering that the future generation of Mostar is taught to differentiate one from the other solitarily based on religious affiliation.

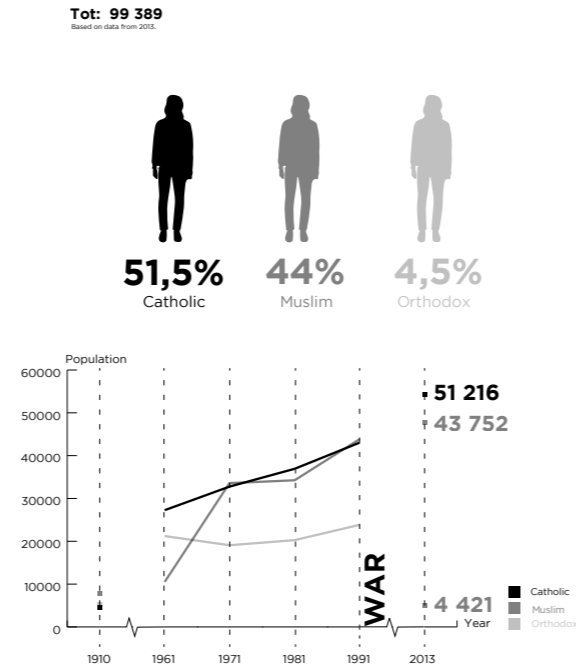
In 2012 the rights of having a school that divides its students based on their religion was brought to court, but was rejected because the court did not find themselves responsible for the issue. They categorized it as a political question and not a legal one. (Fena, 2013)

“The court is not obliged to solve political problems, and the claim of the plaintiff, as it is set, goes beyond the scope of the lawsuit and falls within the domain of the political problem.” (Fena, 2013)



### I.3 POPULATION IN MOSTAR

Mostar has over the years seen an increase in population. The Muslim population makes up 44% of the total, and the Catholic 51,5%. (CP, 2018)



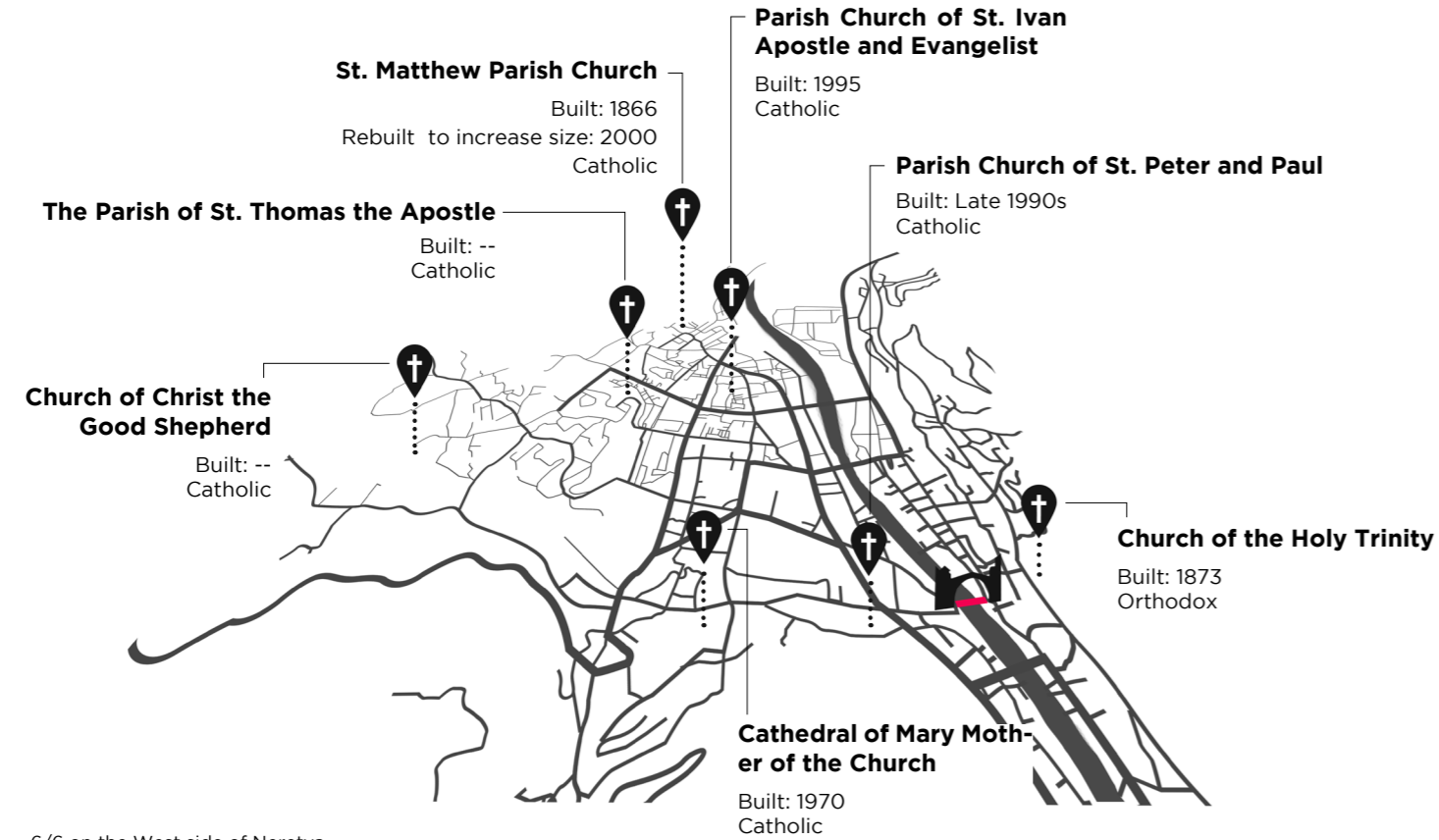
### I.4 CHURCES AND MOSQUES

As seen in the diagram to the right, the distribution the religious buildings is divided; the mosques are mainly focused to the East side of Neretva and the churches to the West side. In cases where both mosques and churches appear in close proximity of each other, the buildings were built in the late 1500s or early 1600s, during a peaceful period of the country’s history.

There are two cases of churches being built after the war in the 90s, and both of these have been raised on the outskirts of town and on the West side of Neretva. As for the mosques, only one has been raised after the war. This mosque is also located on the outskirts of town and on the East side. So, instead of integrating the religions, they are drifting further away from each other.



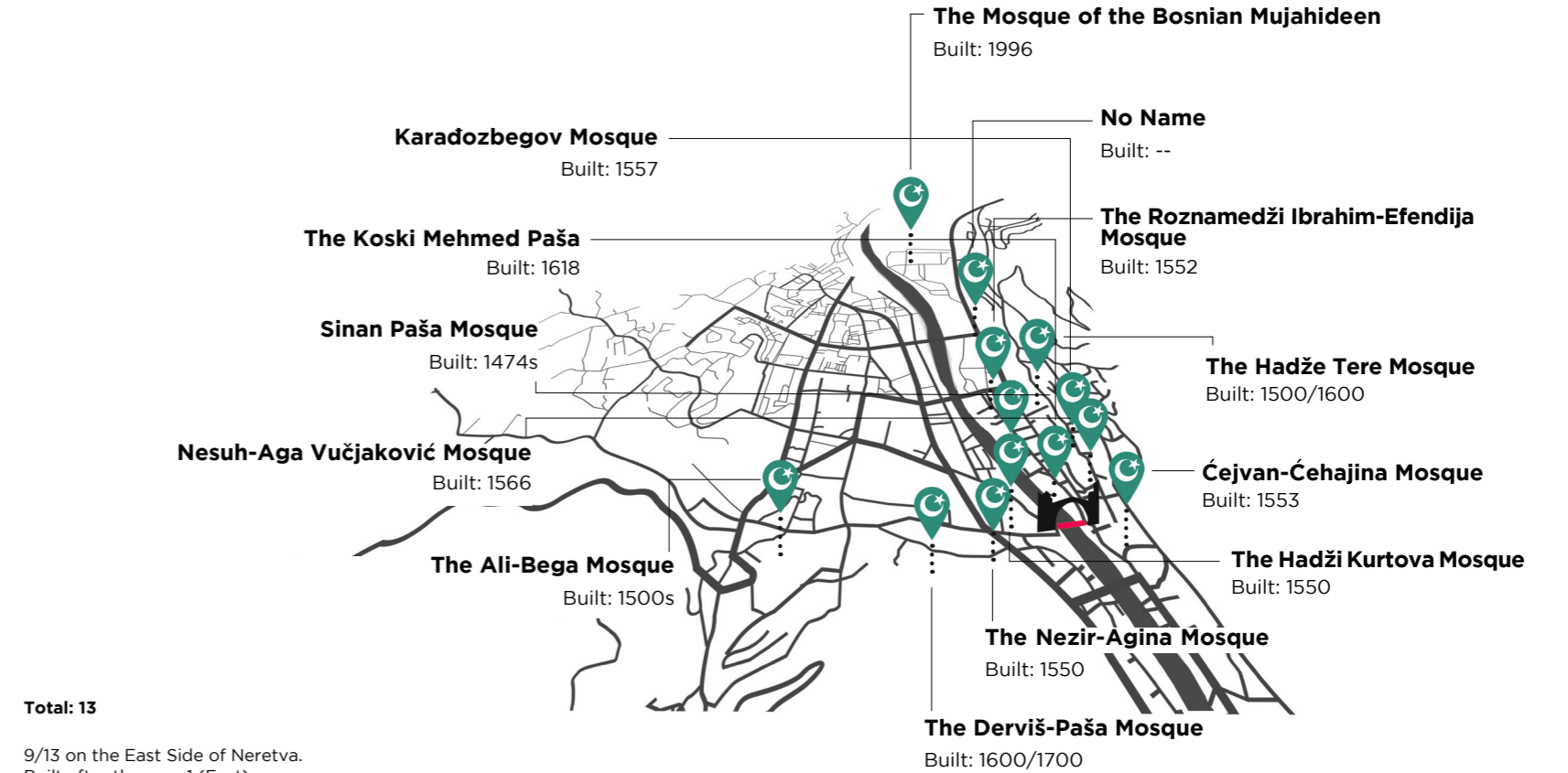
CHURCES AND MOSQUES: 2018



**Total: 7**

Catholic: 6  
 Orthodox: 1  
 Built after the war: 2 (3, if counting the St. Matthew Parish Church)

6/6 on the West side of Neretva  
 1/1 on the East side of Neretva



**Total: 13**

9/13 on the East Side of Neretva.  
 Built after the war: 1 (East)



### I.5 FUNCTIONS SURROUNDING NERETVA

Walking alongside Neretva a sunny day is like looking at a well-mixed salad; all ingredients make up a colorful experience. The old historical path leading up to the Old Bridge is lined with cafés, restaurants, workshops, shops and museums, which inhabit the city on many different levels.

Walking on the old path is an experience that triggers all your senses; everything from the hammering of the blacksmith, the smell of freshly brewed and super strong coffee and the buzzing in multiple languages creates a unique symphony and make up the atmospheric experience.



SELECTION OF FUNCTIONS: 2018



TEPA: 2018

### I.6 "TEPA" - THE MARKET FOR ALL OF MOSTAR

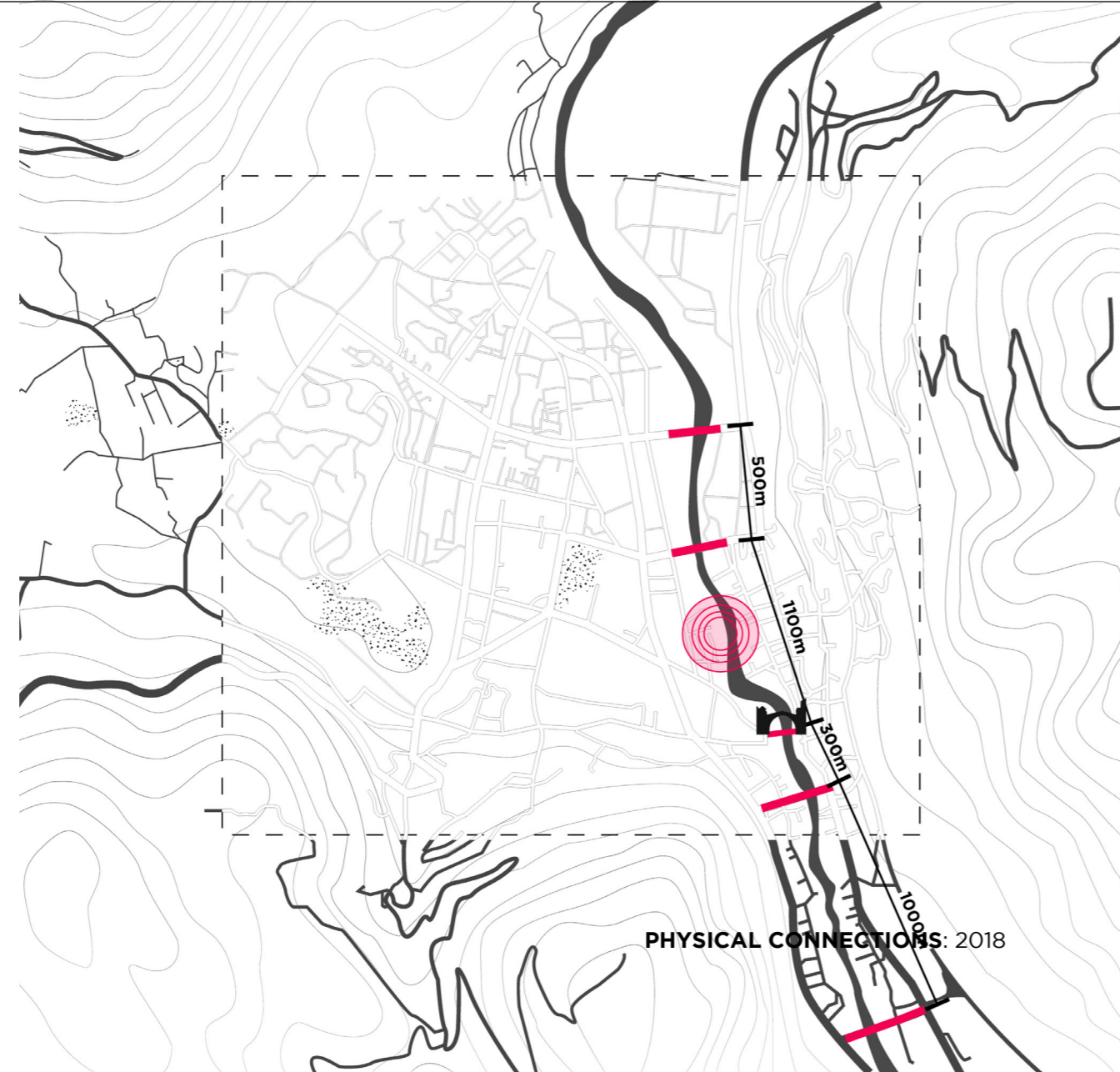
When making the typical way from the bus station to the Old Town, you find yourself walking a straight line towards the Old Bridge. However, right on the border of the Old Town you will notice a shift in paving; going from lime stone plates to old cobble stone. Another thing that becomes apparent, if you pay attention, is how the tourists choose to continue that straight line and head towards the Old Bridge, while the locals take a turn to the right towards the town market "TEPA."

