DOMINIC WEBER

21.06.2000	Born in Erlangen (GER)
2000 - 2005	Early years in Nürnberg (GER) and Strasbourg (FRA)
2005 - 2011	Primary school in Lubumbashi (DRC)
2011 - 2018	Middle- and highschool in Ferrette (FRA) and St.Louis (FRA)
2018 - 2019	BHS Stages 1-4 at the Talland School of Equitation, Cirencester (GBR)
2019 - 2020	Level 1 Bespoke Tailoring at Newham College, London (GBR)
2020 - 2023	BSc Architecture at the EPFL, Lausanne (CH)
2023 - 2024	Internship at Burckhardt Architecture, Basel (CH)
2024 -	MSc Architecture at the ETHZ, Zürich (CH)
2025 -	Teaching Assistant at Gramazio Kohler Research, ETHZ (CH)
C2	German, French, English
A2	Italian, Japanese

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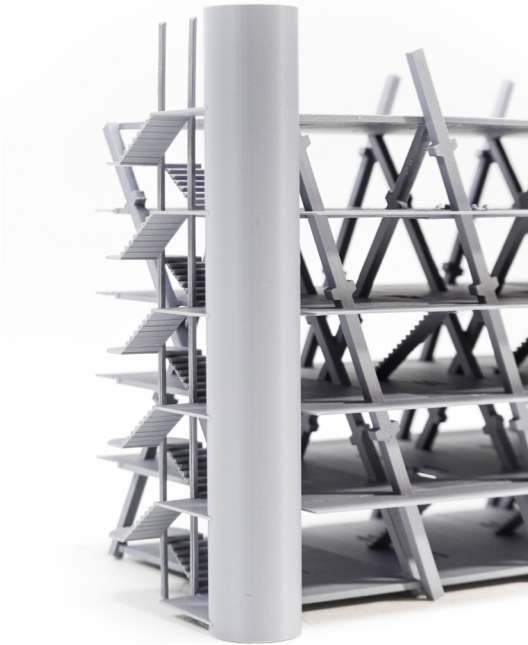
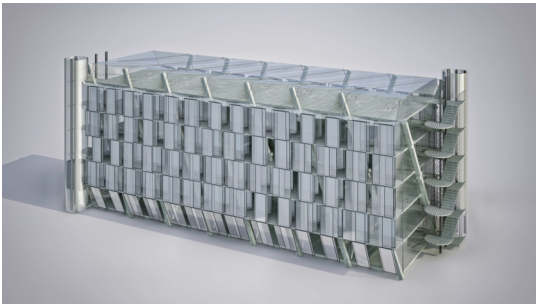
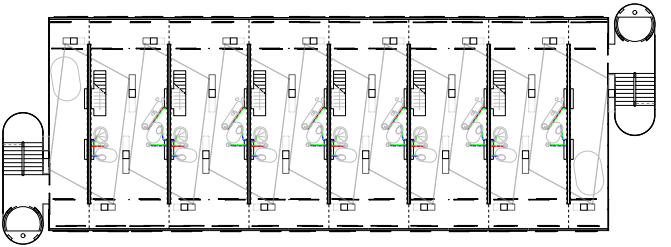
1

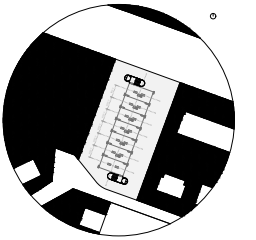
THE LOOM

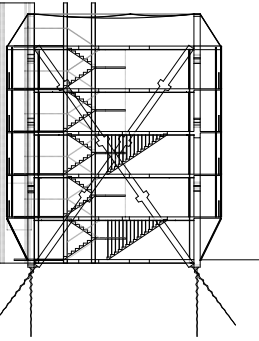


→ **HS25, with SVNM, ETHZ.**
Reusing dissembled building components from a catalogue, this project harnesses tensegrity and other structural solutions to offer a CO2-positive building, radically pushing typologies to establish a design language around tension.

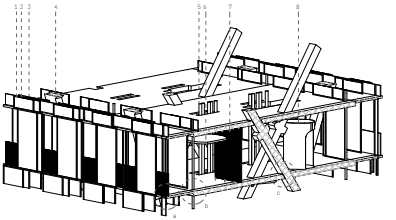


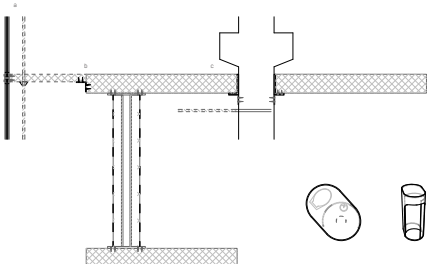


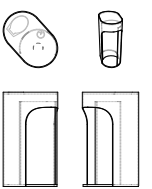




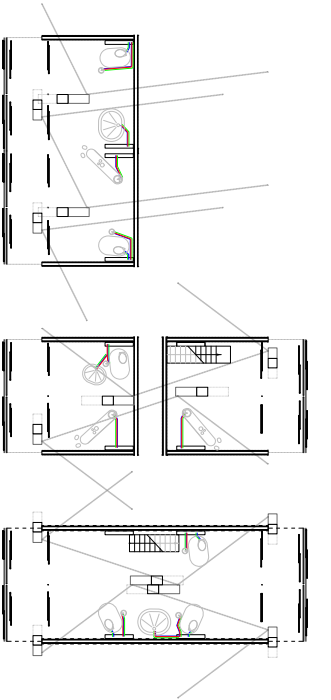
1 Three layers of ETFE stretched over a metallic frame
2 One railing of metallic mesh stretched over a metallic frame
3 One layer of Hemp twill stretched over a metallic frame
4 Single-pane glass doors, fully movable
5 Hot and cold air, hot and cold water, wastewater pipes. Principle of a convective pump using the building skin
6 Acoustic felt ceiling
7 Acoustic walls made of one sheet of metallic mesh stretched between the floors, fiber insulation, hempclay board
8 Prefab watroom made of corrugated metal, insulation and ceramics

