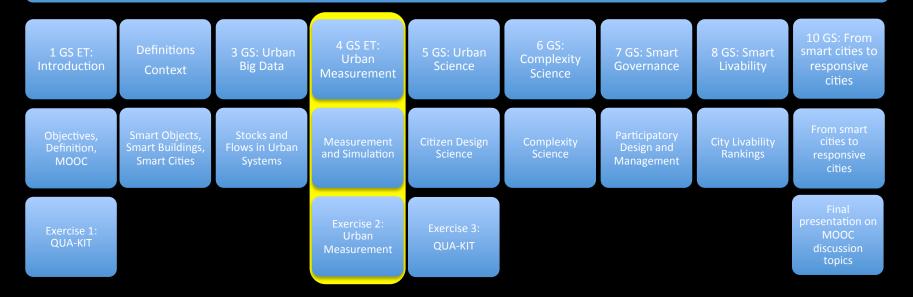
SMART CITIES **Gerhard Schmitt** Spring Semester 2017, ETH Zürich 13.3.2017 **L**4

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Smart Cities



The story so far:

- 13.3.2017 Can you improve what you do not measure?
- 6.3.2017 Big Data as new urban raw material, made useful with Information Architecture and with the Stocks and Flows concept
- 27.2.2017 From smart houses to smart cities emerging criteria for smart cities as urban systems
- 20.2.2017 Cities are complex systems. Ideally, they are sustainable, resilient, livable, smart, and finally responsive – from production machines to human habitat

Quote from "The Responsive City"

"I have a rule of thumb: if you can't measure it, you can't manage it"

June 2014, Michael Bloomberg, Former Mayor of New York City



Open Knowledge for the digital society

The Open Knowledge Foundation Germany is a nonprofit organization that advocates open knowledge, open data, transparency, and civil participation.

Learn more about our organisation, our goals, and our projects.



25 OK Lobs develop tools for digital cities all over Germany.



20,000+ requests

have been made by citizens at FragDenStaat.de.

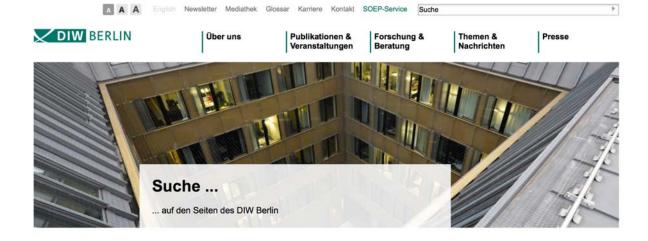


300 young coders

experimenting with code and friendship at Jugend hackt.

1.2 million Euros

for open source projects through the **Protoype Fund**.





Ungefähr 4.360 Ergebnisse (0,60 Sekunden)

-> DIW Berlin: Angst und Ärger: Dimensionen sozialer Ungleichheit

Kurzum: Wir untersuchen, ob das Erleben von Emotionen - vor allem der Gefühle Angst und Ärger - eine Dimension sozialer **Ungleichheit** ist und gehen der ... https://www.diw.de/de/diw_01.../schupp_rgen.html?...



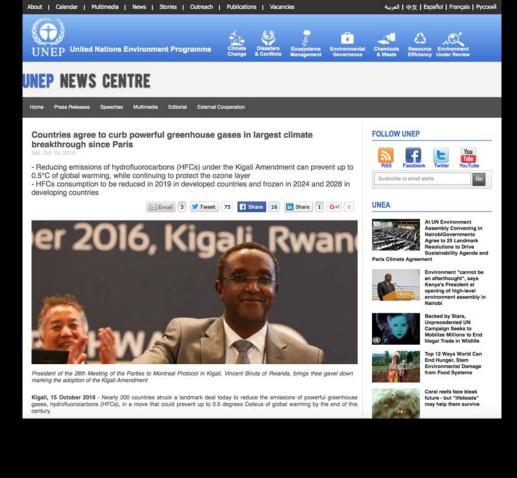
-> DIW Berlin: "Der Konsum wird durch die gestiegene

vor 4 Tagen ... Tatsächlich wäre das Wachstum in Deutschland etwas höher gewesen, wenn die **Ungleichheit** zwischen 1991 und 2015 nicht so deutlich ...

www.diw.de/sixcms/detail.php?id=diw_01.c.554120.de

-> Die Folgen der Ungleichheit: Ein neues Maß der menschlichen ...

Datelformat: PDF/Adobe Acrobat 24. Nov. 2010 ... Die Folgen der Ungleichheit: Ein neues Maß der menschlichen Entwicklung. Zum 20. Jubiläum des Human Development Index. (HDI) haben ... https://www.diw.de/documents/publikationen/73/.../10-47-4.pdf



| Land | bote | 1. Let up a la real real real real real real real | Eitigendersische Technicker Frechscheite Zürich Swisz Federal Institute of Technology Zurich |
|---------------------------------|--|---|---|
| Der Landbote 8400 Winterthur | Medienart: Print Medientyp: Tages- und Wochenpresse | | Themen-Nr.: 999.051 Abo-Nr.: 1086740 |
| 052/266 99 01 | Auflage: 26'656 | | Seite: 23 Fläche: 10/262 mm ² |

ETH Zürich ist Weltspitze

RANKING In einer Rangliste der weltbesten Universitäten in 46 Fächern belegt die ETH Zürich zum dritten Mal in Folge den ersten Platz bei den Erdwissenschaften.

Das Quacquarelli Symonds (QS) Ranking listet die Eidgenössisch-Technische Hochschule Zürich (ETH) in insgesamt zehn Fächern unter den Top 10. Verbessern konnte sich die ETH insbesondere im Fach Architektur, in dem sie zwei Plätze gutmachte und nun Rang 5 belegt. Auch in Umweltwissenschaften, Mathematik, Informatik und dem Fächerkomplex Physik und Astronomie rangiert die Hochschule unter den besten zehn Institutionen weltweit, wie QS gestern mitteilte. Auch die ETH Lausanne konnte sich in drei Fächern unter den Top 20 platzieren, namentlich in Materialwissenschaft, Physik und Astronomie sowie in Elektrotechnik. Die Universität Zürich schaffte es in dem erstmals bewerteten Fach Anatomie und Physiologie auf Platz 20 weltweit. Insbesondere die Hotelfachschulen in der Schweiz können sich über Spitzenplätze freuen: Gleich drei landen in ihrem Fach unter den Top 10: Ecole Hôtelière de Lausanne (Rang 2), Les Roches International School of Hotel Management (Rang 4) und die Swiss Hotel Management School (Rang 8). Nur die USA sind mit vier Plätzen häufiger unter den weltbesten zehn im Hotelfach vertreten. sda



Habitat Research

Based on science \rightarrow measurement and simulation Influenced by people \rightarrow behaviour