For centuries, this market has gathered people from all over Mostar, and its attraction remains to this day. The municipality has identified the market as one of the places in Mostar with the highest potential for integration. Therefore, the market is currently undergoing construction work in order to enhance and strengthen its attraction in Mostar. (TGM, 2016)

## I.7 PHYSICAL CONNECTIONS

There are 5 main physical connections between the two sides of the river Neretva, 4 of which are used for both cars and pedestrians, and one (the Old Bridge) which is mainly a historical landmark and therefore only suited for pedestrians. The distances between the connections span from 300m to 1000m. The furthest distance is measured up to 1100m stretches from the starting point of the "commercial" part of town (shops, old town etc.), to the Old Bridge.

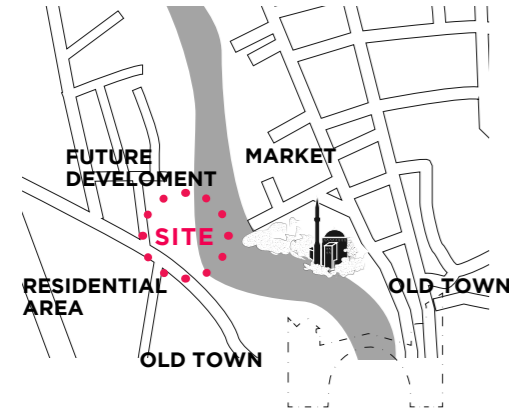
This particular part of Mostar is also the one with the highest pulse - attracting tourists by day and both tourists and locals by evening/night.



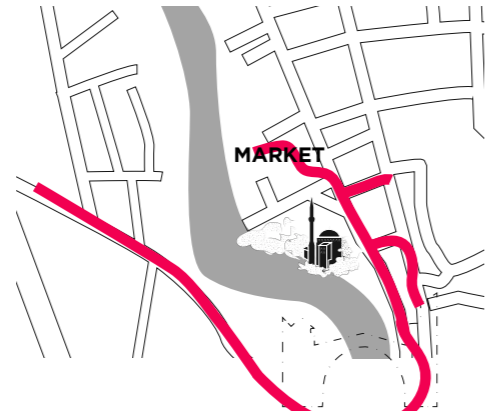
THE OLD BRIDGE

**I.8 THE SITE**

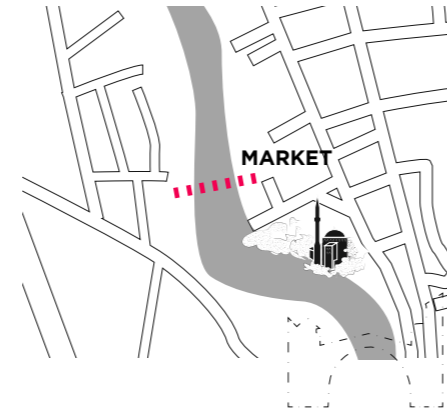
Based on the popularity of the area, the long distance between the connections, the great number of people in motion (both locals and tourists) and the high density of religious buildings, the selected site is located on a deserted piece of land facing the market, the old town, the residential area and the future development.



**CONDITIONS SURROUNDING THE SELECTED SITE**



**PEDESTRIAN MOVEMENT FROM EAST TO WEST/ WEST TO EAST**



**ESTABLISH THIS CONNECTION**

Even though a lot of effort is being put into strengthening the market, it remains disconnected from the West side of the river and only establishes a flow of people from West to East. In order to fully intermix the people of Mostar, the market needs to become more accessible from the West side and establish a flow of people from East to West as well.

**THE SITE**



As mentioned, the selected site is located on a patch of greenery on the West side of the river facing the existing market. Currently, it is a deserted place on a prime location; it is close to all the main attractions in Mostar but left in what can be described as an urban void.

### I.9 THE WHISPERS

After having conducted and concluded the previously presented research I made my way to Mostar to look for a concept for the project that would be rooted in the city and its people.

When I got back to Sweden I went through the photos I had taken, and noticed that a great portion was of the street art in Mostar, each piece holding its own message. And so I found them, the whispers of Mostar. The unfiltered voices of the people displayed in the streets, on ruins and new development. It was everywhere, unprotected from the city's sanitation services. So, I decided my project should harness and protect these messages, making it a place by the people and for the people.

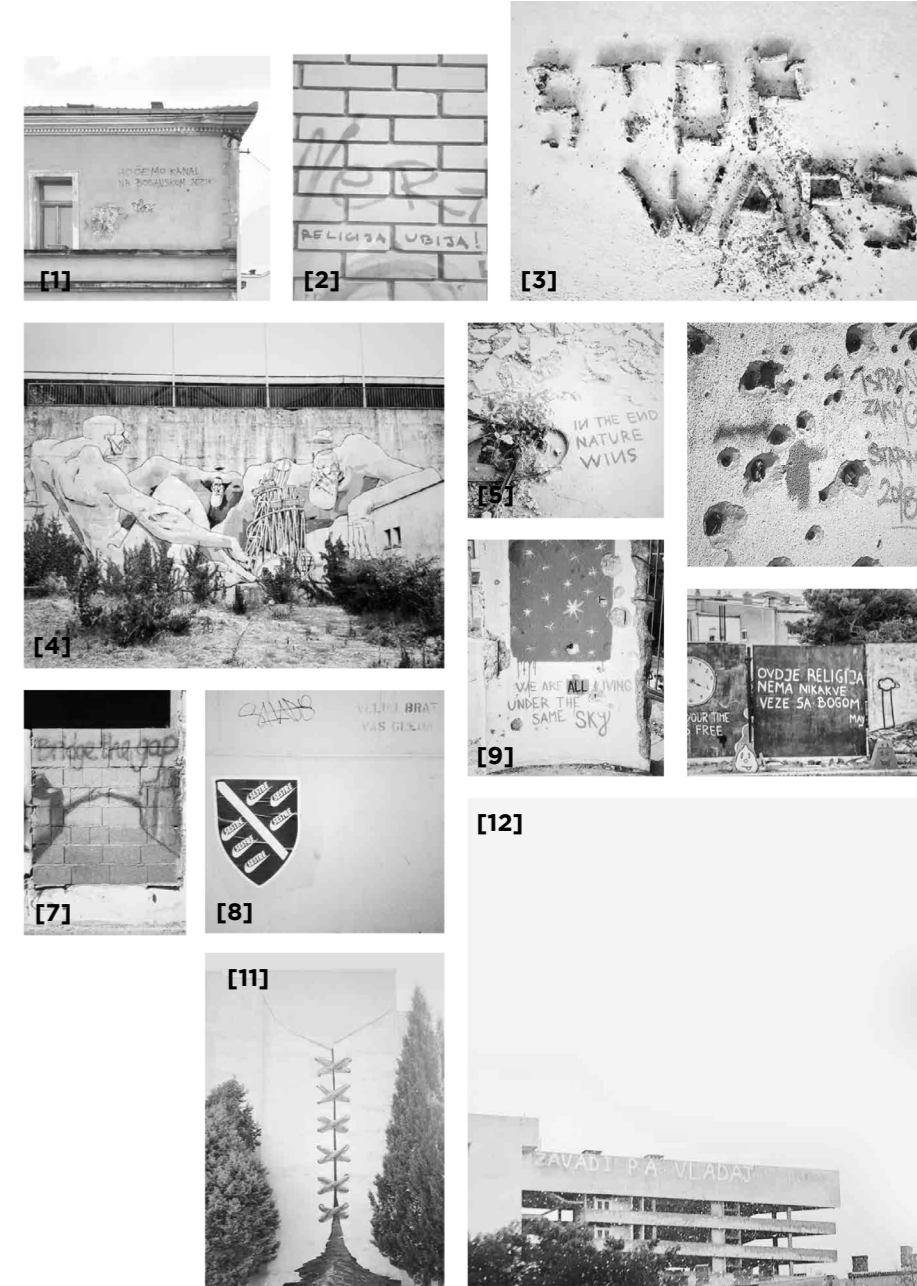


#### STREET ART

“Here, religion has nothing to do with God“

### I.10 A SELECTION OF STREET ART FOUND

- [1] “Hocemo kanal na bosanskom jeziku.“  
En. “We want a tv chanel in Bosnian.“
- [2] “Religija ubija“  
En. “Religion kills“
- [3] “STOP WARS“ - made from empty shot sleeves.
- [4] No Name
- [5] “In the end nature wins“
- [6] Shot holes painted red
- [7] “Bridge the gap“
- [8] Old Bosnian flag branded with “sisters, sisters, sisters“  
“Veliki brat vas gleda“  
(Big brither is watching you)
- [9] “WE ARE ALL LIVING UNDER THE SAME SKY“
- [10] “OVDJE RELIGIJA NEMA NIKAKVE VEZE SA BOGOM“  
En. “Here, religion has nothing to do with God.“
- [11] “Ono sto rijeka dijeli nebo spaja.“  
En. “What the river divides, the sky unites.“
- [12] “ZAVADI PA VLADAJ“  
En. “Divide and conquer.“



### I.11 INSIGHTS PART I

After having conducted the research presented in Part I, I got the following insights. Firstly, the division of the people is merely a synthetic one defined by the horrors of the war in the 90s, and is now even rooted in the constitution. It is however understandable that people get attached to their religious affiliation, because that was what determined their fate during the war. It is a situation where their religion defines their nationality, which labels the people and, in this case, even divides. This labelling results in filter bubbles, which can complicate the integration process of the people.

Furthermore, after having discovered the platform of street art in Mostar and realizing that these are the unfiltered voices of the people, established the idea of introducing a function on the site that would harness and protect these messages. Therefore, the function of the building is a Center for Contemporary Art, with focus on street art in Mostar. The building would host socio-political art from the street that challenge the current climate in the city, and aims to get people out of their filter bubbles, by making them take part of art/messages they would not have been inclined to actively experience on their own.

The target group is the entire population of Mostar, because they are the ones who can make the change. To help achieve this, the Center is designed with the help of advanced data analyzing technology, more specifically, Machine Learning.

**What:** Center for Contemporary Art, with focus on street art in Mostar

**Type of Art:** Unfiltered socio-political art that challenge the current climate in the city, from the streets of Mostar.

**Target Group:** The population of Mostar

**Objective:** Have people leave their filter bubbles by exposing them to art/messages that they would not have been inclined to take part of on their own.



## **PART II** Machine Learning and Architecture



In what follows, a short introduction to Machine Learning is presented, with focus on potential application to architecture based on current Machine Learning abilities. Following that is a description of why one should apply this technology to the project and how it is being applied in order to help fulfil the objective of having people leave their filter bubbles. Finally, the intended application is presented and its consequences are addressed.

## II.1 MACHINE LEARNING

Machine Learning (ML) is a type of data analysis technology that takes data from a variety of potential sources (such as applications, sensors, network devices and appliances), and feeds it into the ML system. The system uses the data to build its own logic and to solve problems or retrieve some insight into a particular matter. (Gartner, 2017, p.5)

The ML process can be described as follows:

1. Data collection: the system collects data.
2. Learning period: the system learns.
3. Output

Bare in mind that the learning process is not only defined by the data collection process proceeding it, but also by previous data and previously defined logic. So, roughly speaking, the ML system keeps adjusting its previous logic using the new data provided. There are many ways of defining the data collection window and the data process window, but they will not be further discussed in this thesis.

### II.1.1 The Black Box

Machine Learning models are often referred to, and will be in this thesis, as black boxes. The choice of terminology stems from the fact that the output cannot, not even by its creator, be easily grasped. (Alpaydin, 2009, p. 268)

When working with, for example, logistic regression or decision trees one can easily find relationships between their inputs and outputs. The logic applied by these methods is simple and retracable. However, the logic developed by a ML system is far more complex and incomprehensible. So the output from a ML system is far more difficult to retrace to the input data.