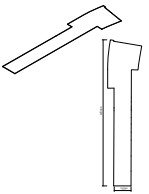


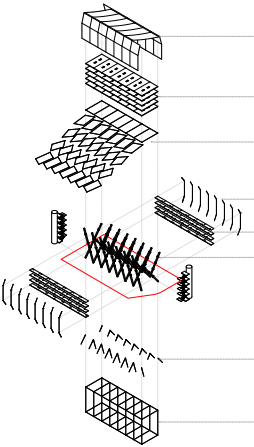


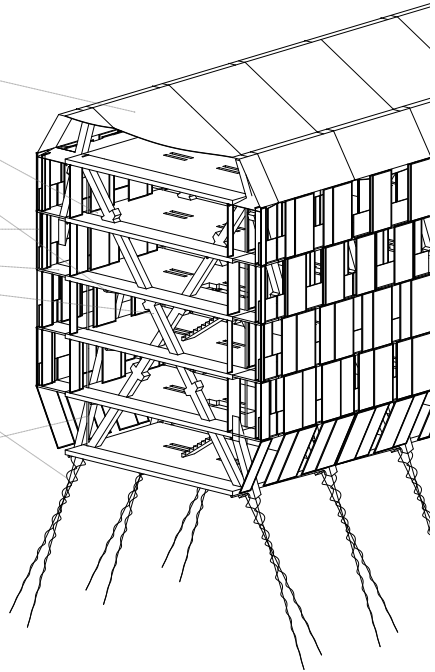


The wet room has a rotary door with a sink that optimizes space depending on the use. 8



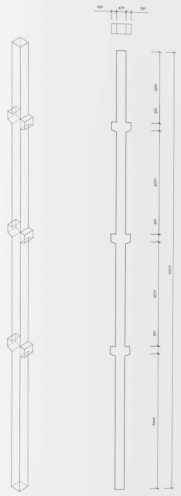






1	Facade	Hemp, ETFE, Mesh			
2	Floorslabs	In situ concrete	C-85-AWB	cut to 42 pieces of 12 × 6 × 0.25 m	+ 158,856.9 kgCO2-eq
3	Cables	Steel cables			- 4,488.93 kgCO2-eq
4	Cables	Steel cables			- 1,339.25 kgCO2-eq
5	Balconies	Garage walls		56 of 56 pieces	+ 15,393.88 kgCO2-eq
6	Columns	Reinforced concrete	C-881-PLB	28 of 54 pieces	+ 90,874.44 kgCO2-eq
7	Foundations	Steel geoscrews		28 pieces	- 6,994.17 kgCO2-eq
8	Cables	Steel cables			- 4,144.6 kgCO2-eq
				Total CO2	+ 252,366.4 kgCO2-eq
				Total weight	2,278,485 kg
				Total floor surface (garages, roof excl.)	2016 sqm
				CO2 per sqm	+ 125.2 kg kgCO2-eq

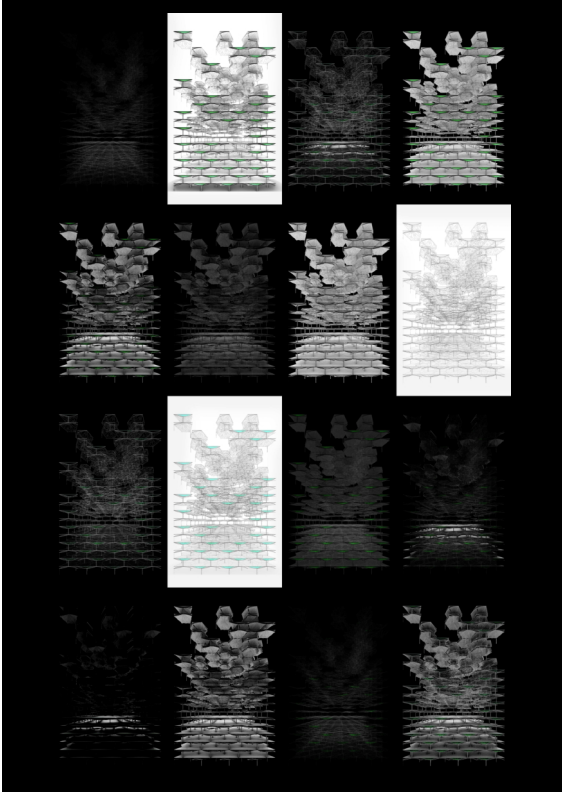
C-001-PLB



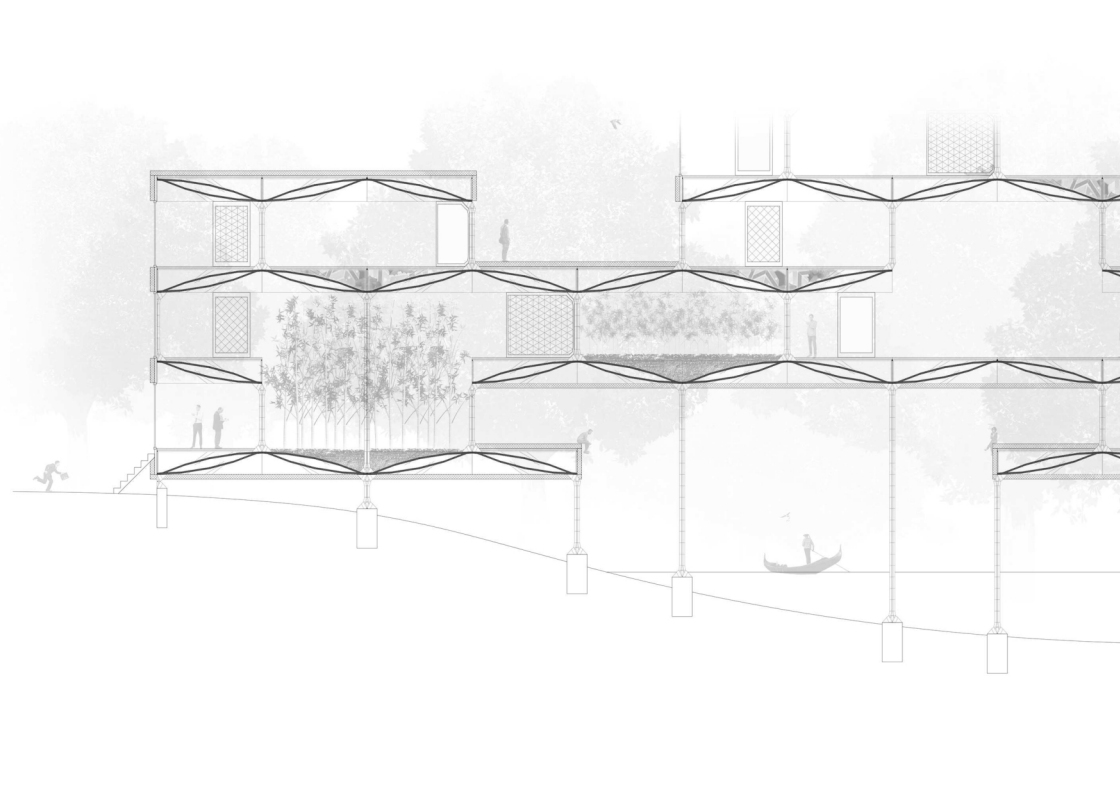
ID	C-001-PLB	Year of construction	1970
Description	Reinforced concrete column	Distance to HB Zürich	90
Material	Concrete	Status	Dismantreled
Dimension (m)	30.15 x 0.47 x 0.57	Storage	Walkweg, Basel
Amount	54	CO_2e [kg/m^3]	440
Mine	Parkhaus Lysbüchel, Basel	Source	Zirkulsr