- Building Research: Understanding Buildings and their interaction with people, cities, stocks and flows
- Urban Research: Understanding Cities and their interaction with people, territories, stocks and flows → Complex Systems
- Territorial Research: Understanding regions, countries, and their interaction with stocks and flows → Complex Systems

Smart Cities Criteria India - Europe

- Indian Ministry of Urban Development
- 1 adequate water supply
- 2 assured electricity supply
- 3 sanitation, including solid waste management
- 4 efficient urban mobility and public transport
- 5 affordable housing, especially for the poor
- 6 robust IT connectivity and digitalization
- 7 good governance, especially e-Governance and citizen participation
- 8 sustainable environment
- 9 safety and security of citizens, particularly women, children and the elderly
- 10 health and education

- European Innovation Partnership on Smart Cities and Communities
- 1 Sustainable Urban Mobility
- 2 Districts and Built Environment
- 3 Integrated Infrastructures
- 4 Citizen Focus
- 5 Policy and Regulation
- 6 Integrated Planning and Management
- 7 Knowledge Sharing
- 8 Baseline, Performance Indicators and Metrics
- 9 Open Data
- 10 Standards
- 11 Business Models, Finance and Procurement
- 12 General Implementation Modes

Know the criteria for selecting Smart Cities

News18.com

First published: January 28, 2016, 4:01 PM IST | Updated: January 28, 2016



In the approach of the Smart Cities Mission, the objective of the government is to promote cities that provide core infrastructure and give a decent quality of life to its citizens, a clean and sustainable environment and application of 'Smart' Solutions.

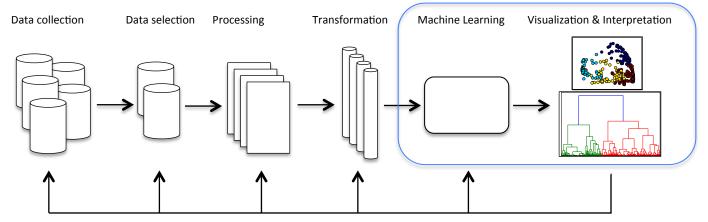
The focus of the mission is on sustainable and inclusive development and the idea is to look at compact areas, create a replicable model which will act like a light house to other aspiring cities.

http://www.news18.com/news/india/know-the-criteria-for-selecting-smart-cities-1195936.html

Measurements for the Smart City: Danielle Griego

Approach

Data analysis



What do we want to know?

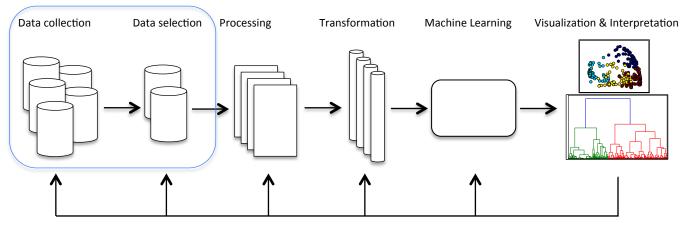
Typical Knowledge Discovery Diagram (KDD)





Data collection/Selection

Domain specific data source(s)

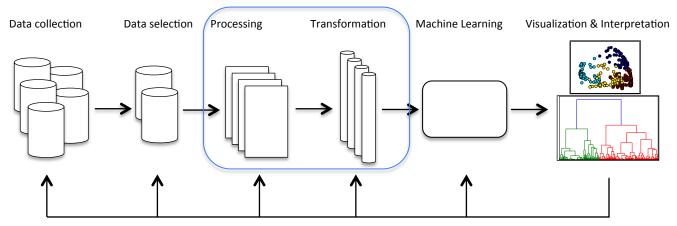


Typical Knowledge Discovery Diagram (KDD)





The time consuming, but essential part of data analysis



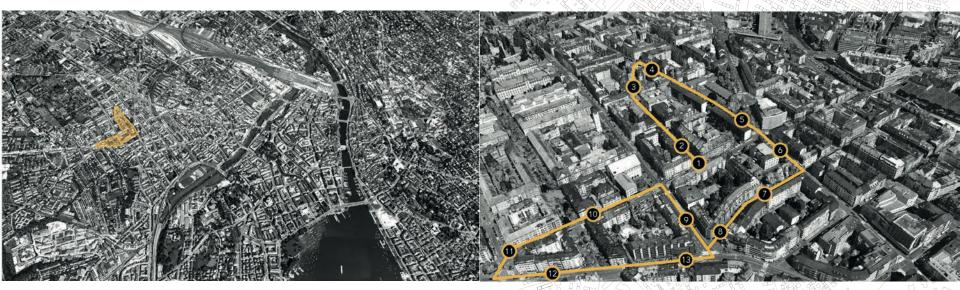
Is the data usable?

Typical Knowledge Discovery Diagram (KDD)



Case study

ESUM- Analyzing trade-offs between Energy and Social performance of Urban Morphologies



SWISS NATIONAL SCIENCE FOUNDATION

Location Wiedikon Zürich

14 survey checkpoints along experimental path

ETHZÜRICH DARCH IA Chairof Information Rechirecture

Creative Data Mining | L01 | Danielle Griego | 20-Feb-17 |

17

Case study

ESUM- Analyzing trade-offs between Energy and Social performance of Urban Morphologies

Data from 37 participants in Zurich to:

 Investigate impact of constant (urban morphology) and dynamic features (environmental sensors) of the built environment on perception (using surveys and biofeedback data)



(a) Pathpoint 2, narrow



(b) Pathpoint 3, spacious

(d) Pathpoint 5, spacious

(c) Pathpoint 4, narrow



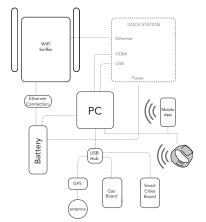
(e) Pathpoint 7, narrow (f) Pathpoint 8, spaciou



(g) Pathpoint 10, narrow

(h) Pathpoint 11, spacious

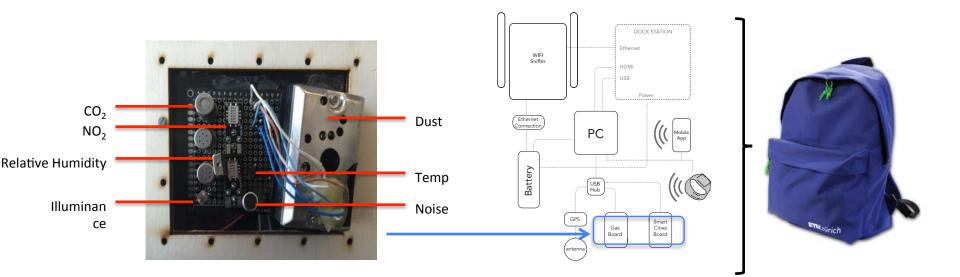
Fig. 2. Four instances of narrow-spacious spatial configurations and their corresponding pathpoints along the select path.