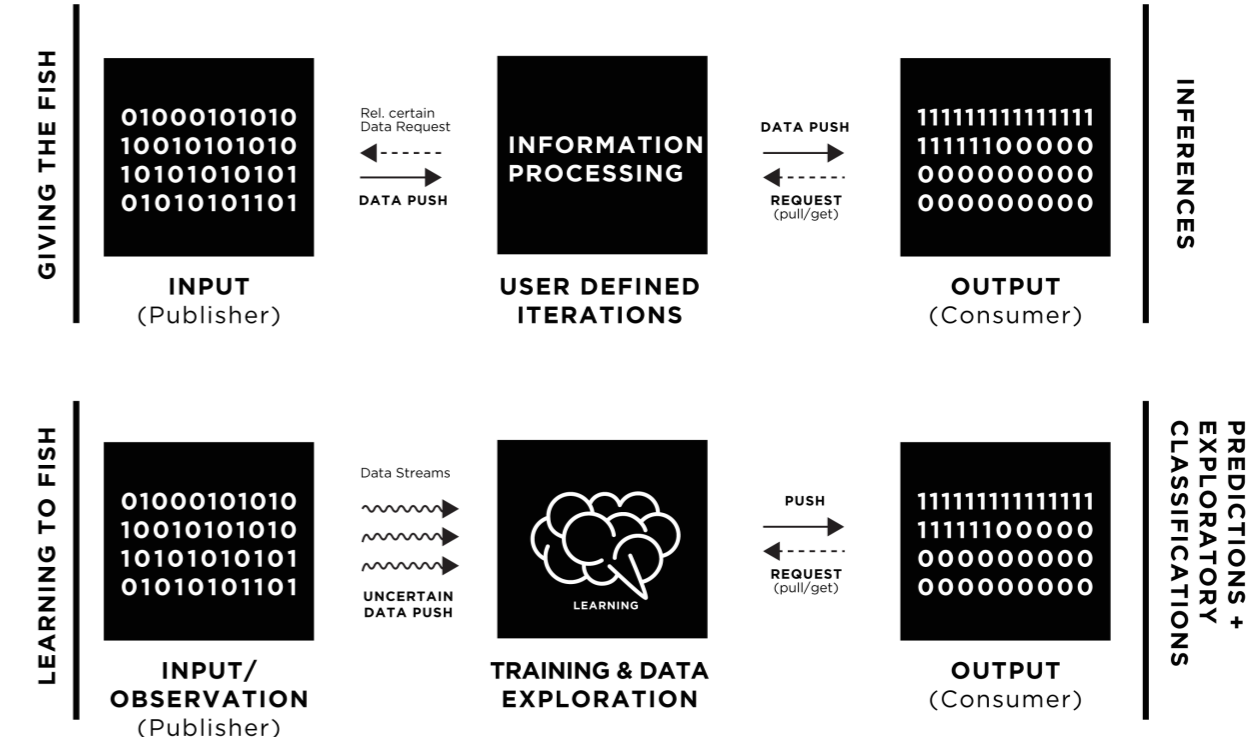
### II.1.2 Between Machine Learning and Computer Vision

Machine Learning and Computer Vision (CV) are two core branches of Computer Science. While CV harnesses the power of complex image processing techniques to extract meaningful features given from image or video, ML deals with pattern recognition and computational learning. An example of a project that was based on the combination of CV and ML recognized specific hand gestures in real time to perform tasks such as opening/closing apps, playing pausing music etc. (Alpaydin, 2009, p. 416)

1. CV: The ability to make the computer see the gestures being performed.
2. ML: The ability to understand the gestures.

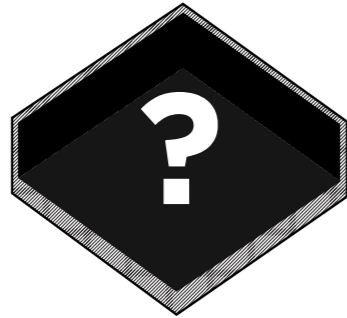
### II.1.3 Traditional Programming versus Machine Learning

The difference between traditional programming and ML can be summarized in the proverb: "Give a man a fish and you feed him for a day; teach a man to fish and you feed him for a lifetime." (Gartner, 2017, p.9)





**VISITORS INSIDE THEIR FILTER BUBBLE**  
(input)



**THE BLACK BOX**  
(machine learning system)



**VISITORS OUTSIDE THEIR FILTER BUBBLE**  
(output)

**ML CONCEPT ILLUSTRATION**

The ML system harnesses and analyzes the visitors' behavior and traits over time, in order to introduce them to undiscovered paths in the exhibition space.



**ML DATA FLOW ILLUSTRATION**

Data input is transformed via the ML logic to the output.



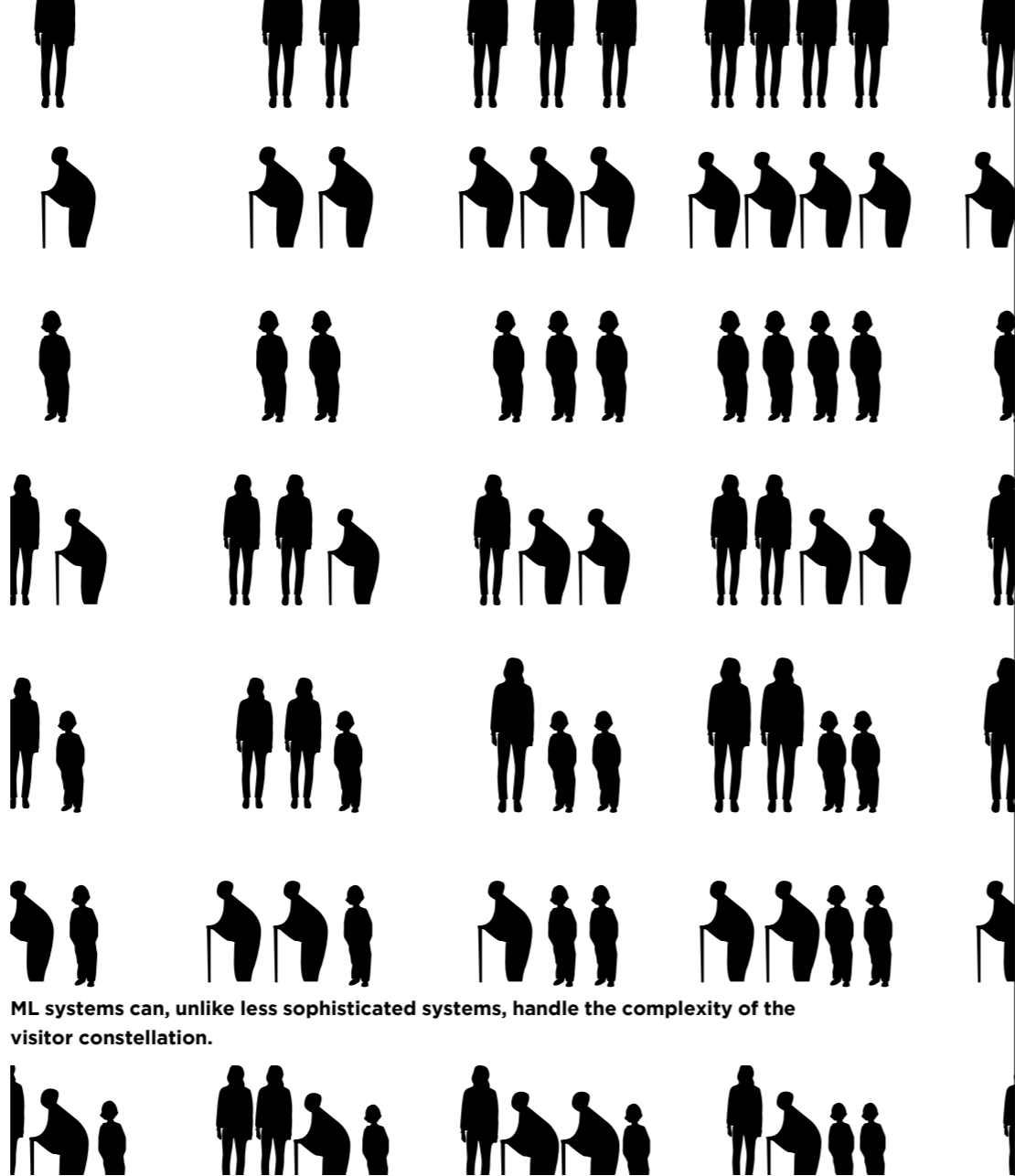
## II.2 WHY MACHINE LEARNING?

With the help of Machine Learning the spaces can reflect the broad pallet that is the human constellation of Mostar. Every person has their own ideas and experiences that have shaped their opinions and behavior. Every person lives in their own filter bubble.

In order to break that bubble, the person needs to be exposed to new ideas and opinions. By applying Machine Learning to the spatial constellation of the exhibition space, the person can be guided and exposed to ideas and opinions they spontaneously would not have been inclined to take part of.

Furthermore, another aspect that sets the ML system apart from simpler versions of algorithms (e.g. logistical algorithms and decision trees) is its ability to process large and complex quantities of data, as well as learning from it.

With an interactive exhibition space that uses Machine Learning based on visitors' behavior and traits, the architecture introduces them to undiscovered pathways, so called anti-paths, in the space, thus guiding the visitors beyond their filter bubble, towards new ideas.



**ML systems can, unlike less sophisticated systems, handle the complexity of the visitor constellation.**

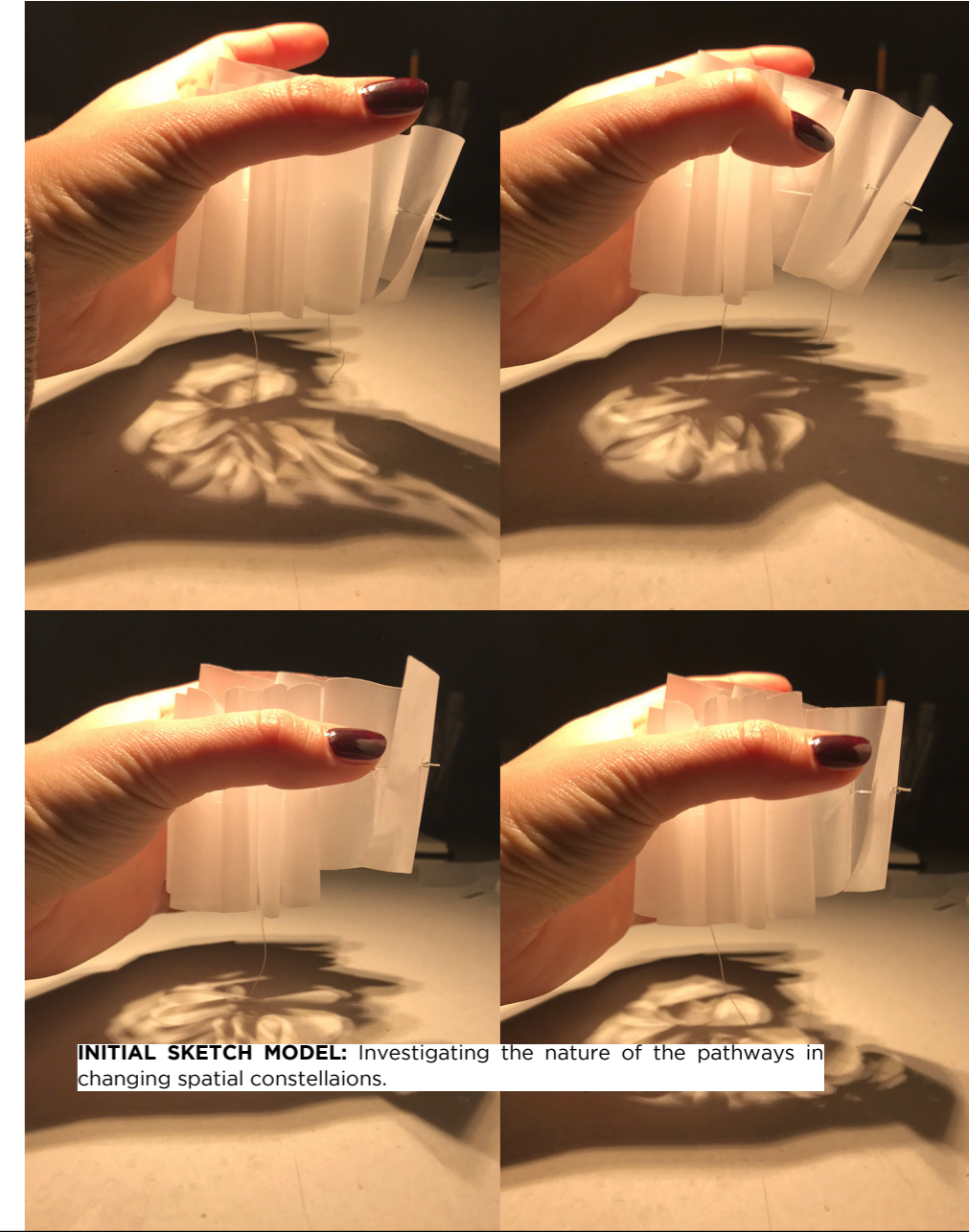
## II.3 HOW MACHINE LEARNING?

In order to create these anti-filter-bubble-pathways, the space needs to know its inhabitants. There are many ways to identify characterizing factors, and in this thesis the following have been selected:

- **Number of people** (measures popularity of art work)
- **Time spent by art work** (measures popularity of art work)
- **Age of observer** (classification of visitor)
- **Time of day** (time aspect)

So, with this defined as the input data the space is able to rearrange itself according to what it has learned from its previous visitors.

Now, tying back to the ML process (data collection, learning period and output) the building needs to have predefined time periods for each slot. In this thesis the data collection takes place during the Center's opening hours. In order to rearrange itself and present anti-paths. The learning and output period take place during closing hours. In this thesis there is one closing period per day, but theoretically speaking one could have multiple learning and output periods per day or even one per month depending on preference.



**INITIAL SKETCH MODEL:** Investigating the nature of the pathways in changing spatial constellaions.

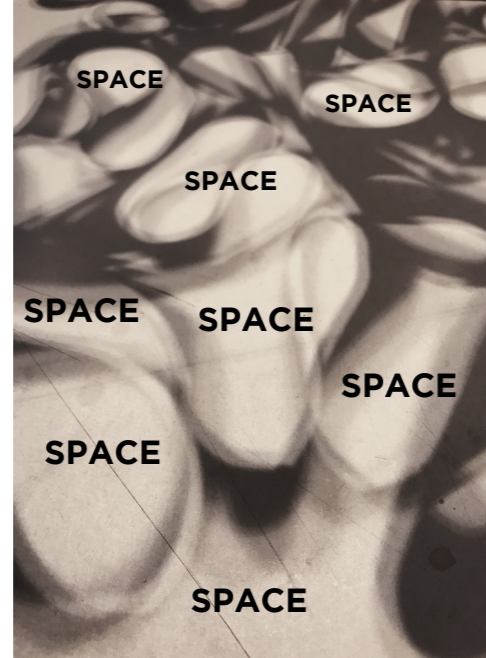
## II.4 SCETCH MODEL OF SPATIAL BEHAVIOR

This model made from tracing paper attached to steel wires, which are suspended in a metal frame helped me understand the nature of the pathways in changing spatial constellations.



**PHOTOGRAPH OF MODEL**

The photo depicts patterns created from folding tracing paper in a simple way, in order to create complexity.



**PHOTOGRAPH OF SHADOWS CAST BY MODEL**

The image shows how the shadows give a sense of pathways, while the openings in the folding speak about potential spaces.



**PHOTOGRAPH OF MODEL**

This photo gives a 2D-effect of the entire body.