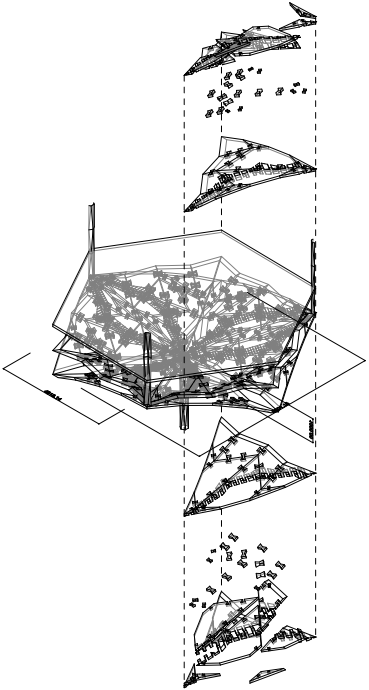
2

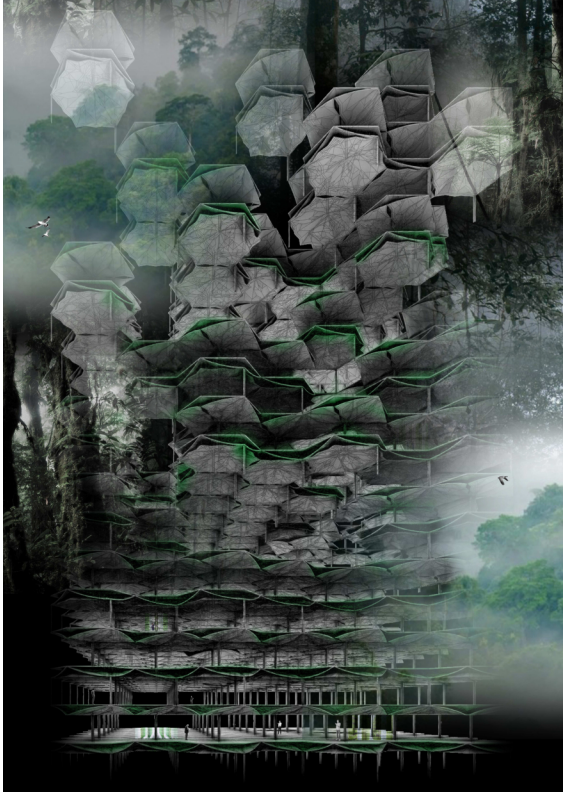
LIFE ON THE SLAB

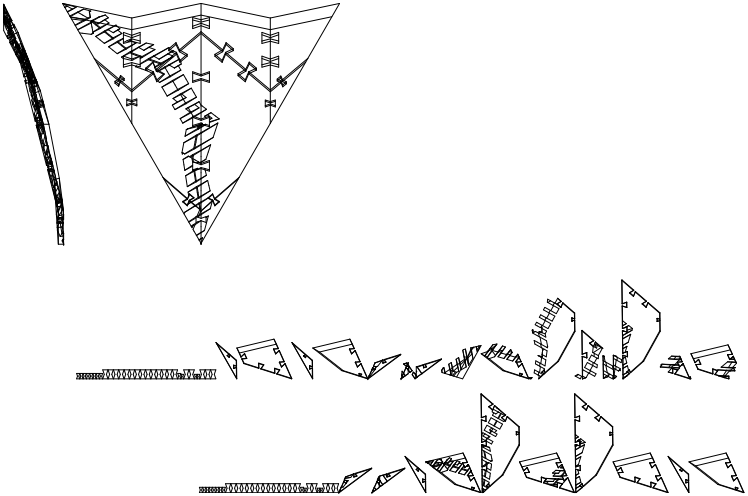


➞ **FS23, with Prof. Weinand, iBois, EPFL.**
A formula of a non-centric urban agglomeration with at its heart a slab made of small pieces out of local material that can be put together at a small scale by local people - architecture as a fluctuating symptom of life and society.



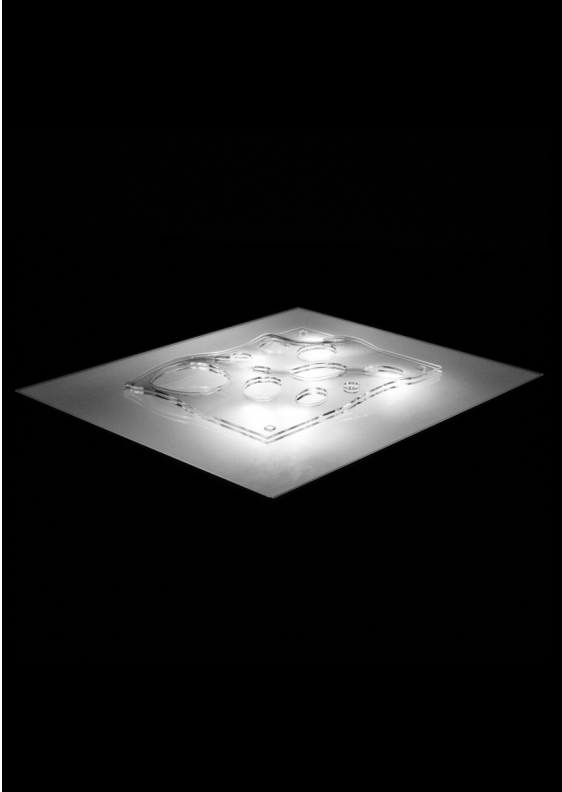






3

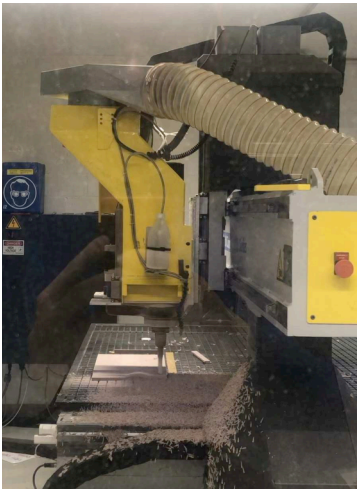
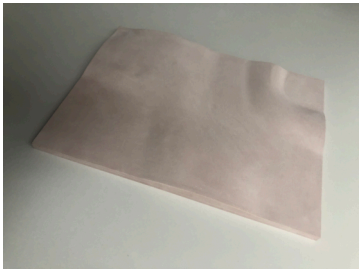
LIT VACUUM