ETHZÜRICH DARCH iA Chairo Architecture

Mobile sensor equipment

Sensor-backpack with environmental and position sensors

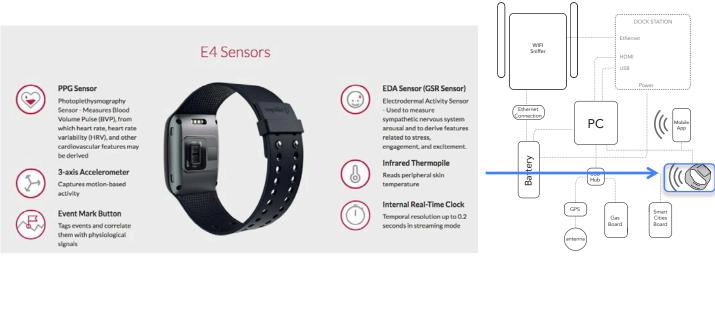


ETH zürich DARCH iA Chair of Information

Mobile Sensor equipment

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Biofeedback wristband





Mobile Sensor equipment

Biofeedback wristband



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Experimental data-set

ESUM- Analyzing trade-offs between Energy and Social performance of Urban Morphologies

| Device | Sensor/ Measurement | units | Measurement range | Measurement frequency | Accuracy | Response time |
|----------------------|--------------------------------------|--|--|--|--|---------------|
| VaspCity | Sound Pressure | dB | 50-100 dB | 0.4 Hz | ±2.5 dB | Not Given |
| | Luminosity | % | 0-100% (400- 700 nm) | 0.4 Hz | Resistive sensor 20MOhm (Darkness) 5-20 kOhm(Light) | Not Given |
| | Dust | mg/m3 | Typical 0.5V/(0.1mg/m3) | 0.4 Hz | Operating supply voltage 5±0.5V | 10±1ms |
| /aspGas | Temperature | С | -40 ~ 125 C | 0.25 Hz | ±2 C(0-70 C), ±4 C(<0 C, >70C) | 1.65 seconds |
| | Atmospheric Pressure | kPa | 15 - 115 kPa | 0.25 Hz | <±1.5% V | 20 ms |
| | Humidity | %RH | 0-100% RH | 0.25 Hz | <±4% RH (a 25C, range 30-80%), ±6 %RH(range 0-100) | <15 seconds |
| 1eshlium Scanner AP | Wifi Scanner | MAC address | Wifi Scanner (50-200m) Bluetooth Scanner (20-30m) | push values @ 0.016 Hz | Measurement range depends on he antenna and line of sight to the device | 60 seconds |
| | Wifi Scanner | AP | | push values @ 0.016 Hz | | |
| | Wifi Scanner | RSSI (Received Signal Strenght Indicator) | -40 dBm (nearest node) to -90 dBm (marthes nodes) | push values @ 0.016 Hz | distance of 10m ~=(50dBm), 50m ~=(75dBm) | |
| lobile Device | GPS | Lat/Long | outdoor only | variable, dependent on device satellite connection | | |
| | Survey | 12 guestions, scale -2 to 2 | NA | At checkpoint | | |
| PS | GPS | Lat/Long | outdoor only | 1 Hz | | |
| iofeedback Wristband | PPG (Photoplethysmography) | Sensor output: Blood Volume Pulse (BPV) | | 64 Hz | 0.9 nW/Digit | |
| | EDA (Electrodermal Activity) | | 0.01 mSiements -100 mSiemens | 4 Hz | | |
| | Skin Temperature Infrared thermopile | C | -40-115 C | 4 Hz | ±0.2 C within 36-39 C | |
| | 3 Axis accelerometer | x, y, z | | 32 Hz | | |

Data Processing: ESUM Experiment

Data cleaning: unified date/time, convert WGS84 spherical coordinates to CH1903 planar coordinates

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| 1 | 1460644478 | 72.83 | 5.828598 | 0.000961 | | 65.4761887 | | 23.521 | 31.988 | 7036.3 | 0 | | |
| 2 | 1460644479 | 72.88 | 7.120091 | 0.001601 | | 65.4761887 | | 23.497 | 31.986 | 6933.8 | 0 | | |
| 3 | 1460644480 | 72.93 | 4.054946 | 0.001281 | 32.66 | 65.4761887 | | 23.497 | 32.02 | 6476.5 | 0 | 681400.75 | 247344.94 |
| 4 | 1460644481 | 72.98 | 2.834946 | 0.001281 | 32.63 | 51.25 | 0.03935484 | 23.472 | 31.984 | 6547.5 | 0 | 681400.736 | 247345.04 |
| 5 | 1460644482 | 73.05 | 3.309515 | 0.000961 | 32.66 | 51.25 | 0.03935484 | 23.448 | 31.982 | 6862.8 | 0 | 681400.979 | 247344.74 |
| 6 | 1460644483 | 73.13 | 3.426358 | 0.001281 | 32.66 | 51.25 | 0.03935484 | 23.448 | 32.049 | 6799.7 | 0 | 681401.131 | 247344.69 |
| 7 | 1460644484 | 73.23 | 4.381686 | 0.001281 | 32.65 | 64.8717957 | 0.03741935 | 23.448 | 32.116 | 6776.1 | 0 | 681401.231 | 247344.7 |
| 8 | 1460644485 | 73.43 | 3.822565 | 0.001281 | 32.65 | 64.8717957 | 0.03741935 | 23.448 | 32.183 | 6918 | 0 | 681401.305 | 247344.88 |
| 9 | 1460644486 | 73.7 | 7.809537 | 0.00064 | 32.65 | 63.9743576 | 0.04064516 | 23.448 | 32.183 | 7036.3 | 0 | 681401.301 | 247345.14 |
| 10 | 1460644487 | 74 | 5.099897 | 0.00064 | 32.68 | 63.9743576 | 0.04064516 | 23.424 | 32.181 | 7059.9 | 0 | 681401.324 | 247345.32 |
| 11 | 1460644488 | 74.3 | 5.686858 | 0.00064 | 32.66 | 63.9743576 | 0.04064516 | 23.4 | 32.179 | 7036.3 | 0 | 681401.386 | 247345.40 |
| 12 | 1460644489 | 74.6 | 8.993654 | 0.001281 | 32.65 | 68.4523773 | 0.03935484 | 23.4 | 32.145 | 7288.5 | 0 | 681401.357 | 247345.66 |
| 13 | 1460644490 | 74.87 | 4.041514 | 0.00032 | 32.65 | 68.4523773 | 0.03935484 | 23.4 | 32.179 | 7454.1 | 0 | 681401.342 | 247345.80 |
| 14 | 1460644491 | 75.13 | 6.846003 | 0.000961 | 32.65 | 68.4523773 | 0.03935484 | 23.4 | 32.179 | 7351.6 | 0 | 681401.444 | 247345.75 |
| 15 | 1460644492 | 75.35 | 12.109529 | 0.00064 | 32.66 | 60.1282043 | 0.04129032 | 23.376 | 32.176 | 7398.9 | 0 | 681401.38 | 247345.84 |
| 16 | 1460644493 | 75.55 | 15.356786 | 0 | 32.63 | 60.1282043 | 0.04129032 | 23.376 | 32.176 | 6996.8 | 0 | 681401.38 | 247345.82 |
| 17 | 1460644494 | 75.7 | 9.704498 | 0.000961 | 32.65 | 57.3684196 | 0.03870968 | 23.376 | 32.31 | 6981.1 | 0 | 681401.405 | 247345.79 |
| 18 | 1460644495 | 75.92 | 28.555943 | 0.001281 | 32.65 | 57.3684196 | 0.03870968 | 23.352 | 32.509 | 6989 | 0 | 681401.494 | 247345.73 |
| 19 | 1460644496 | 76.1 | 12.256844 | 0.001601 | 32.66 | 57.3684196 | 0.03870968 | 23.352 | 32.742 | 7004.7 | 0 | 681401.582 | 247345.75 |
| 20 | 1460644497 | 76.28 | 71.173195 | 0.00032 | 32.66 | 63.3333321 | 0.04193548 | 23.352 | 32.909 | 6799.7 | 0 | 681401.541 | 247345.99 |
| 21 | 1460644498 | 76.42 | 87.28521 | 0.00064 | 32.65 | 63.3333321 | 0.04193548 | 23.352 | 33.043 | 6989 | 0 | 681401.5 | 247346.25 |
| 22 | 1460644499 | 76.55 | 25,758465 | 0.000961 | 32.65 | 63.3333321 | 0.04193548 | 23.328 | 33.041 | 7067.8 | 0 | 681401.472 | 247346.4 |
| 23 | 1460644500 | 76.92 | 20.388626 | 0.000961 | | | | 23.328 | 33.107 | 7067.8 | 0 | 681401.418 | 247346.68 |
| 24 | 1460644501 | 77.32 | 15.548265 | 0.001281 | | 57.8947372 | | 23.304 | 33.239 | 6996.8 | | 681401.441 | |
| 25 | 1460644502 | 77.7 | 8.387268 | 0.00064 | | 57.6315804 | | 23,304 | 33.239 | 6941.7 | 0 | | |
| 26 | 1460644503 | 78.08 | 9.249283 | 0.00064 | | 57.6315804 | | 23.304 | 33,239 | 6957.4 | | 681401.369 | |
| 27 | 1460644504 | 78.45 | 14.46798 | 0.001281 | | 57.6315804 | | 23.304 | 33.372 | 6933.8 | | 681401.392 | 247347. |
| 28 | 1460644505 | 78.82 | 19.762161 | 0.00032 | | 58.9473686 | 0.033333404 | 23.112 | 33,488 | 6910.1 | | 681401.389 | |
| 29 | 1460644506 | 79.15 | 26.95731 | 0.002242 | | 58.9473686 | 0.04 | 23.088 | 33,619 | 6925.9 | | 681401.205 | |