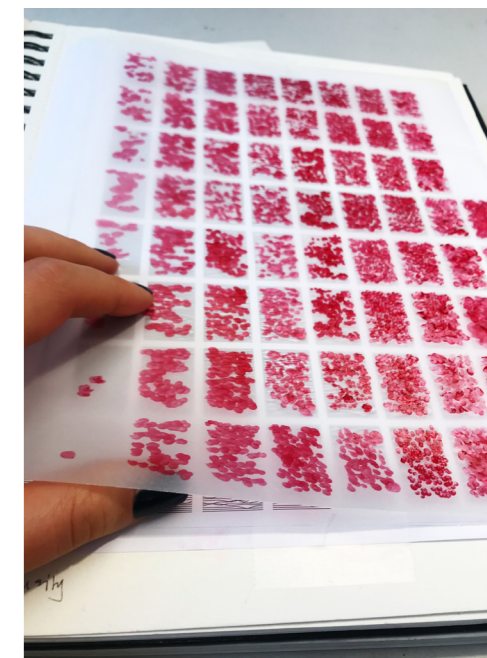
**PHOTOGRAPH OF MODEL**

This photo starts speaking about the potential 3D-effect.



**PHOTOGRAPH OF MODEL**

This photo shows increased complexity of a potential 3D-effect.

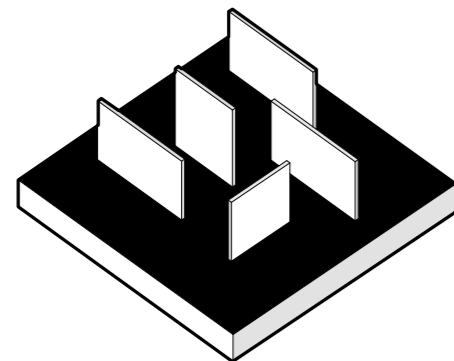


**PROCESS SKETCH**

After studying the physical model, its qualities of space and pathways were digitally interpreted and printed as curves. Each rectangle arranged according to increase in complexity (data collection and learning) and the resulting "spaces" marked out in red on tracing paper.

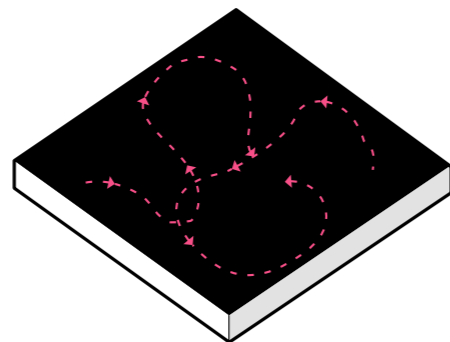
### II.5 CONVENTIONAL EXHIBITION SPACE

Conventional exhibition spaces often have predefined borders, which give predefined circulation patterns regardless of its visitors.



TRADITIONAL EXHIBITION SPACE

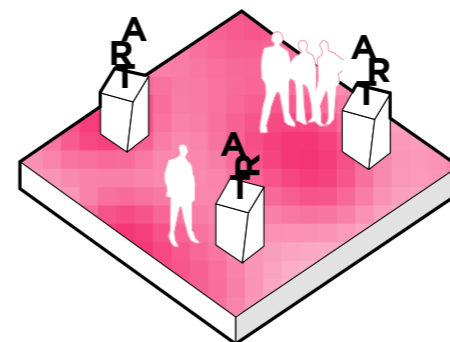
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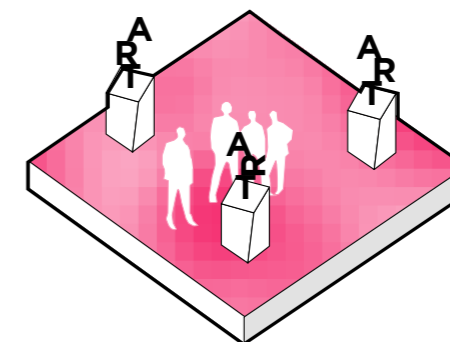
PREDEFINED CIRCULATION PATTERN

### II.6 MACHINE LEARNING EXHIBITION SPACE

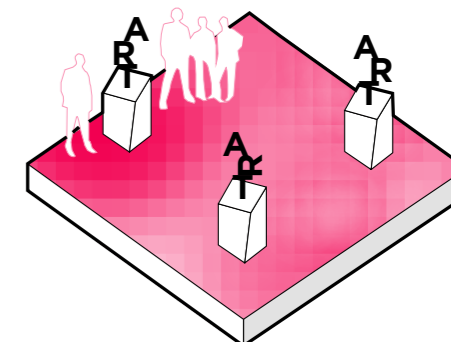
The Machine Learning approach with an interactive exhibition space, enables a prediction in circulation patterns of its visitors and outputs the anti-pattern.



CIRCULATION PATTERN A



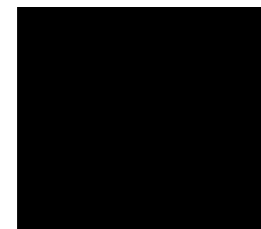
CIRCULATION PATTERN B  
(Reaction to A)



CIRCULATION PATTERN C  
(Reaction to B)

**II.7 APPLICATION ON SPACE CREATING ELEMENTS**

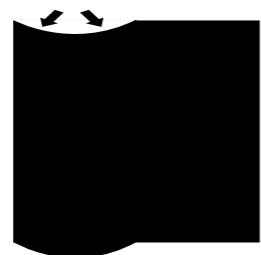
Deriving from the sketch models, the ML system's output can be applied to space creating elements in the exhibition space; walls can open up to create entrances and move in x-, y- and z-axis to alter the spatial constellation.



WALL



ENTRANCE

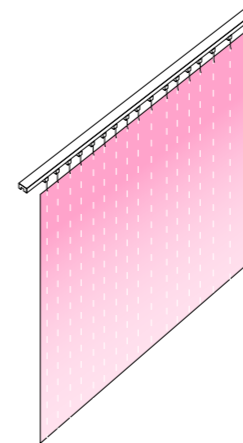


EXPANDING SPACE (X,Y)

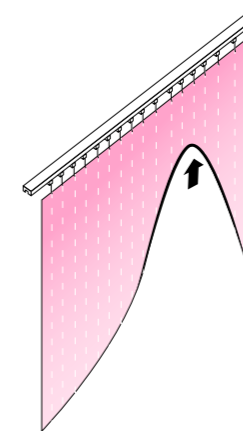


EXPANDING SPACE (Z)

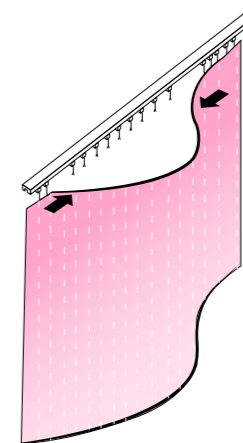
The walls are fabric and attached to rails with clips that are mounted to motors and sensors. On command, they can loosen the fabric from the rail. The top and bottom part of the fabric have integrated steel wires, which stabilize the body as the fabric when it is being "squeezed" together by adjacent motors. The walls are also provided with seams that help pull the fabric up and down. The result is vertically and horizontally moving walls elements, which depending on their arrangement define the spatial experience and establish circulation patterns.



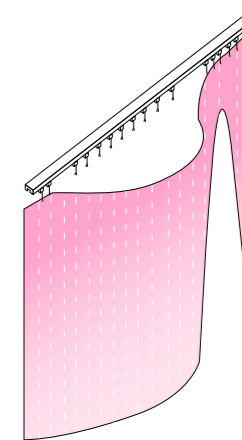
Fabric wall with seams



Seams pull the fabric up to create an entrance.



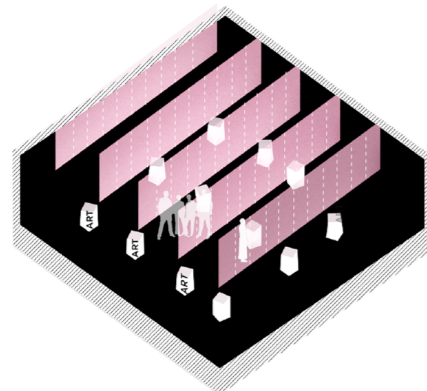
Steel wires stabilize the fabric as motors push it outwards.



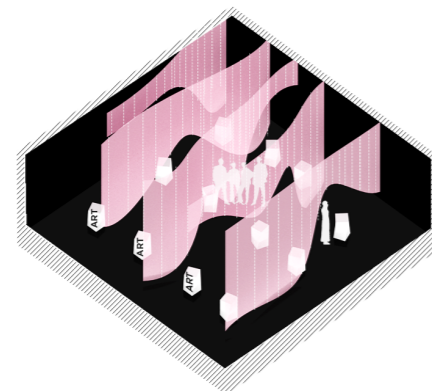
Moving walls that alter the spatial experience based on people's behavior over time.

### II.7.1 SPACES BASED ON BEHAVIOR

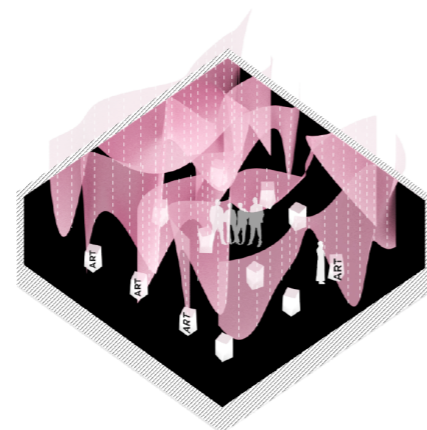
Given the nature of the ML process (data collection, learning period and output) the exhibition space becomes more complex with an increase in data and over time.



INITIAL LEARNING STAGE



PROCEEDED LEARNING STAGE (A)



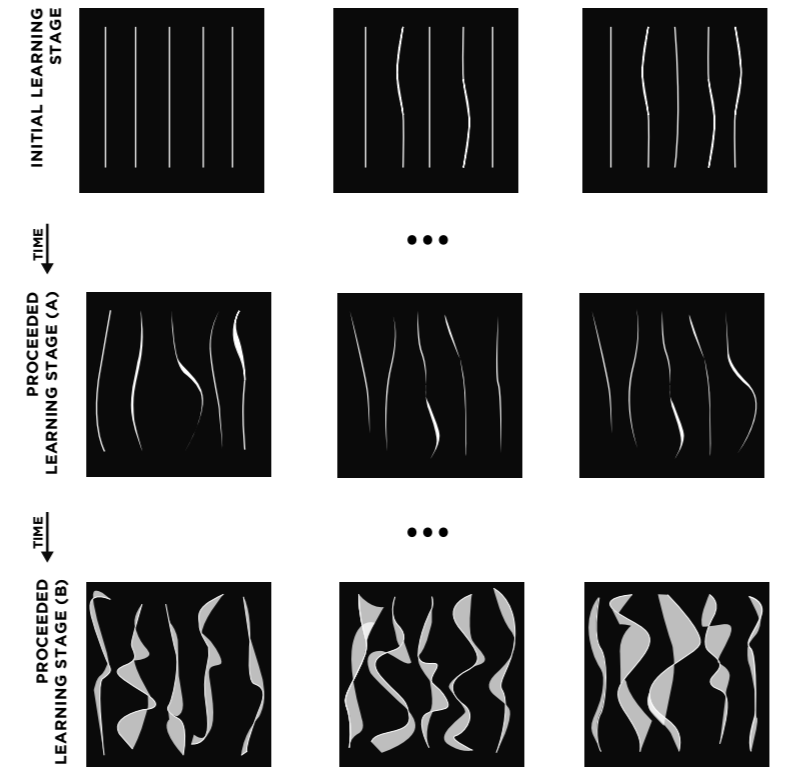
PROCEEDED LEARNING STAGE (B)



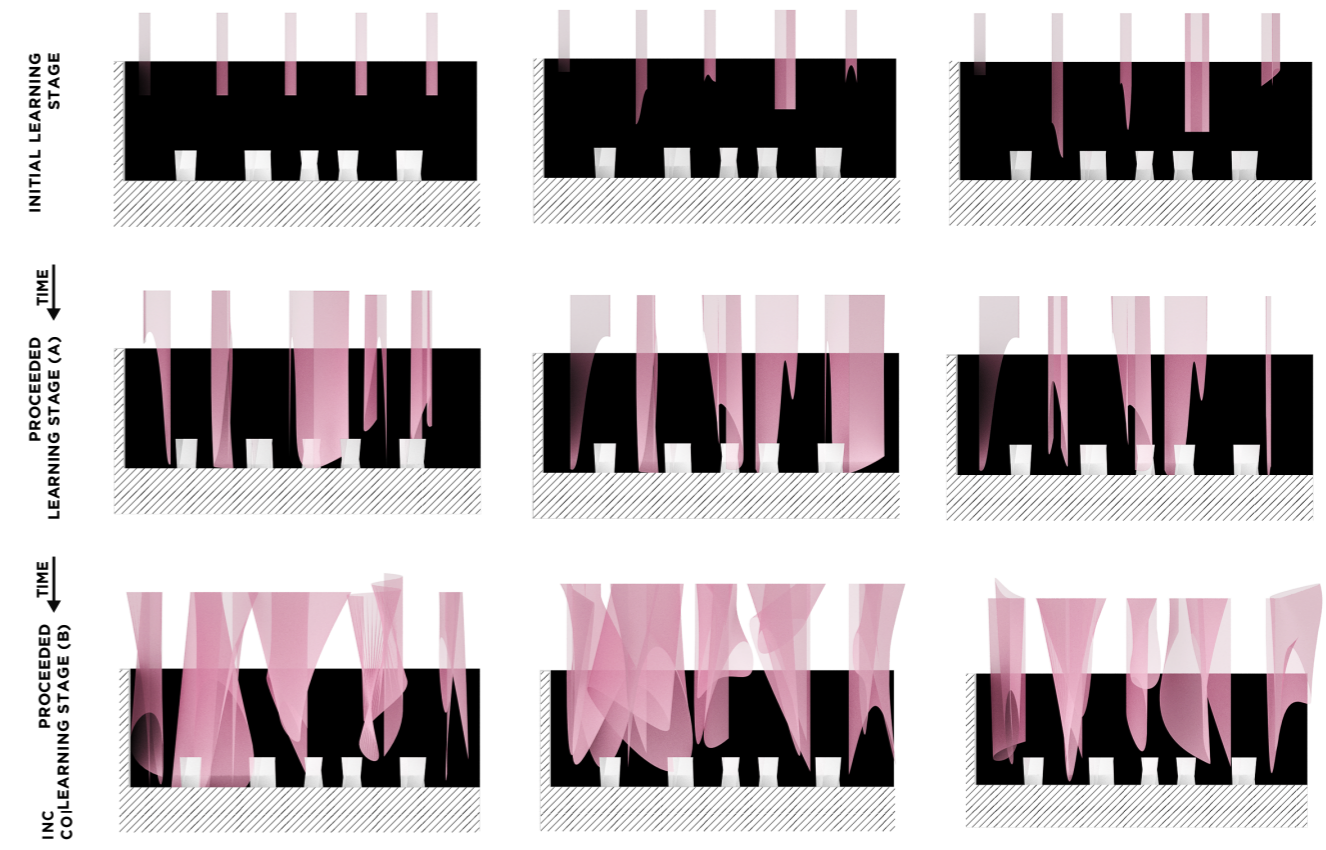
PROCESS SKETCH: Space defined by Sketch Model of Spatial Behavior and tracing paper with people.