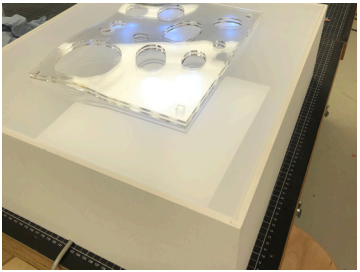


➡ **SKILL HIGHLIGHT: PHYSICAL MODELS**

➡ **FS25, with the RAPLAB, ETHZ.**
Model study of the Rolex Learning Center in Lausanne.
Acrylic, MDF, LEDs, copper wire. Use of 3-Axis CNC-milling, Thermo- & Vacuum-forming, Laser-cutting.



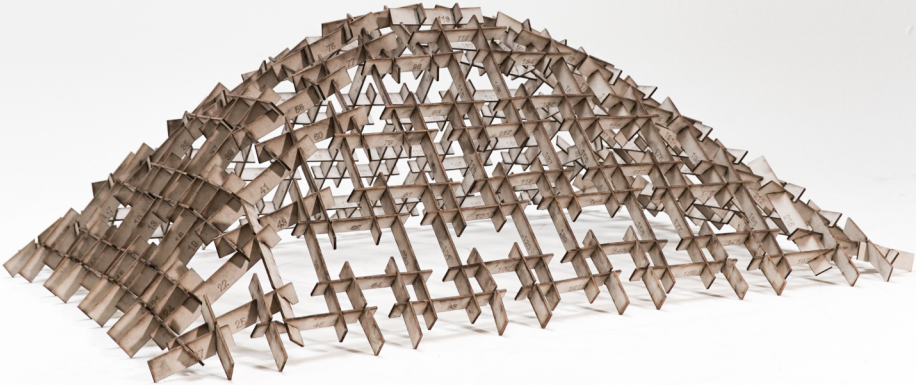


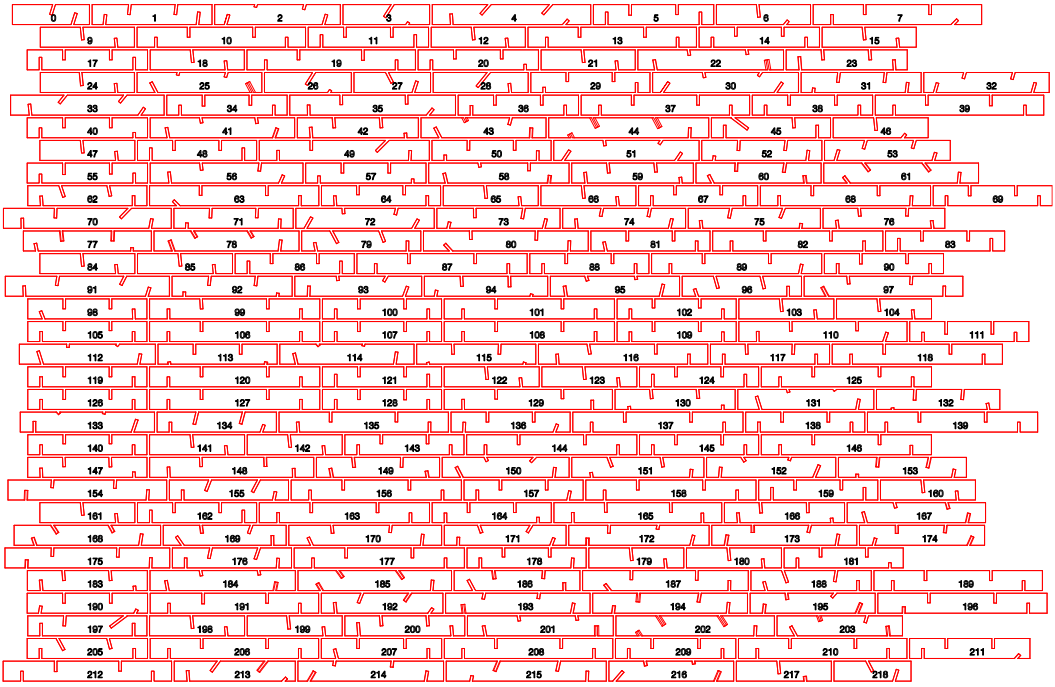
4

RECIPROCAL ROOF

➡ **SKILL HIGHLIGHT: DIGITAL DESIGN AND FABRICATION**

➡ FS25, with Prof. Gramazio and Prof. Kohler, ETHZ.
Digital Design and Fabrication exercise of a Zollinger-type roof, with optimised cutting files. Entirely written in Python.
Cardboard. Use of Laser-cutting.

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55 56 57 58 59 60 61
62 63 64 65 66 67 68 69
70 71 72 73 74 75 76
77 78 79 80 81 82 83
84 85 86 87 88 89 90
91 92 93 94 95 96 97
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112 113 114 115 116 117 118
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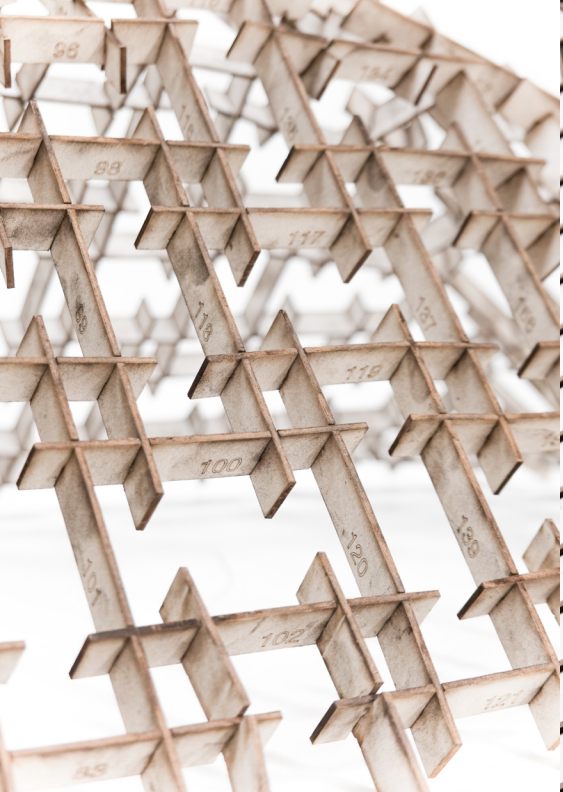
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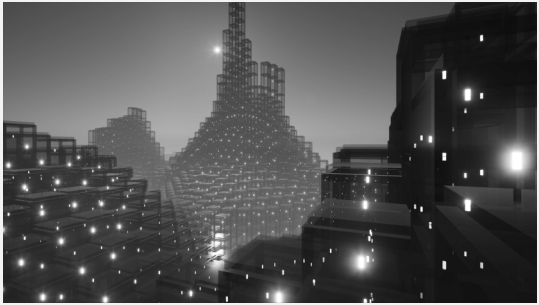
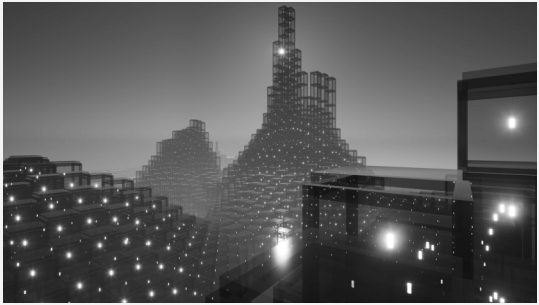
5