Data Processing: ESUM Experiment

Frequency reduction to integrate data from multiple sources

| Sensor description | Frequency [Hz] |
|--------------------------------|-------------------------------|
| Heart rate (HR) | 1 |
| Blood volume pressure (BVP) | 64 |
| Electrodermal activity (EDA) | 4 |
| Biofeedback temperature (T-BF) | 1 |
| Sound level (S) | 0.3 |
| Dust (D) | 0.3 |
| Environment temperature (T-EN) | 1 |
| Relative humidity (RH) | 1 |
| Illuminance (IL) | 1 |
| People density (PD) | 1 (if many), 0.024 (if few) |
| Longitude (LON) | 1 |
| Latitude (LAT) | 1 |
| Survey answers | In each of the 14 checkpoints |

Chair of Information

ETHzürich DARCH

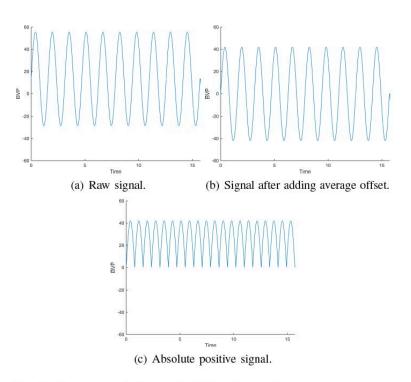


Fig. 4. Frequency reduction applied to the bloom volume pressure measurements.

Data processing: ESUM Experiment

Geo-referencing data to specific locations

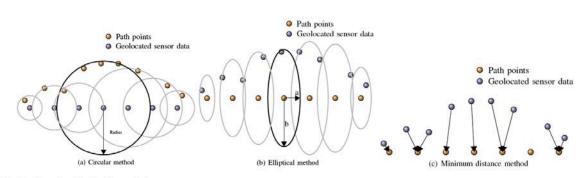


Fig. 5. Three data localization methods.

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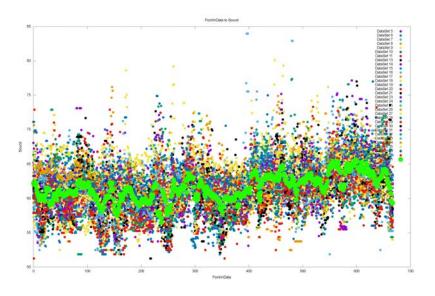




Data analysis: ESUM Experiment

Time-series sensor visualization: sound

ETH zürich DARCH iA



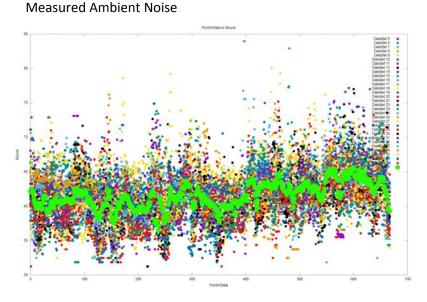




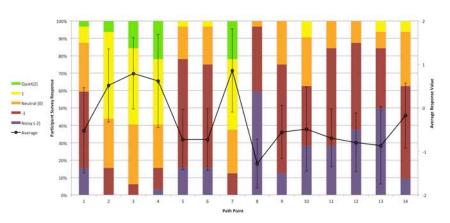
Data analysis: ESUM Experiment

Comparing data sources: Measured and perceived noise

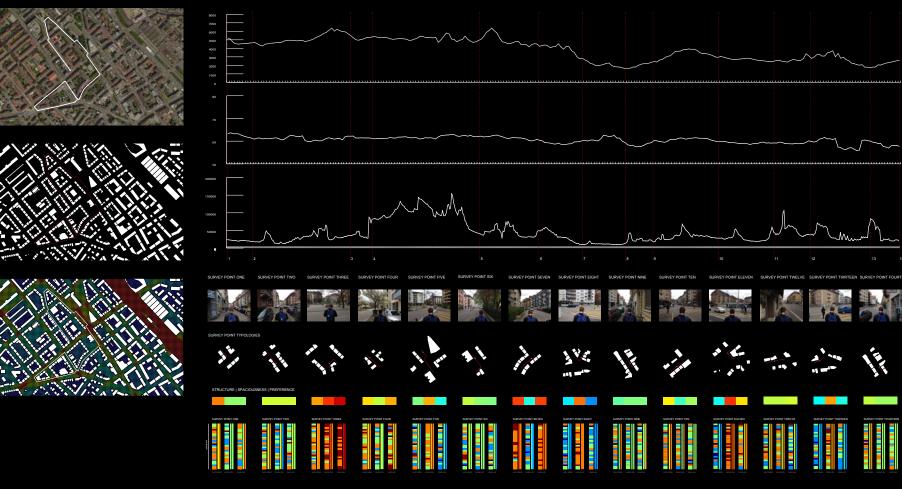
ETHZÜRICH DARCH iA











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Creative Data Mining FS2016 Final project from Jochen Aarts and Stéphane de Weck