**ARBITRARY PORTION OF THE EXHIBITION SPACE (top view)**



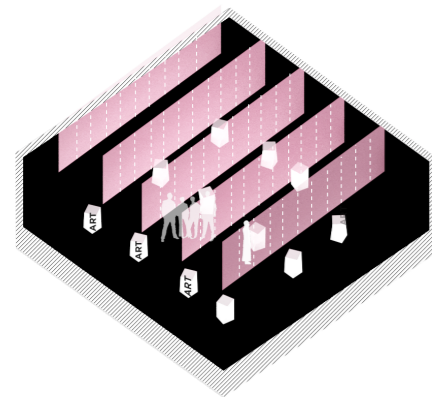
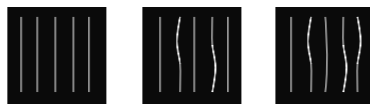
**ARBITRARY PORTION OF THE EXHIBITION SPACE (side view)**



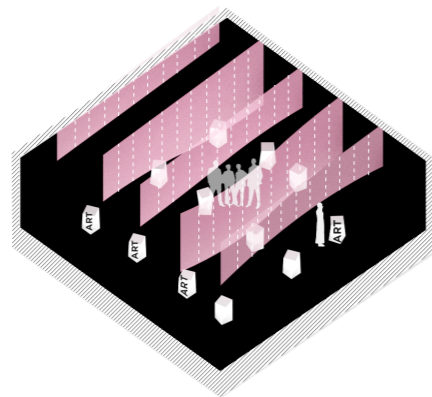
VIEW IN EXHIBITION SPACE

### II.7.2 INITIAL LEARNING STAGE

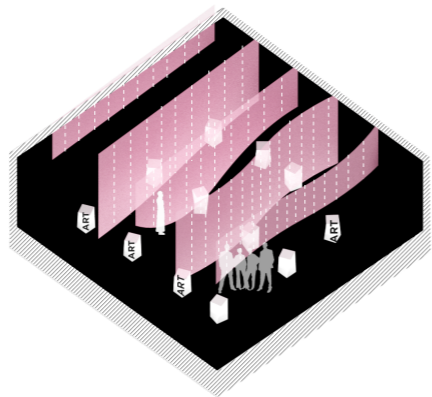
The illustrations below are examples of potential spatial constellations during the initial learning stage of the ML. Due note that due to the ML's Black-Box-qualities, they are by no means predictable. So, the diagrams serve to depict the ML system's logic development.



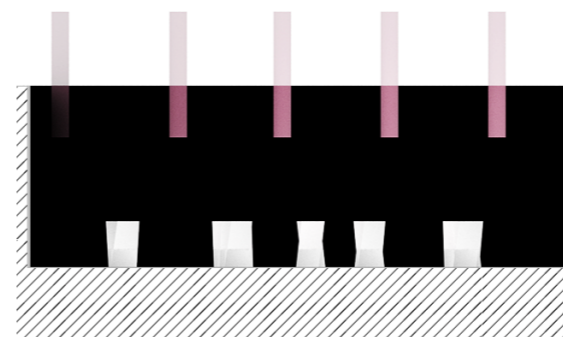
SPATIAL CONSTELLATION 1



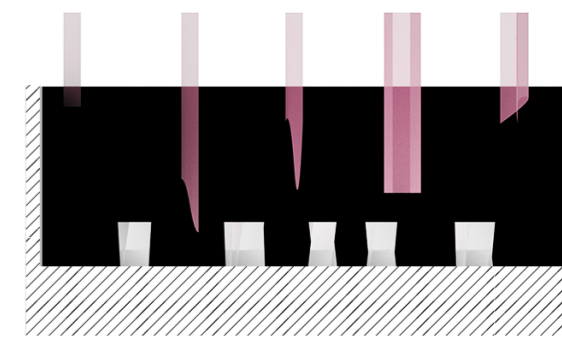
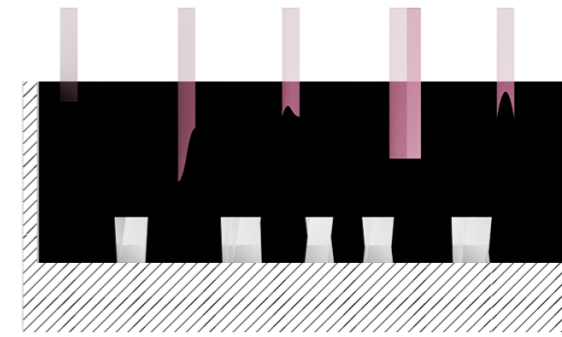
SPATIAL CONSTELLATION 2



SPATIAL CONSTELLATION 3

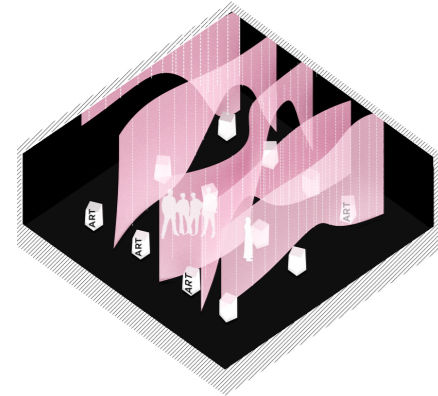


INITIAL LEARNING STAGE (side view)

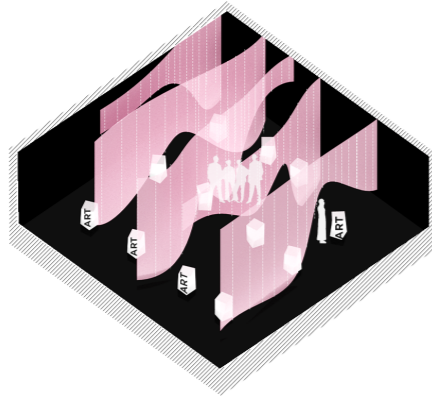


### II.7.3 PROCEEDED LEARNING STAGE (A)

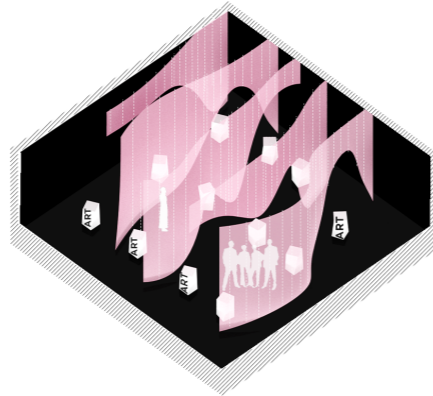
The illustrations below are examples of potential spatial constellations during the proceeded learning stage (A) of the ML. Due note that due to the ML's Black-Box-qualities, they are by no means predictable. So, the diagrams serve to depict the ML system's logic development.



SPATIAL CONSTELLATION 1



SPATIAL CONSTELLATION 2



SPATIAL CONSTELLATION 3

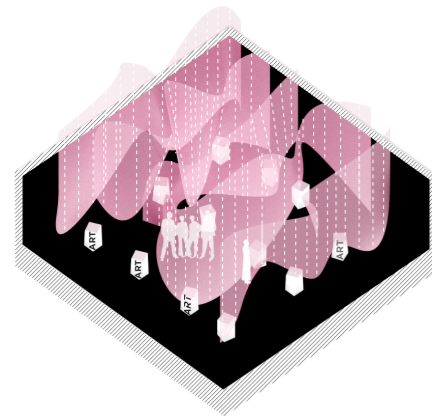


PROCEEDED LEARNING STAGE (A) (side view)

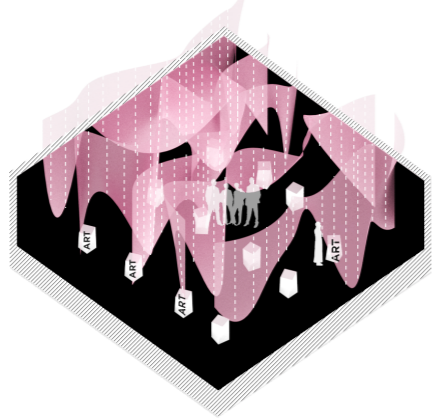


## II.7.4 PROCEEDED LEARNING STAGE (B)

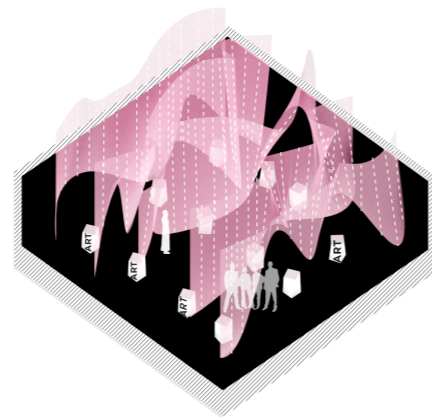
The illustrations below are examples of potential spatial constellations during the proceeded learning stage (B) of the ML. Due note that due to the ML's Black-Box-qualities, they are by no means predictable. So, the diagrams serve to depict the ML system's logic development.



SPATIAL CONSTELLATION 1



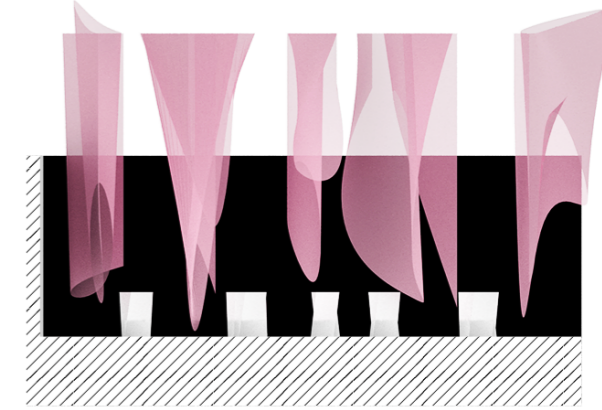
SPATIAL CONSTELLATION 2



SPATIAL CONSTELLATION 3

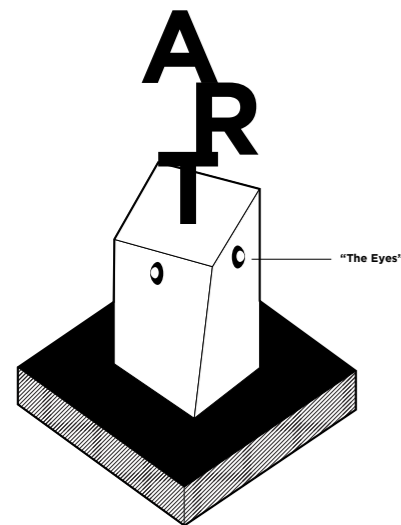


PROCEEDED LEARNING STAGE (B) (side view)



### II.7.5 THE EYES

In order to collect the data, cameras using Computer Vision, are mounted to each podium or around each art piece. They collect the necessary data for the ML process, thus becoming the eyes of the space.



**VIEW IN EXHIBITION SPACE:** "SISTERS, SISTERS, SISTERS" ON THE OLD FLAG



## II.8 INSIGHTS PART II

After working with the behavior of the space and the parameters defining it (i.e. the behavior of the visitors) I have noted the following.

Firstly, it is regarding the matter of the architect's role in designing a space that is not in detail designed by the architect. Are we even necessary? The answer is yes. I even dare to say that the role is the same, because the architect is the definer of the performance of the space. In this case it is about creating a space that establishes anti-paths in order to get people out of their filter bubbles. Because the target group is the entire population of Mostar (approximately 100 000 people) it is very difficult for the architect to analyze their inclinations and design a suitable space accordingly.

In addition to this, the architect defines the initial stage of the ML process (i.e. the input data) and what the ML process is to output from this. What then happens in between is analyzed by the machine on the architect's command. Now, because of the nature of the ML's Black-Box-quality, the architect is not able to micromanage the space, but is in total control of what it is to perform.

Furthermore, the ML is not a human brain that is contaminated by human prejudice and presumptions, making its analysis of the visitors' behavior more reliable. It deals with data and logic, and is therefore only a tool that is used to translate people's behavior in order to fulfil the architect's objective for the space.

Another aspect I came to think about was the curator. Who is the curator of the art? If the role of the curator is described as the distributor/arranger of the art in the exhibition space, then following the logic, the visitors are the curator. This is so because it is their behavior that determines the spatial constellation, and thereby affects the focus around each artwork.

If one is to claim that the Machine Learning system is the

curator, one is not taking its primary task into account; prediction based on historic data. One should not to confuse the ML with the human brain, because it is far more primitive than the human brain. However, as previously stated, it is far more superior to our brains in regard to data analysis and has no prejudice. So, again it is therefore only a tool that translates people's behavior in order to fulfil the architect's objective for the space, in which the visitors, with their behavior, determine the spatial constellation around the artwork.



## **PART III** Rooting the Whispers in Mostar



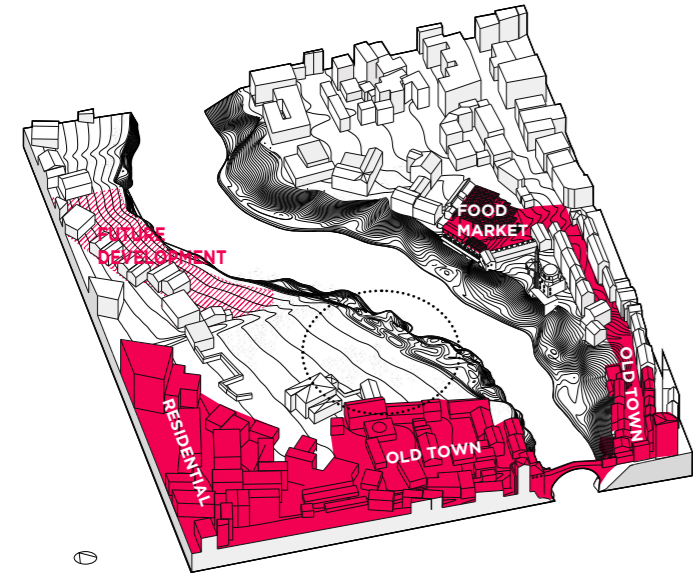
In order for people to even visit the exhibition space in the Center, the entire building needs to perform so that it connects to the existing conditions surrounding the site, as well as stitches the urban fabric in order to create more accessibility on the urban scale.