HUNGRY WAVES

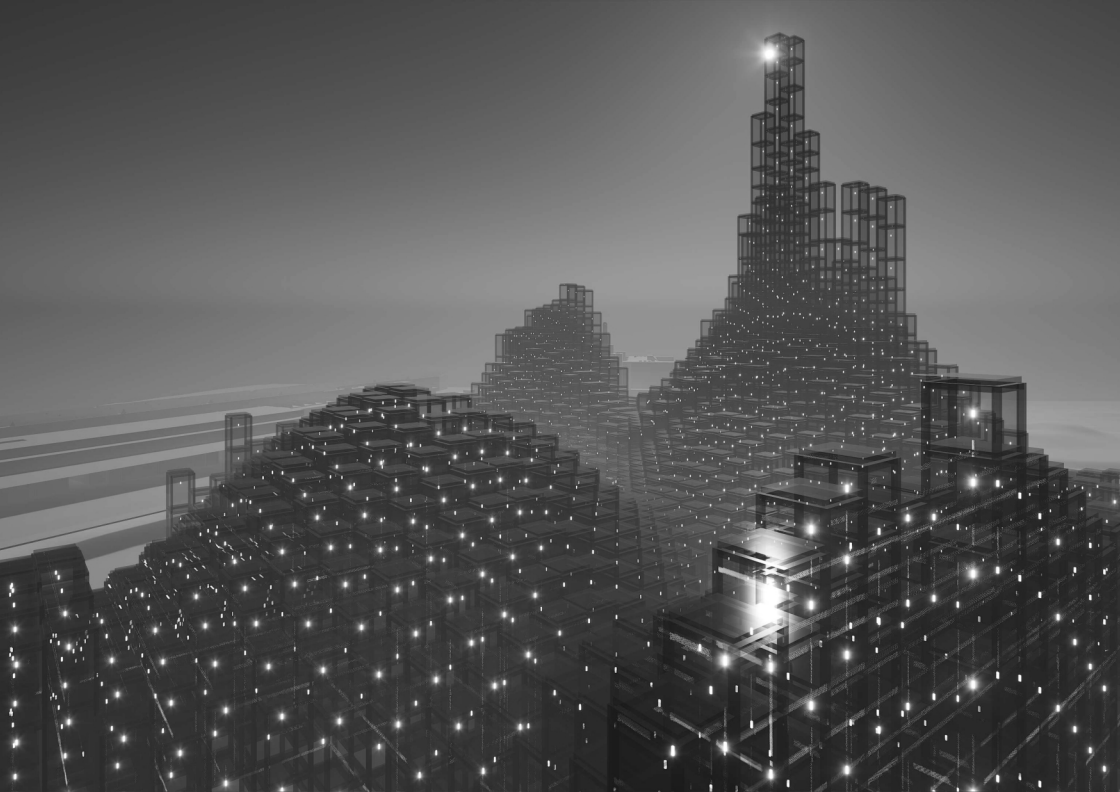


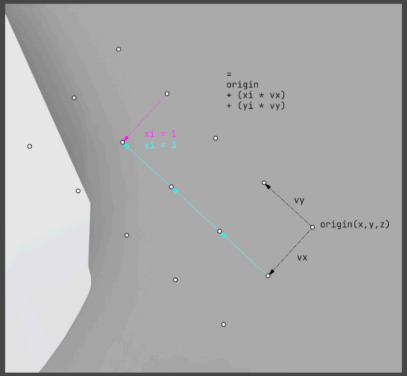


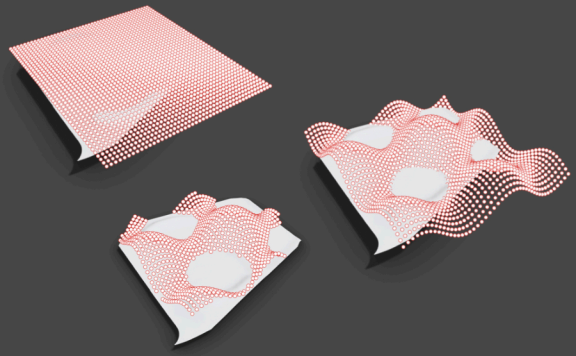
➡ **SKILL HIGHLIGHT: CODING**

➡ HS24, with Prof. Gramazio, ETHZ.

Waves in plan. Waves in height. Waves in stories.
A sinusoidal wave spreads its modules on the given plot. The modules vary in waves of sinusoidal heights. The closer to an outside building the wave comes, the higher soar its stories; engulfing, immense, hungry. A landscape of hungry waves.