DARCH IA Chair of Information Architecture

Measurements for the Smart City: Estefania Tapias



The transformation from data to information and knowledge is one of the most important activities in every society and are the elements that structure the Information Architecture concept.

Tapias, E. 2013. Shadow rage simulation and visibility analysis. Residential area in Altstetten, Zurich

| | 1.12.2014 | 01:00:30 | 21.2 | 1.1.2015 | 01:00:30 | 22.6 | 1.2.2015 | 01:00:30 | 21.2 | 1.3.2015 | 01:00:30 | 22.8 | |
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| | 1 12 2014 | 07:30:30 | 28.1 | 1 1 2015 | 07:30:30 | 23.9 | 1 2 2015 | 07:30:30 | 25.1 | 1 3 2015 | 07-30-30 | 26.3 | |

"We refer to data as the smallest entities of information, as values given to objects, expressions, functions or properties. Data

becomes information by interpretation."

Gerhard Schmitt, Information City

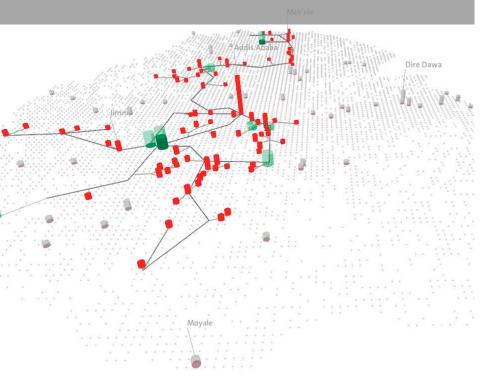
Tapias, E. 2016. Weather data from mini portable weather stations.



Connections or relations of data results in information.

Readings from a weather station console showing weather parameters.

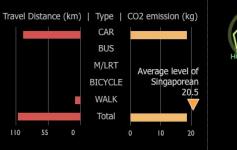
Data collection

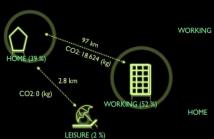


The basic assumption here is that we can only improve the performance of a system, such as a city, if we know its present performance.

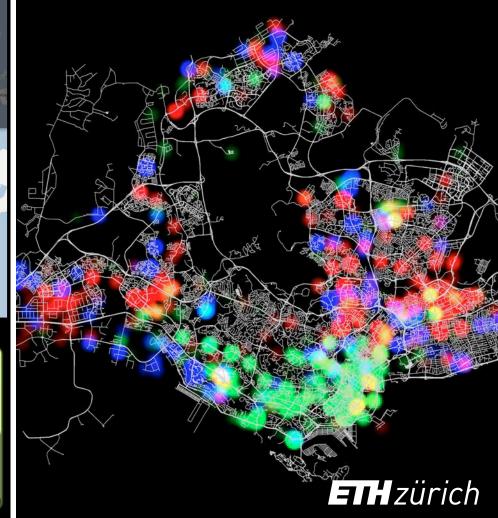
Friedrich, E. 2013. An interactive tool for modelling Ethiopia's energy future.





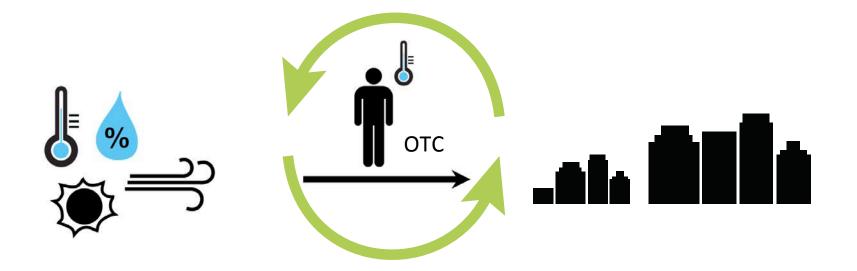


LEISURE



Climate-sensitive Urban Adaptation

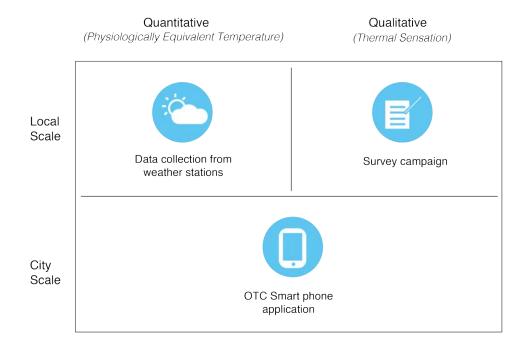
Measurement Network – Barranquilla Colombia



Climate-sensitive Urban Adaptation

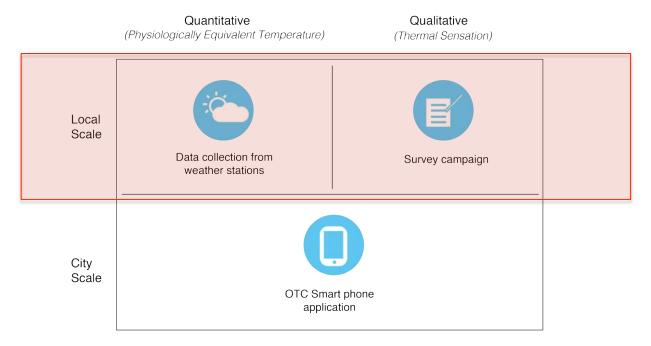
Measurement Network – Barranquilla Colombia

OUTDOOR THERMAL COMFORT (OTC)



Measurement Network - Barranquilla Colombia

OUTDOOR THERMAL COMFORT (OTC)