Furthermore, it needs to announce itself in the urban space, not only in current prime locations, but also be prepared for a growing city that is undergoing a lot of changes.

In what follows, the final Center is presented according to the thought process behind its design; firstly, the site is solved, then the performances of the building are defined, after which the final design of the building is described. Finally, a brief discussion concludes Part III.

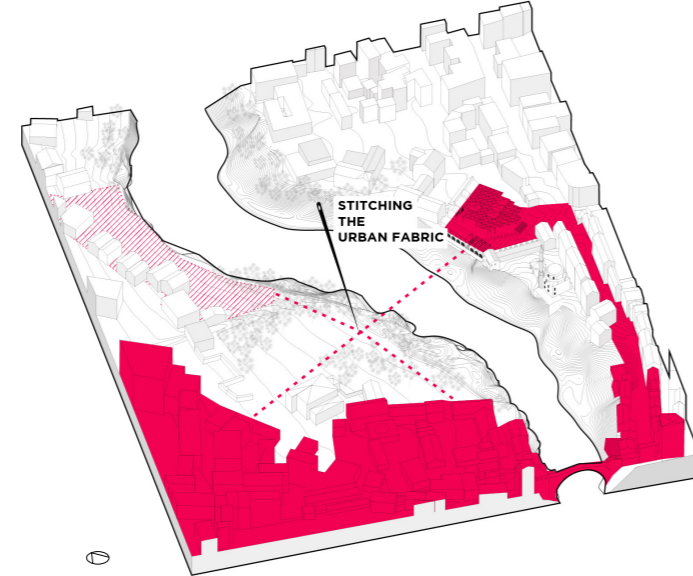
### III.1 SOLVING THE SITE

In what follows is a series of diagrams that depict the thought process behind solving the site, which laid the groundwork for the design of the Center.



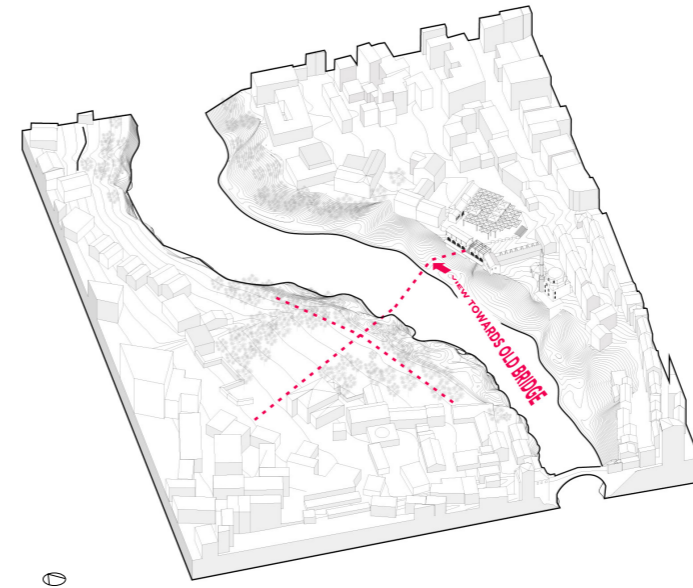
#### EXISTING CONDITIONS SURROUNDING THE SITE

There is a strong existing **flow** of people stretching from the old town in East to the old town in West, that continues to the residential area in West. The future development North of the site might establish a future flow just as strong as the current, and should therefore be considered in the design proposal of the Center.



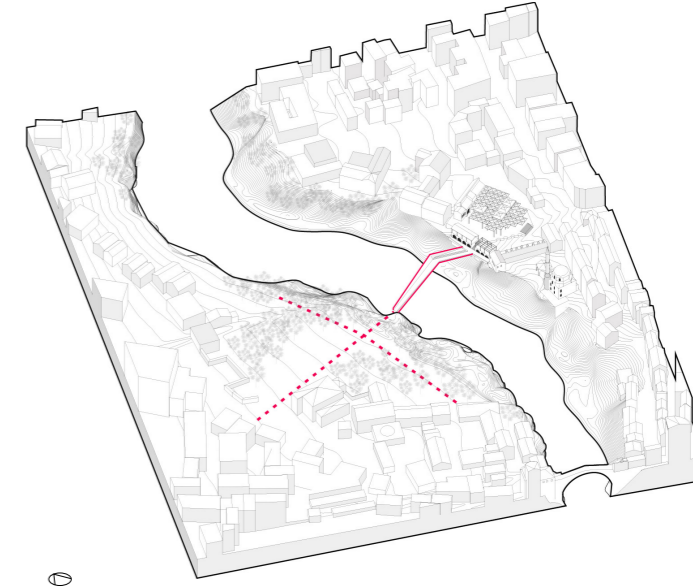
#### STITCHING THE URBAN FABRIC

In order to stitch the urban fabric to ensure more accessibility from one side of the river to the other, two main connections need to be established; one going from East to West/West to East and one from the old town to the future development.



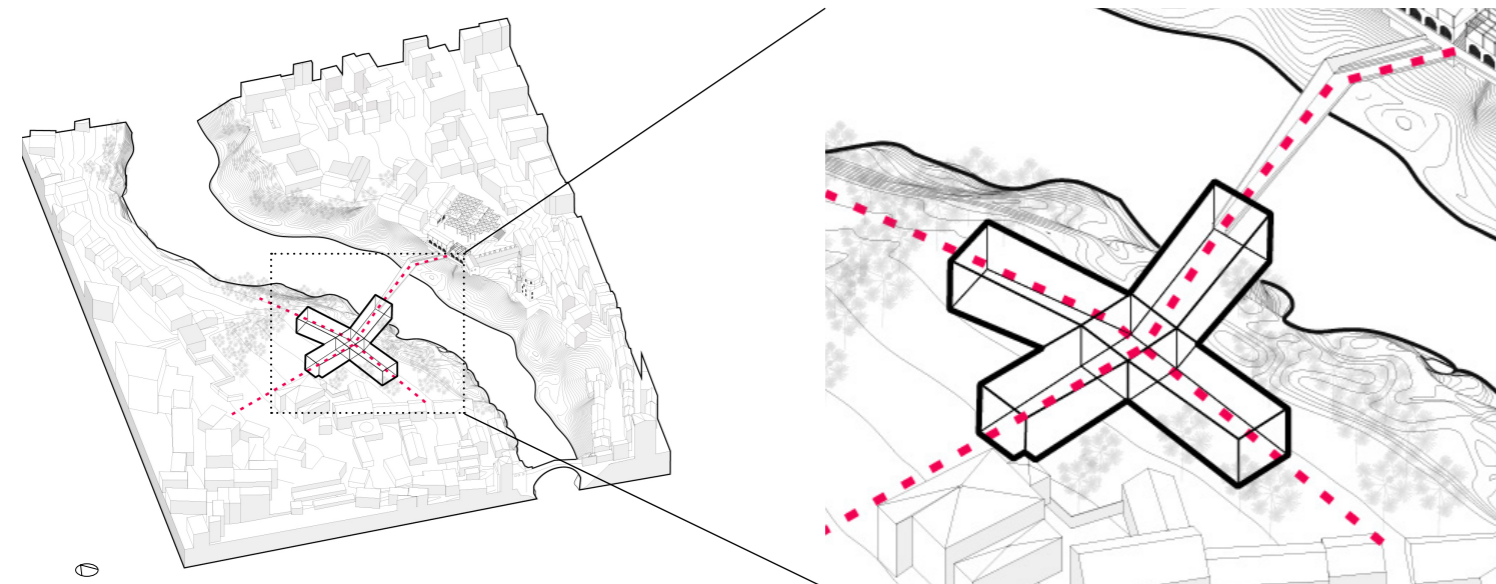
#### GIVING SHAPE TO THE ESTABLISHED CONNECTIONS

Because the site is located in close proximity to a historically important place (the old town and the old bridge), the new connection is altered to salute the old era as it establishes the new.



#### THE NEW BRIDGE

The main physical connection between the East and West side of the river is a bridge that is modestly designed to respect and salute the historical part of Mostar.



#### THE RESULTING DIAGRAMMATIC BODY

The resulting diagrammatic body is a constellation of two axes based on the establishment of crucial flows; one connecting the East side with the West, and the other connecting the past with the future. The body announces itself from all directions of Mostar and aims to pick up the current and future flows in the city.

### III.2 DESIGNING THE CENTER

In short, the Center hosts 2 different conditions; one characterized by the current climate in the city, and the other defined by the counter-reaction to the current climate in the city. Therefore, the building needs to perform differently depending on the condition it is being exposed to.

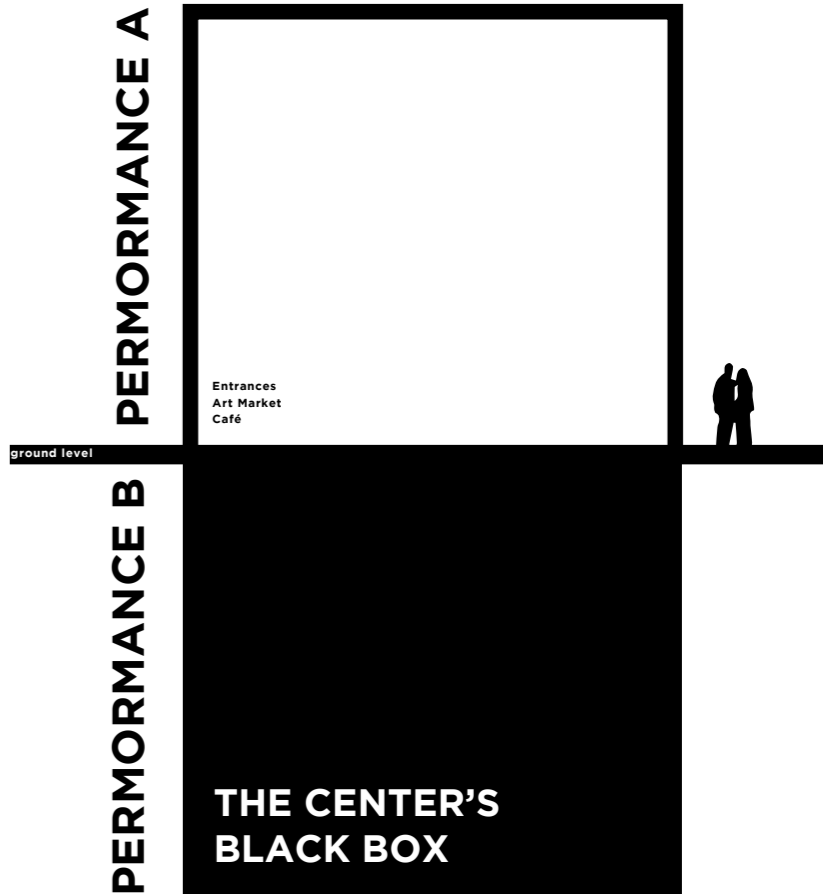
**Performance A:** This performance takes place on ground level and is static and characterized by the current climate in the city.

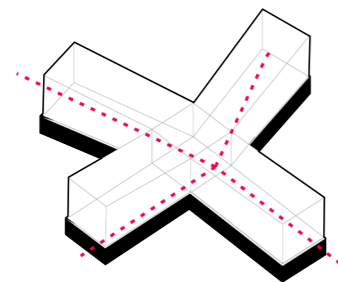
With its architecturally static form, the building aims to encourage movement from one side of the river to the other on ground level. It merges and stitches the urban fabric.

**Performance B:** Below ground level the experience is dynamic and aims to challenge the current climate in the city, by establishing counter-reactions to it.

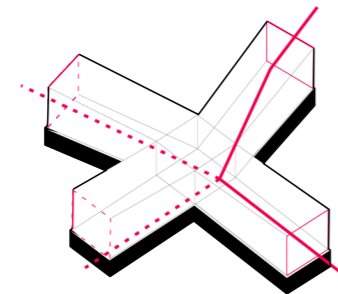
Its dynamic nature, defined by people's behavior and traits, requires simplicity in its static architectural design in order to create an environment in which the Machine Learning is not competing with pre-defined borders, such as walls, static pathways etc. This establishes Performance B as the building's "Black Box", in the same manner as the Machine Learning.

In what follows is a series of diagrams, drawings and visualizations that depict the thought process behind designing the Center based on previous conclusions regarding performance and the site.