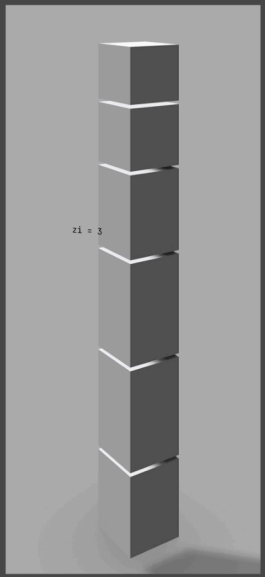






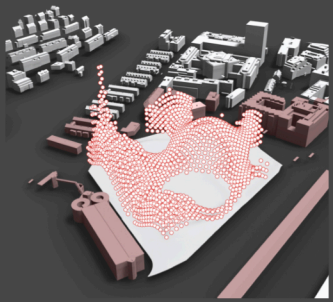
```
vector_x = Vector.Xaxis().rotated(2.4)
vector_y = Vector.Yaxis().rotated(2.4)
vector_x = vector_x.unitized()
vector_y = vector_y.unitized()

for ix in range(x):
    for iy in range(y):

        #ROTATE, get the new vectors
        origin_v_x = vector_x.scaled(ix * x_size)
        origin_v_y = vector_y.scaled(iy * y_size)

        #ORIGIN, get the new 0, first uniform 2D grid
        a_point = Point(origin.x, origin.y, origin.z) + origin_v_x + origin_v_y
        points.append(a_point)
```

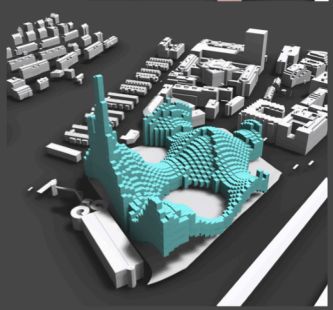
```
for ix in range(x):
    for iy in range(y):

        carpet_v = amplitude * 15 * (math.sin(ix * x_size * 10) + math.sin(iy * y_size * 10)) + 10
        last_height = origin.z + carpet_v

        #point1 = Point(point.x, point.y, last_height) + origin_v_x + origin_v_y
        point1 = Point(origin.x + ix * x_size, origin.y + iy * y_size, last_height)
        point1_r = point1.rotated(2.4, Vector.Zaxis(), origin)

        #discriminate the wave to the plot
        if not rbrep.contains(point1_r):
            continue
        points.append(point1)
```



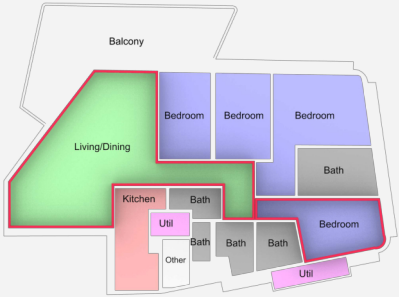

```python
def min_d(cpoint):
    min_distance = float('inf')
    for vertex in meshes.vertices():
        vertex_point = Point(*meshes.vertex_coordinates(vertex))
        distance = distance_point_point(cpoint, vertex_point)
        if distance < min_distance:
            min_distance = distance

    return min_distance
```

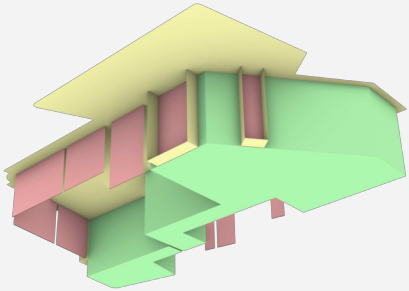
```python
#point1 = Point(point.x, point.y, last_height) + origin_v_x + origin_v_y
point1 = Point(origin.x + ix * x_size, origin.y + iy * y_size, last_height)
point1_r = point1.rotated(2.4, Vector.Zaxis(), origin)

#get the story heights for each point
a_factor = min_d(a_point)
c_factor = 1 + 100/a_factor

for iz in range(int(c_factor)):
    n_size = z_size + (s_amplitude * (1+math.sin(iz)))
    n_z = last_height + n_size

    box = Box.from_corner_corner_height(point1, point2, n_size)
    box = box.rotated(2.4, Vector.Zaxis(), point)
    boxes.append(box)

    point1 = Point(origin.x + ix * x_size, origin.y + iy * y_size, n_z)
    points.append(point1)

    point2 = Point(point1.x + x_size, point1.y + y_size, last_height)
    last_height = point1.z
```





APARTMENT IN SINGAPORE

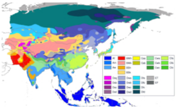


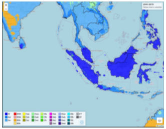


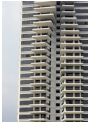
➡ **SKILL HIGHLIGHT: BUILDING SYSTEM ANALYSIS**

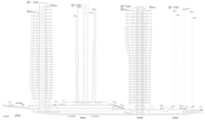
➡ FS25, with Prof. Schlüter, ETHZ.
Analysing a given apartment in Singapore on climate-relevant factors, and using high-precision computational simulation tools, a detailed and justified improvement is proposed.

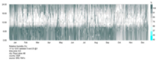
URBAN CONTEXT & CLIMATE ANALYSIS



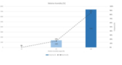






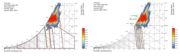


Annual hourly relative humidity, when RH >70% and <35%

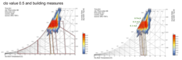


Histogram of annual hourly relative humidity

clo value 1.0 and building measures



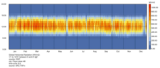
clo value 0.5 and building measures



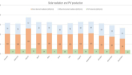
Singapore has a tropical climate, characterized by its proximity to the equator, which results in consistently high temperatures throughout the year. Relative humidity is persistently elevated, typically exceeding 70%, contributing to a warm and humid environment. In response to this climate, traditional vernacular architecture in the region emphasizes strategies such as cross and vertical ventilation to enhance indoor thermal comfort without relying heavily on mechanical systems.

In this case study, we aim to analyze the performance of a contemporary residential apartment within this climatic context. The unit selected is located on the 18th floor of one of the towers in D'Leedon, a residential complex designed by Zaha Hadid. The building features a massive concrete structure and large glass openings, with limited external shading apart from balconies. Moreover, the apartment lacks effective cross-ventilation.

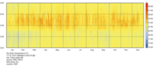
These design characteristics raise concerns regarding the indoor comfort of occupants and the energy performance of the building. The objective of this project is to evaluate the thermal and energy performance of the selected apartment and to identify the key factors influencing its efficiency and occupant comfort.



Annual hourly global irradiation on a horizontal surface

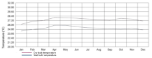


Monthly global, diffuse and direct horizontal irradiation and PV production

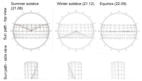


Annual outdoor dry-bulb temperatures above 26 and below 12 °C

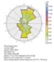
Histogram of annual hourly outdoor dry-bulb temperature



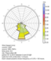
Average monthly per hour dry- and wet-bulb temperature



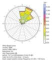
Sun path



Annual wind-rose diagram



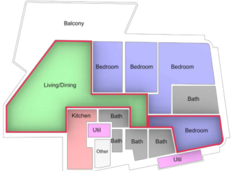
Wind-rose diagram (June-July-Aug.)