Measurement Network – Barranquilla Colombia

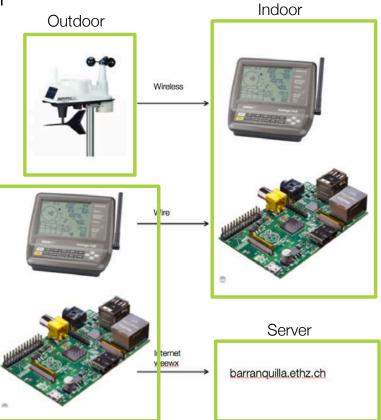




Climate-sensitive Urban Growth

Measurement Network – Barranquilla Colombia



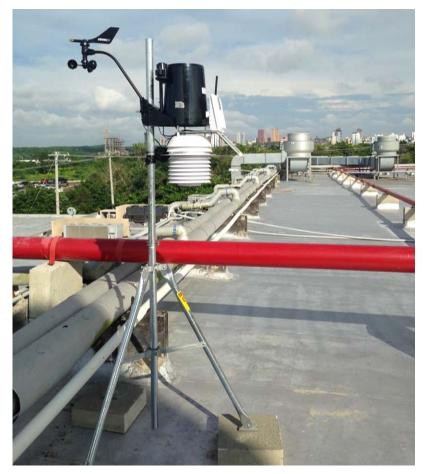




Climate-sensitive Urban Growth

Measurement Network – Barranquilla Colombia





Climate-sensitive Urban Growth

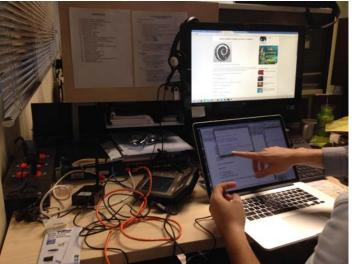
Measurement Network – Barranquilla Colombia





Mapa Universidad del Norte





| High Temperature | 37.1°C at 09/13/15 14:09:07 23.6°C at 06/07/15 19:38:52 | | | | | |
|---|---|--|--|--|--|--|
| High Heat Index | 51.4°C at 09/13/15 14:06:23 | | | | | |
| Low Wind Chill | 23.6°C at 06/07/15 19:38:52 | | | | | |
| High Humidity Low Humidity | 96% 06/03/15 06:16:15 52% 07/13/15 12:06:31 | | | | | |
| High Dewpoint Low Dewpoint | 28.6°C 09/23/15 10:48:52 18.2°C 03/07/15 01:34:13 | | | | | |
| High Barometer Low Barometer | 1013.2 hPa at 03/20/15 09:41:02 1001.5 hPa at 07/03/15 16:45:02 | | | | | |
| Rain Total | 179.2 mm | | | | | |
| High Rain Rate | 137.2 mm/hr at 10/02/15 13:35:00 | | | | | |
| High Wind Speed | 17.9 m/s from 61° at 03/04/15 00:19:28 | | | | | |
| Average Wind | 2.3 m/s | | | | | |
| RMS Wind | 3.0 m/s | | | | | |
| Vector Average Speed Vector Average Direction | 2.6 m/s 35° | | | | | |
| High Inside Temperature Low Inside Temperature | 32.7°C at 06/29/15 13:29:02 21.8°C at 03/19/15 07:15:00 | | | | | |
| High UV Low UV | 10.7 at 10/02/15 11:30:00 0.0 at 01/01/15 00:00:01 | | | | | |
| High ET Low ET | 0.8 mm at 02/22/15 13:00:00 0.0 mm at 01/01/15 00:05:00 | | | | | |
| High Radiation Low Radiation | 1225 W/m ² at 08/18/15 11:21:52 0 W/m ² at 01/08/15 00:03:26 | | | | | |

 WX Barranquilla, Colombia Yea ×

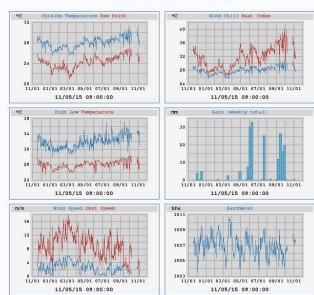
 C
 barranquilla.arch.ethz.ch/station1/year.html

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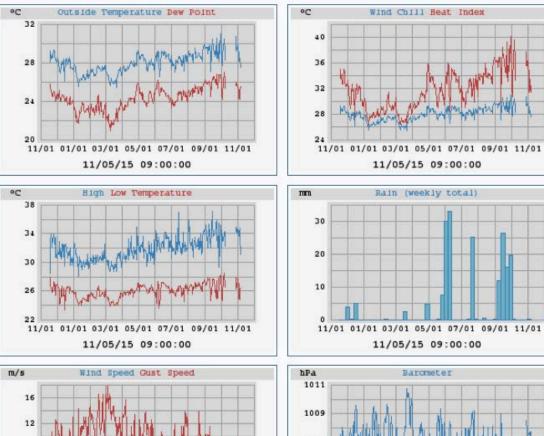
Barranquilla, Colombia

Yearly Weather Summary

11/05/15 09:00:00



Yearly Statistics and Plots

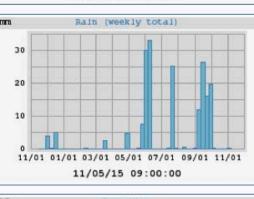


11/01 01/01 03/01 05/01 07/01 09/01 11/01

11/05/15 09:00:00

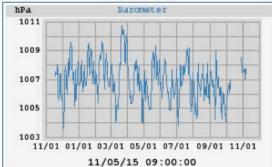
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11/05/15 09:00:00

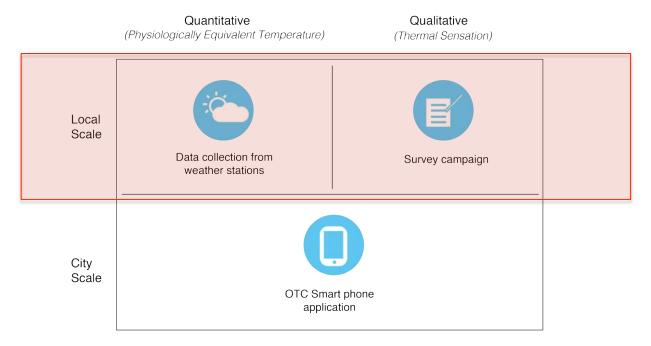
Wind Chill Beat Index



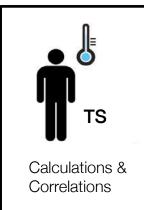


Measurement Network - Barranquilla Colombia

OUTDOOR THERMAL COMFORT (OTC)