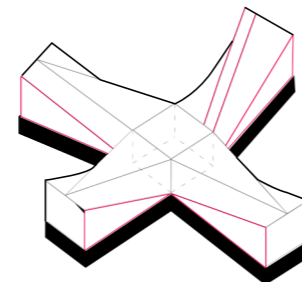




**THE RESULTING DIAGRAMMATIC BODY  
+ BLACK BOX** (exhibition space)

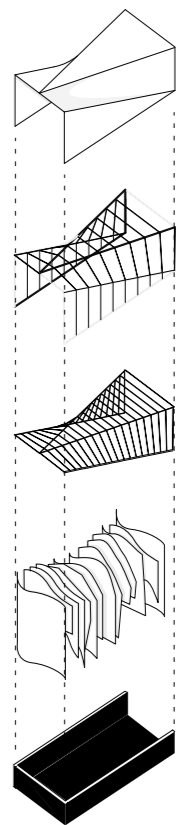
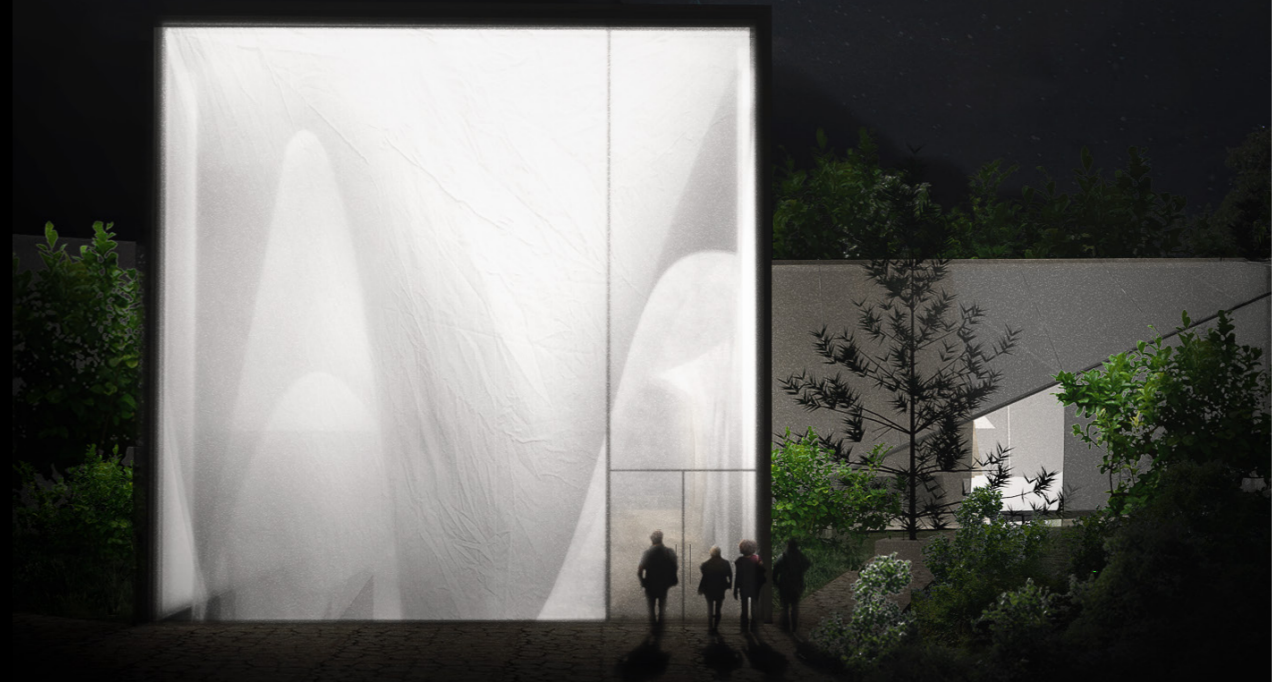


**CURRENT FLOW HIERARCHY**  
The current flow hierarchy through the building is a reflection of the current climate in the city,



**THE BODY IS "CARVED" TO ESTABLISH DIRECTIONALITY**  
The resulting building shape reflects its requirement of different performance (Performance A and Performance B); on ground level the architecture is static and directing (white), whereas the Black Box remains simplistic in its static design to benefit the ML.

**VIEW SOUTH ENTRANCE:** This entrance is currently the main entrance to the exhibition due to its regions popularity. Exterior pathways guide the visitors to the East part of the building, towards the bridge and over to the East side of Mostar, thus establishing the building as a compass in the urban context.



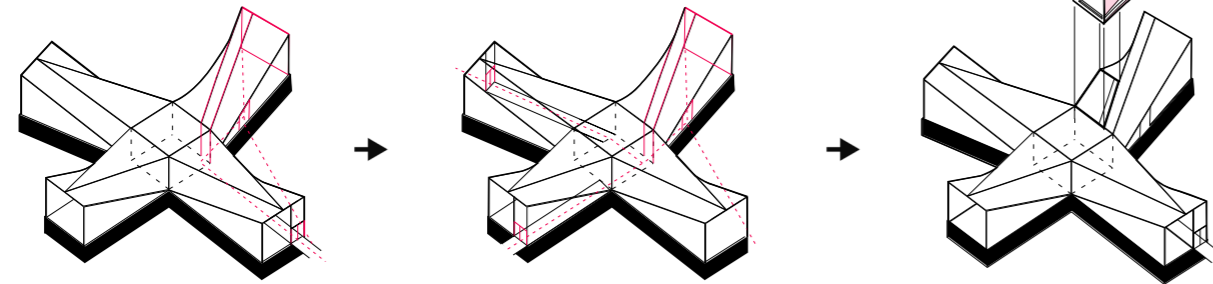
**Exterior:**  
Weather proof, translucent plastic shell.

**Steel Truss**

**Rails**

**Interactive Fabric**

**The Black Box:**  
Exhibition Space



**CURRENT ENTRANCES AND PATHWAYS**

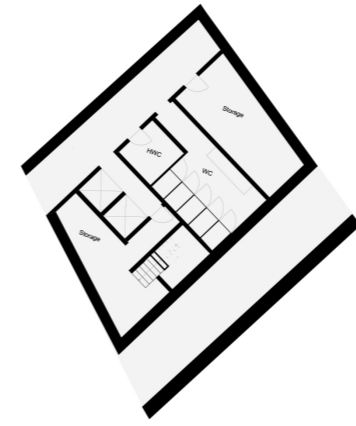
The current entrances and pathways are a result of the desired flows. All pathways but one, are situated on the ground. The other is located in the ceiling as a conceptual continuation of the new bridge.

**POTENTIAL FUTURE ENTRANCES AND PATHWAYS**

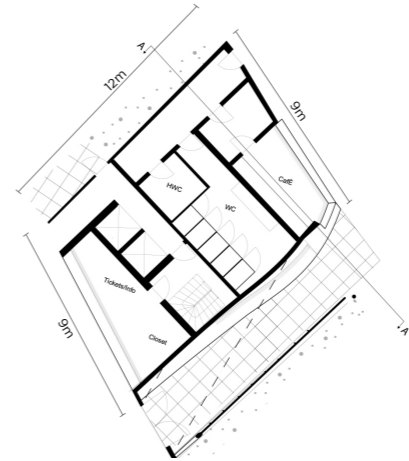
As the city changes, and the future development grows, the entrances can be interchanged in case of shift in flow hierarchy in the city.

**“CARVING” OF INTERIOR SPACE**

The Center hosts a “function block” that caters to the facility’s practical needs, such as café, WC, offices etc. The wall facing the public is a resulting surface of the “bridge pathway” and a “ground pathway”, which establishes an angulating body that guides visitors to the second entrance of the exhibition.



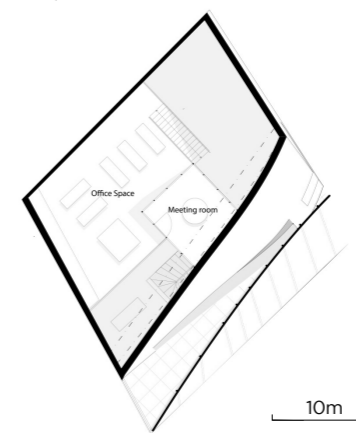
**FUNCTION BLOCK PLAN -1**  
Storage, communication, WC



**FUNCTION BLOCK PLAN 0**  
Tickets/Information, communication, WC, café, exhibition entrance.

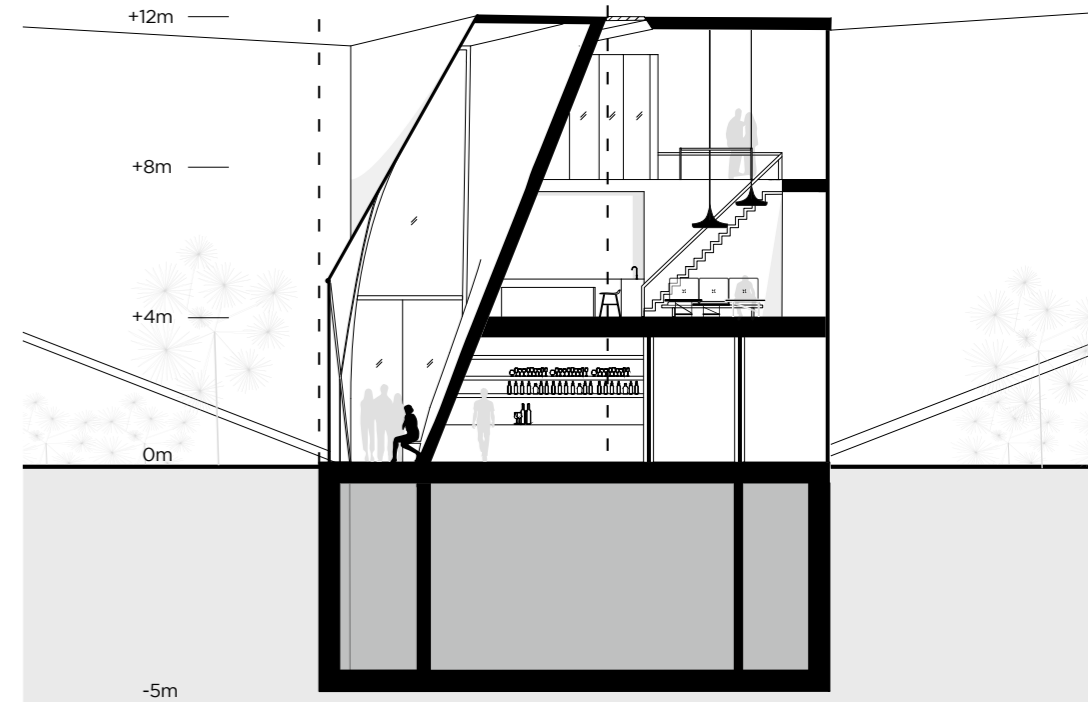


**FUNCTION BLOCK PLAN +1 (staff)**  
Office space, kitchen, lounge, reception.



**FUNCTION BLOCK PLAN +2 (staff)**  
Meeting room (glazed), office space, built-in storage.

**THE GUIDING SPACE TOWARDS THE EXHIBITION ENTRANCE**





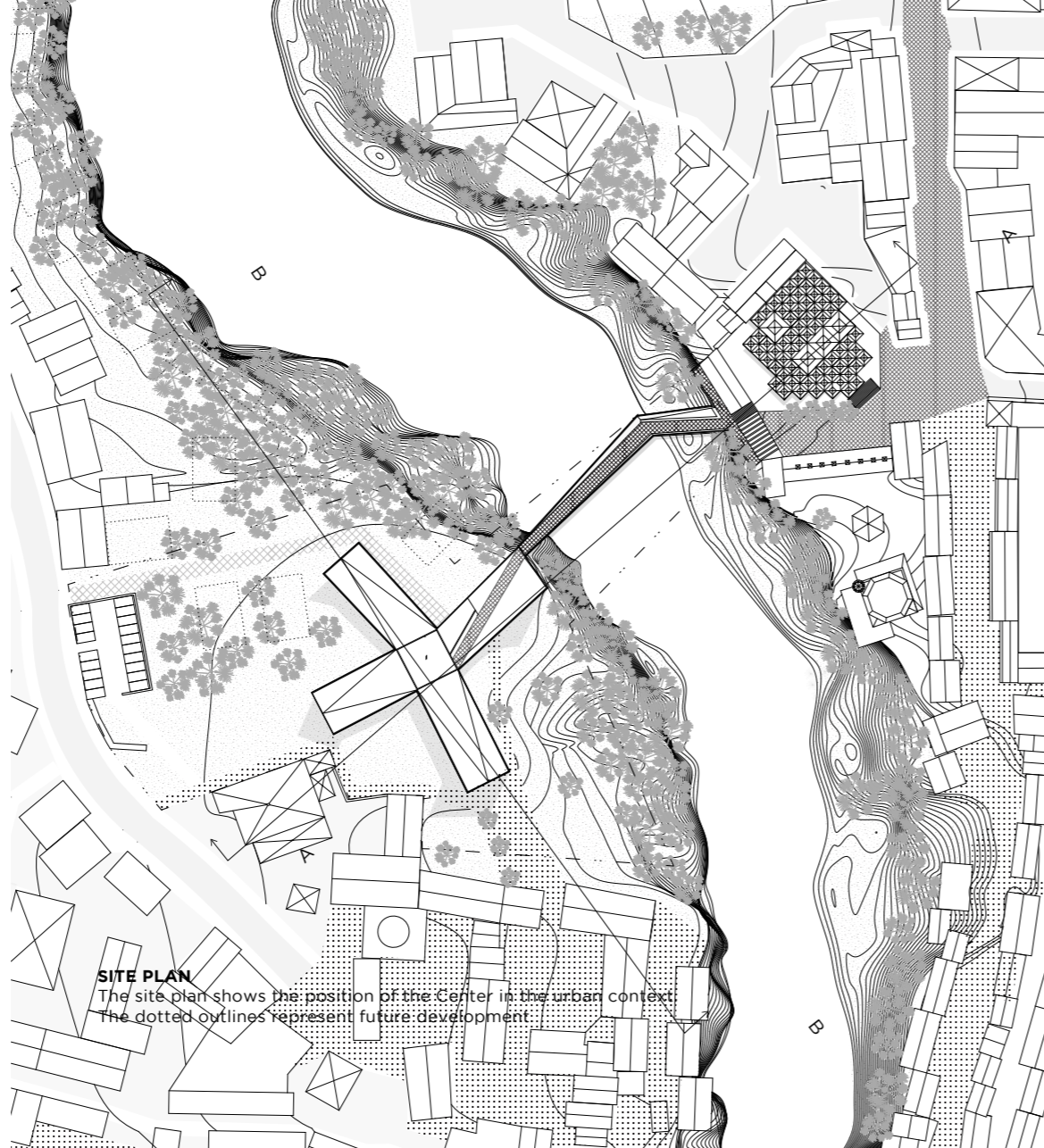
### III.3 CONTEXTUAL CONNECTION

The final design of the Center is a result of many different aspects in order to stitch together the city and attract people to and beyond the site. The contextual connections extend to more than just the directionality of the building body, it also includes the different character of the entrances and functions.

The current South entrance towards the old town can be described as introvert and mysterious, where the building frames the interior like a painting sitting in the landscape (p. 56), a painting created by the people of Mostar.

The other, more permanent, entrance is connected via the bridge to the existing food market. This part of the building serves as an art market, establishing a continuation of the existing function, thus blurring the current sharp and dividing edge. The entrance situation is in this case more dramatic and meant to create a suction of flow towards it. The East part of the function block can then be used for projections of various messages from the street art being displayed in the exhibition.

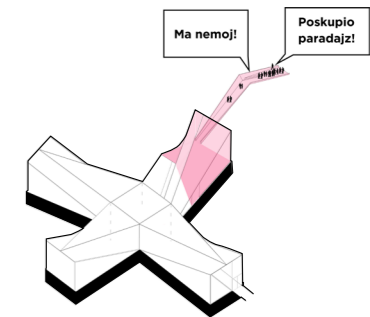
Imagine crossing the new bridge from the food market towards a provocative message that states: "Here, religion has nothing to do with God."