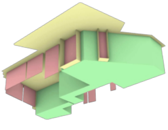


Wind-rose diagram (Dec.-Jan.-Feb.)

Wind

BUILDING SIMULATION, ENERGY DEMAND, THERMAL COMFORT, DAYLIGHT, AIRFLOW





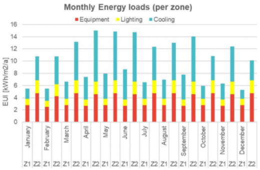
3D image of building design showing windows and shaders

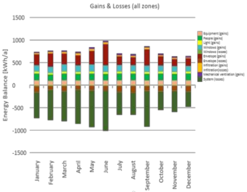
For the analysis of the building's performance, two distinct zones within the apartment were considered: the living room and one of the bedrooms, which are located on opposite sides of the unit. The living room is oriented primarily towards the north/north-west and features a wide balcony that provides shading from direct solar radiation. Additionally, the room has relatively small openings, which help minimize heat gain. In contrast, the selected bedroom faces south/south-east and includes two large, unshaded windows, making it more susceptible to solar gains. These two spaces are considered representative of the overall apartment layout and usage patterns.

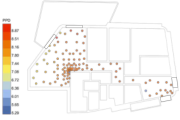
As expected for a tropical climate, the energy demand is predominantly driven by cooling needs throughout the year. Zone 2 (the bedroom) exhibits a higher cooling load compared to Zone 1 (the living room), largely due to its orientation and lack of shading.

An examination of internal gains and losses highlights the dominant impact of the mechanical cooling system compared to other contributing factors. It is also noteworthy that the building envelope results in more heat gains than losses. This can be attributed to the construction materials: the façade is predominantly made of concrete, which absorbs heat during the day and retains it overnight. Due to the minimal drop in nighttime temperatures in Singapore, the structure is unable to effectively dissipate the stored heat, thereby contributing to indoor thermal discomfort.

In terms of comfort analysis, December 21st was used as the "heating design day" and June 21st as the "cooling design day." The thermal comfort maps displayed on the left present the results at noon for both days. During the heating design day, comfort values remain within acceptable limits (PMV below +0.5), indicating thermal acceptability. However, on the cooling day, comfort values exceed the acceptable threshold at midday, indicating significant discomfort. When examining the entire cooling day, the number of discomfort hours approaches 12, representing approximately 50% of the total time.

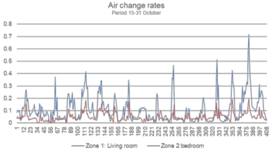


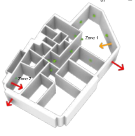




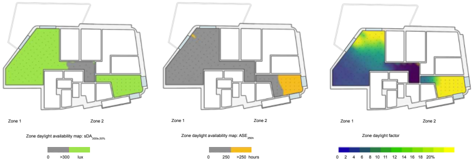
3D or top view image of thermal comfort maps for a "heating" design day (PPD)

3D or top view image of thermal comfort maps for a cooling design day (PPD)





BUILDING SIMULATION EXTERIOR RADIATION, PHOTOVOLTAIC YIELD



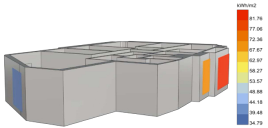
Regarding daylight availability, both zones show strong performance, indicating minimal reliance on artificial lighting during the day. Specifically, the Spatial Daylight Autonomy (sDA) is 92.86% in Zone 1 (living room) and 100% in Zone 2 (bedroom), meaning these areas receive adequate natural light for more than 50% of the occupied hours. However, Zone 2 also experiences significant overexposure, with an Annual Sunlight Exposure (ASE) of 64.29%. This level of daylight penetration may cause visual discomfort due to glare and contribute to increased cooling loads from solar heat gains. These results highlight the importance of incorporating design interventions to mitigate overexposure and enhance comfort.

The main factors influencing daylight availability and solar gains include window orientation, glazing size, and the presence or absence of external shading. In this case, large, unshaded windows help maximize daylight performance but simultaneously raise the risk of overheating—an especially critical issue in Singapore's consistently warm and humid climate.

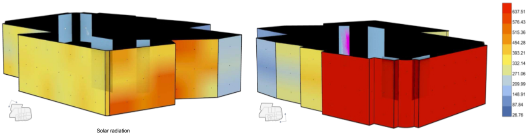
In terms of solar irradiation, the apartment receives a significant amount of solar exposure, particularly on the south and southeast façades. Measurements indicate a total exposure of approximately 469.33 kWh/m², influenced by the apartment's orientation, the equatorial solar path of Singapore, and the geometry of the façades. This high level of solar input presents an opportunity to integrate photovoltaic (PV) panels as a strategy for improving the building's energy performance.

Given the architectural constraints of the unit—namely limited roof space and complex geometry—the installation of PV panels was explored on the opaque façade surfaces with the highest exposure. The design includes two panels installed on the south façade to capture direct sunlight, and one panel on the north façade to utilize diffuse solar radiation. The PV panels used have an efficiency rating of 20%, paired with a battery storage system with a 30 kWh capacity and a charge/discharge efficiency of 90%.

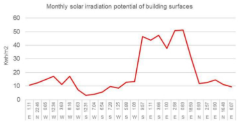
Simulation results show that this PV system can generate energy equivalent to approximately 55% of the apartment's total annual energy demand. Although it does not cover the full consumption, the system significantly reduces dependence on the grid, particularly for cooling needs, and contributes meaningfully to the overall energy resilience and sustainability of the unit.

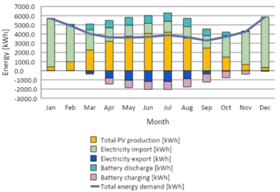


3D image of PV system on the building



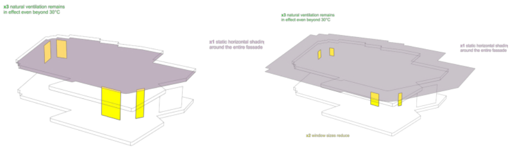
Solar radiation

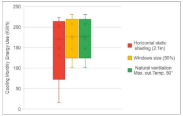


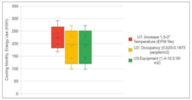


Graph of electricity demand and production, and monthly battery charging and discharging

SENSITIVITY AND UNCERTAINTY ANALYSIS







We're exploring static shading, natural ventilation and window size.
We're analyzing the drybulb temperature, the occupancy and the internal loads.

x1: Shading is the most fundamental passive measure you can use in hot and humid climates. The offset of the new shading slab is between 0 and 2.1m, so as to align with the balcony at its maximum.
x2: Ventilation is the second important passive measure, however, since the climate is already humid, it is less powerful than in a dry and hot environment. We use the windows to have natural ventilation, but want to reduce solar heat gains. Their size is therefore very strategic. We vary their size between 0.5* and 1* of their original size.
x3: We change the natural ventilation behavior to fit a more passive based approach. Ideally we would implement cross-ventilation. We vary the max.out.temp between 33°C and 50°.

u1: the Drybulb temperature increases between 1.5°C and 2°C, as projected in Singapore. With climate change as our main topic, this was our main interest.
u2: with Singapore an extremely dense city which is projected to grow even further without being able to expand the same, a higher people density was an important factor to test. We varied it between 0.025 and 0.1875 P/m^2.
u3: with growing digitalization and children's online literacy being ever more evident, the equipment active in normal households is a very interesting phenomenon. We varied the EPD between 1.4 and 10.5 W/m^2.