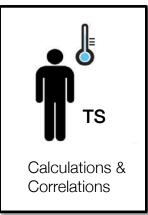
Thermal sensation



| Confort térmico en | espacios exteriores en percepción térmica y la | Barranquilla, Colombia os resultados del cálcul | | | Villadie | ego - CUC istefanía Tapi | rticipantes : Dr. Ka ias - ETH | | | |
|-----------------------------------|---|--|----------------------|-------------------------------|------------------------------|-----------------------------|-----------------------------------|--|--|--|
| | | | 1. Datos de Contr | rol | | | | | | |
| Folio: | Fecha: | | Hora Inicial | | Empla | zamiento | | | | |
| Encuestador(a) | | | Hora Final | | | Sol | Sombra | | | |
| | | 2. Per | rcepción del confor | rt térmico | | | | | | |
| -3 | -2 | -1 | 0 | 1 | 2 | | 3 | | | |
| 2.1 Sensación Térm | nica | ¿Que siente usted e | n este momento co | on respecto a la tempe | ratura? | | | | | |
| Mucho frio | Frio | Un poco de frio | Ni frio/Ni cale | or 🗌 Un poco de ca | lor 🗀 | Calor | Mucho Calo | | | |
| 2.2 Grado de Satisf | acclón | ¿Cuál es su grado d | le satisfacción resp | oecto a la temperatura | en este n | nomento? | | | | |
| Batisfecho | | Neutro | | Insatisfecho | | | | | | |
| 2.3 Preferencia Térmica | | ¿Que preferiria sent | tir en este momente | o con respecto a la ten | o a la temperatura? | | | | | |
| Mas fresco | | Igual, sin cambios | | | Mas Calor | | | | | |
| 2.4 Percepción de l | a humedad | | n este momento co | on respecto a la hume | dad? | | | | | |
| Muy húmedo | Húmedo | Un poco húmedo | Normal | Un poco seco | Beo | - | Muy Seco | | | |
| 2.5 Grado de Satisf | acción | ¿Cuál es su grado d | le satisfacción resp | pecto a la humedad en | este mon | nento? | | | | |
| Batisfecho | | Neutro Neutro | | Insatisfecho | | | | | | |
| 2.6 Preferencia | | ¿Cómo preferiría se | ntir la humedad en | este momento? | | | | | | |
| Más Húmedo | | Igual, sin cambios | | Más seco | | | | | | |
| 2.7 Percepción del | viento | ¿Cómo siente el vie | nto en este momen | nto? | | | | | | |
| Ningún Viento | Poco viento | Viento moderado | b | Viento muy fue | arte | | | | | |
| 2.8 Grado de Satisf | acción | ¿Cuál es su grado d | le satisfacción resp | pecto al viento en este | momente | 17 | | | | |
| Batisfecho | | Neutro | | | | | | | | |
| 2.9 Preferencia | | ¿Cómo preferiria se | ntir el viento en es | te momento? | | | | | | |
| Preferiria mas viento | | Igual sin cambios | | viento | | | | | | |
| 2.10 Percepción de | asoleamiento | Sol un poco tuerte | ¿Cómo siente el s | sol en este momento? | | | | | | |
| Sin Sol | Poco Sol | | | | nuy fuerte | | | | | |
| 2.11 Grado de Satis | facción | ¿Cuál es su grado d | le satisfacción resp | pecto al sol en este mo | mento? | | | | | |
| Satisfecho | | Neutro | | Insatisfecho | | | | | | |
| 2.12 Preferencia so | bre el tema | | ¿Cómo preferiria | sentir el sol en este m | ntir el sol en este momento? | | | | | |
| Preferiria mas sol | | Igual, sin cambios | | Preferiría menos a | | | | | | |
| 2.13 Percepción de Confortable | l confort térmico | | En general usted | se siente con respecte | o al clima | P. | | | | |
| | | | 3. Datos del individ | duo | | | | | | |
| 3.1 Sexo | 1 | Hombre | Mujer | | | | | | | |
| 3.2 Estatura (m): | | | 3.3 Peso (Kg): | | 3.4 Ec | lad: | - | | | |
| | empre en Barrangu | illa? | | D Si | No | | - | | | |
| | specto a Barrangu | | cedencia es: | | □ Igual | | Mas caliente | | | |
| | do está en Barrang | | 1 semana | | 1-6 | Meses | >6 Meses | | | |
| | a otros usted gene | | | | Igual | | Mas caliente | | | |
| | | 4 | Datos por observa | - | | | | | | |
| 4.1 Vestimenta | | Observación en ca | | | | | Gorra | | | |
| Ligera ropa | a de verano | | 10 10 100 apo de | | | | Sombrilla | | | |
| | pa de invierno | | | | | | Gafas | | | |
| 4.2 Actividad | | Pasiva [| Moderada | | C Intens | a | | | | |
| (En el momento) | | | | (Marcha/de pie en movimiento) | | | (Trote/Marcha rapida) | | | |
| Observaciones | | | | | | | | | | |

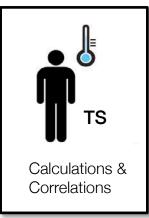
Location: UniNorte – stations

Thermal sensation





Thermal sensation

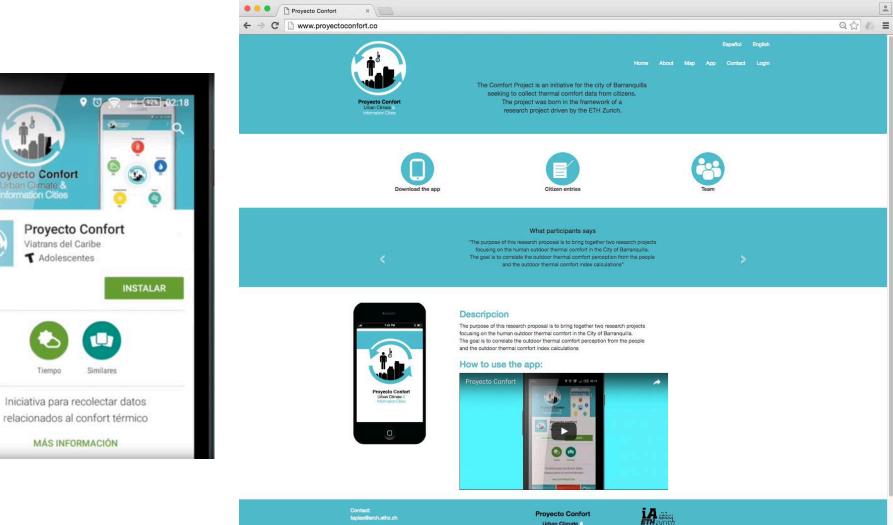




Crowdsourcing – Barranquilla Colombia

OUTDOOR THERMAL COMFORT (OTC)





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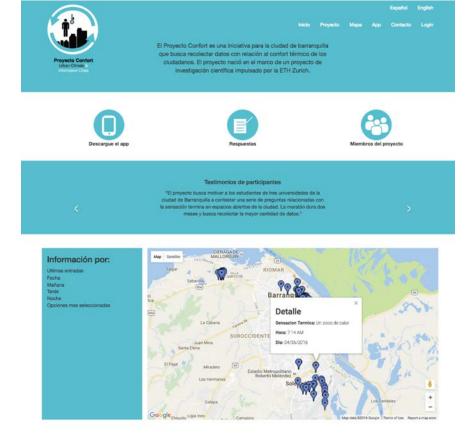
Proyecto Confort