#### SITE PLAN

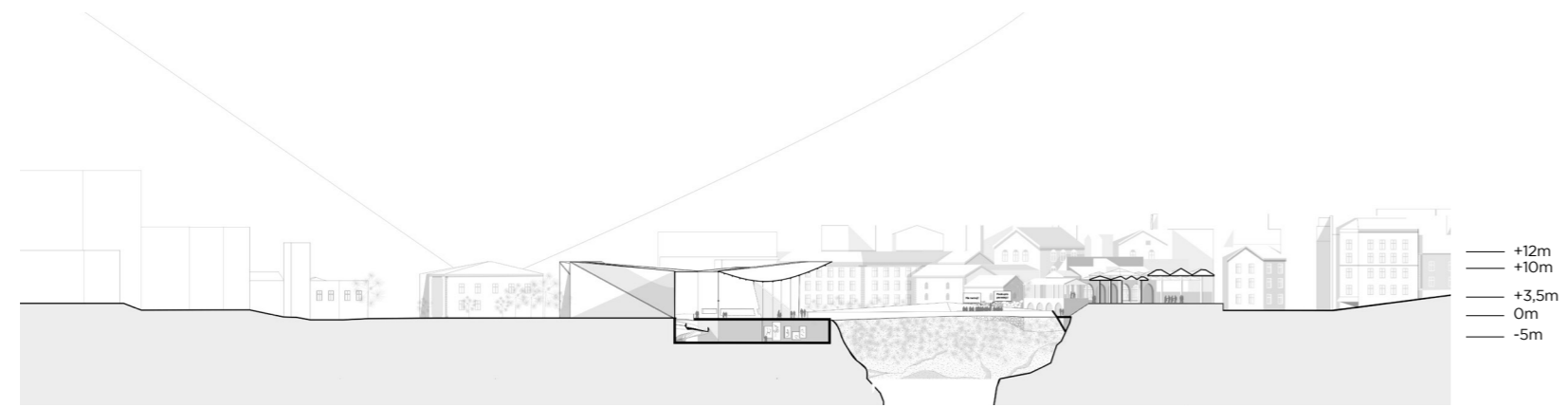
The site plan shows the position of the Center in the urban context. The dotted outlines represent future development.

**VIEW FROM THE NEW BRIDGE TOWARDS THE ART MARKET SPACE:** The function block's East wall can be used for projecting messages from the artwork inside.

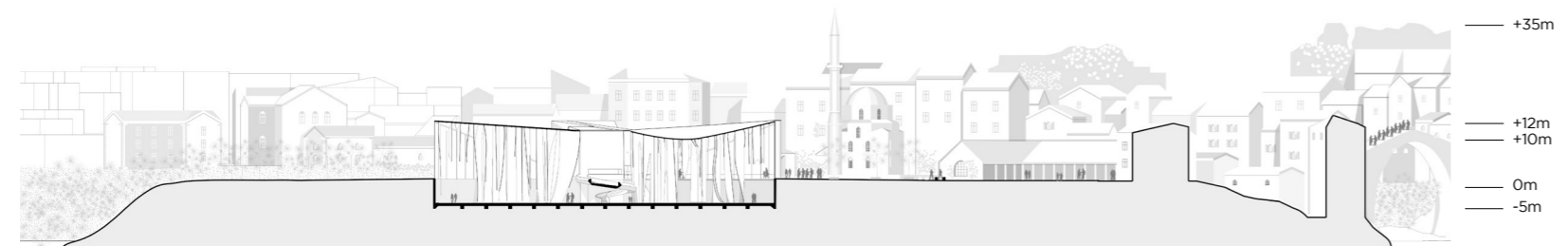


#### ART MARKET

The established art market is a public space that can continue out on the new bridge. Here people can gather for public talks or just simply to admire the view towards the Old Bridge.



**SECTION A:A**  
Connection between the Center and the existing food market.



**SECTION B:B**  
The Center ties together the old town and the new development.

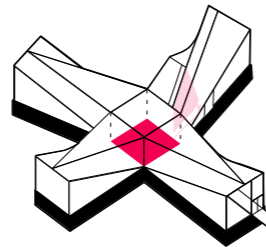


**VIEW TOWARDS THE SOUTH PART:** The building is prepared for the future development.

### III.4 THE PORTAL

Due to the final building being a result of crucial flows, their intersection becomes of importance. Where the paths meet and intersect they establish a situation, which becomes a portal between two worlds; one that is defined by the current climate in Mostar, and one that is a counter-reaction to the climate.

Because of this special condition the pathways transform when descended to the Black Box of the building - the exhibition space. They go from being linear axes to creating a sculptural communication element in the shape of a staircase, which twists down to tell the story about the transformation of itself and the people who walk on it - and by extension, Mostar.

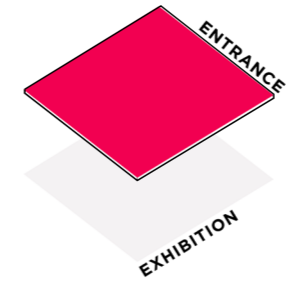


#### THE PORTAL

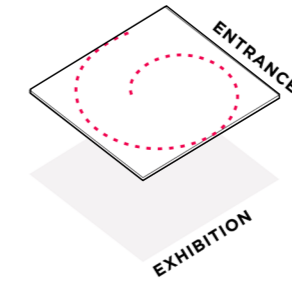
"The Portal" hosts the foyer of the exhibition space and connects to all entrances, including the future ones.

#### VIEW FROM BENEATH THE PORTAL

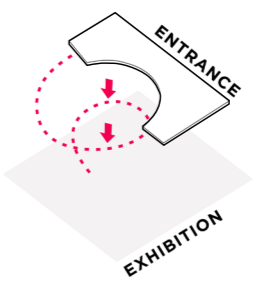




THE PORTAL



PATHWAYS TRANSFORM



TRANSFORMATION DESCENDS



FINAL STAIRCASE + FOYER

— Current pathways/entrances  
 - - - Potential future pathways/entrances

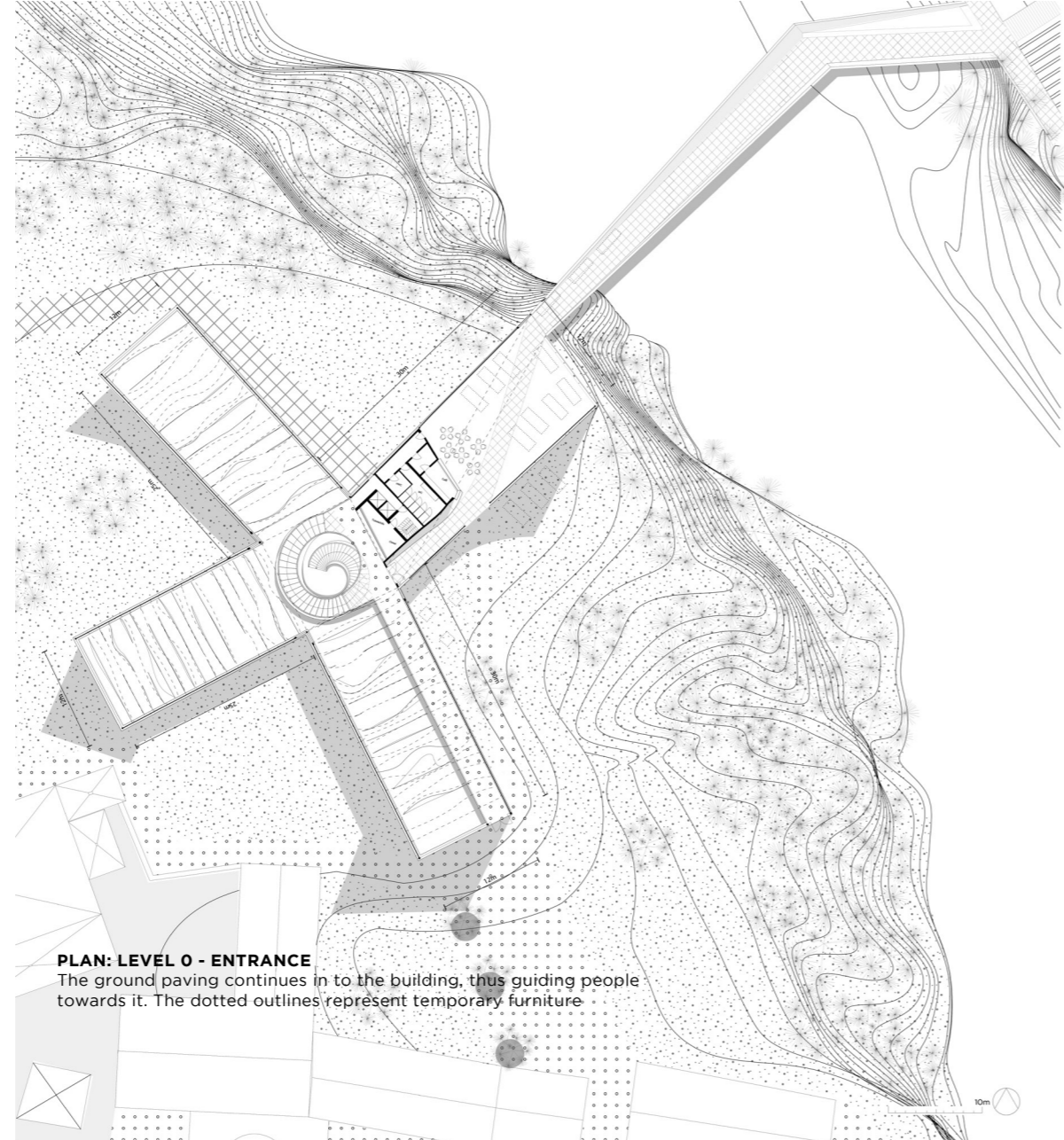
**CONCEPT ILLUSTRATION OF THE PORTAL TRANSFORMATION**  
 The intersection of established flows (pathways) create a portal between two worlds.

### III.5 LEVEL 0

In order to stitch the urban fabric even more, and strengthen the flows, the Center is making use of existing ground paving in its adjacent context to lead people towards the building.

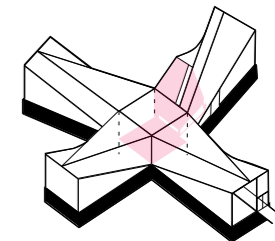
The entrance platform (which is an elevated platform seen from the exhibition space) penetrates the exhibition space and heads straight to the foyer.

From the new bridge, one is guided by the pathways and the angulated wall of the function block towards the foyer. However, one can also choose to sneak out through the opening by the café and continue to the West side.



**PLAN: LEVEL 0 - ENTRANCE**  
The ground paving continues in to the building, thus guiding people towards it. The dotted outlines represent temporary furniture

**VIEW INSIDE THE FOYER**



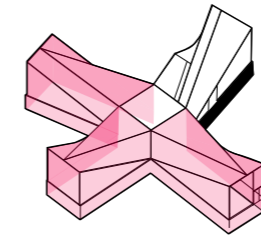
### III.6 LEVEL -1

Once descended down the staircase, one is no longer guided by the pathways on Level 0. Instead the guiding elements are the interactive walls, which now have established the anti-paths defined by previous visitors.

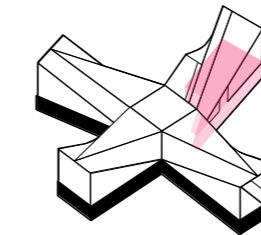
The East part of the building is host to temporary exhibitions, in order to attract more renowned artists that in turn can attract a different audience.

#### PLAN: LEVEL -1 - EXHIBITION

Here, the pathways are defined by the visitors' behavior.



**Permanent Exhibition:** Machine Learning based space.



**Temporary Exhibition:** Static space.



VIEW INSIDE THE EXHIBITION SPACE

### III.7 INSIGHTS PART III

The greatest challenges during Part III have been handling the two different performances of the building (i.e. Performance A characterized by the current climate, and Performance B a counter-reaction to the current climate), as well as tying the final result to a growing city.

In the first case, the main difficulty was that the nature of the performances was in some way contradicting each other; on one hand the building needed to guide people in its static architectural design, and on the other hand it needed to be as simplistic as possible in its architectural design in order to benefit the Machine Learning space. Because of this, there was a present fear of the building not feeling cohesive, and detached either from itself, or from its context.

However, by having both parts of the building deriving from the same diagrammatic body, Performance A could then be given the character of being carved out from the same solid as Performance B. Another thing that helped tie them together was the narrative of the pathways; that were going from being linear and static to being transformed by the dynamic ML space to a three-dimensional body.

Regarding tying the Center to a growing city, the idea about working with the existing flows and crucial additions of flows helped determine and guide the thought process behind the buildings directionality. Now, whether it would be able to help tie the Center to the growing city is hard say, because it is one of those things that can only be determined after it has been built



## PART III

Rooting the Whispers in Mostar

## FINAL DISCUSSION

Whispers of Mostar

“Can technology in architecture help mitigate contested terrain?”

Mostar is a town which has undergone many transformations throughout its history. Its collective population has over time witnessed wars, peace, various divisions of the people and is now experiencing frustrating post-war growing pains; it is excited about its future but wounded by its past.

The current division between the Muslim and Catholic population is synthetic, and a result of the religious characterization during the war in the 1990s. The division can be spotted in the constitution, the schools and the distribution of religious buildings in the town. This has encapsulated people in their filter bubbles and is threatening Mostar's prospects of a unified future.

However, in the midst of all this are voices of peace and unity, the whispers of Mostar. These unfiltered whispers are the street art, which can be spotted in the writings on walls, fences and ruins all over the town, but lack the protection and stability they need to survive. The whispers need to be rooted in the town and seen by everyone in Mostar.

Therefore, I have chosen to introduce a Center for Contemporary Art, that hosts an exhibition space that aims to take people out of their filter bubbles by exposing them to art/messages that they would not have been inclined to take part of on their own.

In order to achieve this in an unbiased manner, Machine Learning is introduced to the exhibition space to analyze the behavior of the visitors to establish anti-paths, aiming to guide people towards the artwork they would not have been inclined to take part of on their own. The analysis made by the machine is unbiased and free of prejudice,



WHISPERS  
OF MOSTAR



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