We chose to compare these variables on the Cooling Monthly Energy Use. Our goal is to create a low-energy climate-friendly housing unit in Singapore. Cooling being by far the most important energy use, the goal is to reduce that.

For this design optimization, we used the main parameters that influence the cooling energy consumption: the static shading (varying between 0 and 2.1m), the window size (between 1* and 0.5* of their original size) and the orientation of the apartment (between 0 and 180° difference to the original orientation).
We aim to minimize the cooling energy use. For clarity's sake, we use the sum of the yearly cooling energy consumption. Our cost function is therefore: min f(x) = CoolingEnergyUse (in kWh/a).

This means that as expected, the optimal values for (x, y, z) are **(1,1,-1)**, or translated into non-normalized values: **(0.5, 2100, 0)**.

This gives us a final cost-value of **f(0.5, 2100, 0) = 1243.162524 kWh/a**.
This is **337.743129 kWh/a** less than the maximum of this function.

Singapore remains a very difficult climate to deal with. The best chance is to ventilate as much as possible, and keep cross-ventilation to a maximum. This is not possible in this apartment, and should be kept in mind when designing any Singapore project. Shade should also be provided by plants, which can also release moisture and sweat, thus cooling the apartments behind them. Living facades could therefore be an interesting option.

OPTIMISATION

f1	f2	f3	f4	f5	f6	f7	f8	f9	f10	f11	f12
-1.-1.-1	-1.-1.1	-1.1.-1	-1.1.1	1.-1.-1	1.-1.1	1.1.-1	1.1.1	0.0.0	0.-1.0	0.-1.1	0.1.-1
164.794659	182.55974	137.819096	182.540591	143.68704	182.55974	126.382844	182.540591	176.606693	177.235636	182.55974	131.344496
146.563032	161.374919	120.638178	161.359911	127.205727	161.374919	115.261926	161.359911	154.12326	154.447487	161.374919	116.500426
143.680911	156.97734	126.912541	156.959997	129.347754	156.97734	117.814351	156.959997	147.567632	147.874483	156.97734	120.905867
157.930905	154.172532	138.4332	154.157637	138.311701	154.172532	129.996716	154.157637	146.963975	147.120925	154.172532	133.328386
156.091826	155.282149	140.928359	155.266312	143.801841	155.282149	133.426138	155.266312	149.52195	149.651912	155.282149	136.332765
197.352566	174.938916	152.664104	174.920318	163.381208	174.938916	149.758185	174.920318	170.244209	170.432907	174.938916	150.512543
94.126583	105.381626	94.058038	105.371064	96.419154	105.381626	89.03545	105.371064	102.116085	102.188073	105.381626	90.745638
98.893359	109.087134	96.960187	109.076451	99.842046	109.087134	91.102964	109.076451	107.391279	107.470481	109.087134	93.117843
195.229646	178.714073	151.466089	178.694475	160.823171	178.714073	146.194407	178.694475	176.08719	176.35186	178.714073	147.876925
23.807128	30.053357	25.043652	30.049752	25.341222	30.053357	23.176848	30.049752	28.893964	28.940314	30.053357	23.771178
76.3548	104.994079	79.820613	104.985365	80.698386	104.994079	75.49816	104.985365	96.977889	97.19636	104.994079	76.833831
43.44711	67.371788	47.801652	67.366314	49.206858	67.371788	45.514535	67.366314	63.826131	63.99554	67.371788	45.814209
1498.272525	1580.905653	1312.545709	1580.748187	1358.066108	1580.905653	1243.162524	1580.748187	1520.320257	1522.905978	1580.905653	1267.084107
1390.629883	1618.445086	1315.39355	1543.208753	1390.629883	1670.842487	1367.790951	1595.606154	1545.246799	1558.288455	1571.326112	1584.365769

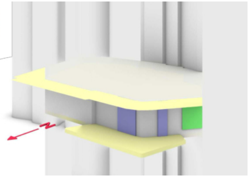
$$f(x, y, z) = 1493.118 - 26.199x - 37.618y + 113.908z$$

```
Case 1: Actual=1498.27, Predicted=1443.03, Error=55.25 (3.69%)
Case 2: Actual=1580.91, Predicted=1670.84, Error=89.94 (5.69%)
Case 3: Actual=1312.55, Predicted=1367.79, Error=55.25 (4.21%)
Case 4: Actual=1580.75, Predicted=1595.61, Error=14.86 (0.94%)
Case 5: Actual=1358.07, Predicted=1390.63, Error=32.56 (2.40%)
Case 6: Actual=1580.91, Predicted=1618.45, Error=37.54 (2.37%)
Case 7: Actual=1243.16, Predicted=1315.39, Error=72.23 (5.81%)
Case 8: Actual=1580.75, Predicted=1543.21, Error=37.54 (2.37%)

MAE: 49.39
R²: 0.8304
```

$$x_{physical} = 0.75 + (0.5/2) \cdot x^* = 0.75 + 0.25 \cdot 1 = 1.0$$

$$y_{physical} = 1050 + (2100/2) \cdot y^* = 1050 + 1050 \cdot 1 = 2100$$

$$z_{physical} = 90 + (180/2) \cdot z^* = 90 + 90 \cdot (-1) = 0$$



7

VOICES OF RENOVATION - ON SOCIETY

➡ **SKILL HIGHLIGHT: FILMMAKING**

➡ HS24, with Prof. Brandlhuber, ETHZ.
Done within the European Commission's initiative HouseEurope!, interviewing ETHZ's professors and diploma students, this video essay makes a case for renovation, and against demolition.

➞ Projects on Machine Learning, advanced Coding, Computational Design and Fabrication can be submitted on request.