Viatrans del Caribe

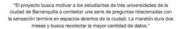
T Adolescentes

Tiempo

Proyecto Confort Urban Climate Information Cities



Testimonios de participantes



Proyecto Confort Urban Climate 2

Contacto: tapias@arch.ettuz.ch



INFORMATION ARCHITECTURE OF CITIES

MOOC exercises Data collection



Information Architecture

Prof. Dr. Gerhard Schmitt



MOOC & ETH iA course

| | | | | | | DATE | | | | | | | | |
|----------------------|--------------|---------------------|--------------|-------------------------|---------------------|-------------------------------------|-----------------|--------------------|--------------------|----------------------|--------------|-------------|-------------------------------|----------------------|
| COURSE | 13.02.2017 | 20.02.2017 | 27.02.2017 | 06.03.2017 | 13.03.2017 | 2003.2017 | | 03.04.2017 | 10.04.2017 | 17.04.2017 | 24.04.2017 | 01.05.2017 | 08.05.2017 | 15.05.2017 |
| | Week 1 | | Week 3 | Week 4 | | Week 6 | Week 7 | Week 8 | Week 9 | Week 10 | 2.110.112027 | | | 2010012027 |
| | Warm-up week | | Smart cities | Big data and stock | | | | | Smart Livability | From smart cities to | | | | No MOOC |
| | | course | | and flows of | | science | sector presente | | | responsive cities | No MOOC | No MOOC | No MOOC | |
| | | | | information | city | | | | | | | | | |
| IA COURSE | No lecture | Lecture 1 | Lecture 2 | Lecture 3 | Lecture 4 | Seminar week Citizen-design science | Lecture 5 | Lecture 6 | Lecture 7 | No lecture | No lecture | No lecture | Lecture 8 Smart Livability | Lecture 9 |
| | | Introduction to the | Smart cities | Big data and stock | | | Citizen-design | Complexity science | Smart Governance | | | | | From smart cities to |
| | | course | | and flows of | simulations in the | | science | | | | | | | responsive cities |
| | | | | information | city | | | | | | | | | |
| | | | | | | | | | | | | | | |
| | | Week 2 | | | Week 5 | Week 6 | | | Week 9 | | | | | |
| Excercises MOOC* | | QUA-KIT | | | Data collection app | Q <mark>U</mark> A-KIT | | | QUA-KIT | | No MOOC | No MOOC | No MOOC | No MOOC |
| | | Online design tool | | | | Or line design tool | | | Online design tool | | | | | |
| Excercises iA course | | Lecture 1 | | | Lecture 4 | | | | Lecture 7 | | | | | Lecture 9 |
| | | Introduction to the | | No exercise No exercise | Measurements and | Seminar week | No exercise | No exercise | Smart Governance | No exercise No e | | | No exercise | From smart cities to |
| | No lecture | course | No exercise | | simulations in the | | | | Exercise: | | No exercise | No exercise | | responsive cities |
| | | Exercise: | | ito chereise | city | | | | QUA-KIT | | | | | Final presentation |
| | | QUA-KIT | | | Exercise: | | | | Online design tool | | | | | |
| | | Online design tool | | | Data collection app | | | | | | | | | |
| | | | | | | | | | | | | | | |



https://www.edx.org/

Smart Governance

Week 10 (14/11/16 -20/11/16): From Smart Cities to Responsive Cities

Week 9 (7/11/16 - 13/11/16): Smart Liveability

| Week 2 (19/09/16 - 25/09/16): Introduction | Online data collection and visualisation tool | VIEW UNIT IN STUDIO |
|---|--|---------------------|
| Week 3 (26/09/16 - 02/10/16): Smart Citles | Exercise: | |
| Week 4 (03/10/16 - 09/10/16): Big data and stocks and flows of information | This week you learned about data collection in the city. In this exercise, you can put learned and collect qualitative and quantitative data in your city. Select one urban a data from the following variables: | |
| Week 5 (10/10/16 - 16/10/16); Measurements | 1. Temperature (in degrees Celsius, °C) | |
| and Simulations in the City | (you can use a simple tool like a thermometer or download a smart phone application | on) |
| 5.1 Information City | 2. Thermal perception | |
| 5.2 Data Collection | (from 1 to 10 – 1 being "very cold" and 10 "very warm") | |
| 5.3 Smarter, resilient, interactive and participatory citles | 3. Noise (in decibel, dB) | |
| 5.4 Additional Material | (you can use a sound/decibel meter with a smart phone application) | |
| 5.5 Review Questions Review Question due Nov 28, 2016 at 00:00 UTC | 4. Noise perception | |
| 5.6 Compulsory Exercise 2 Compulsory Exercise due Nov 28, 2016 at | (from 1 to 10 - 1 being "no noise" and 10 being "a lot of noise" -) | |
| 00:00 UTC 2 | 5. General satisfaction | |
| Week 6 (17/10/16 - 23/10/16): Citizen-Design Science | (Do you like the place you selected? from 1 to 10 – 1 being "not at all" and 10 "yes, ve | ery much" -) |
| Week 7 (24/10/16 - 30/10/16): Urban Complexity Science | (Note: Please make sure you are in an outdoor space.) | |
| Week 8 (31/10/16 - 6/11/16): | If you do not own a smartphone please skip variables 1 and 3. | |

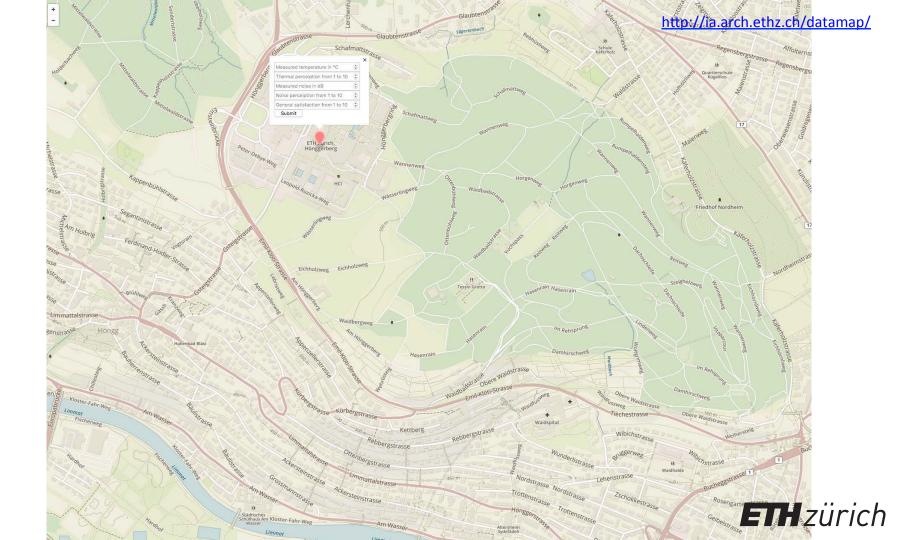
When you finish, please enter your data together with the date and time of your recording in our online data collection tool using the following link;

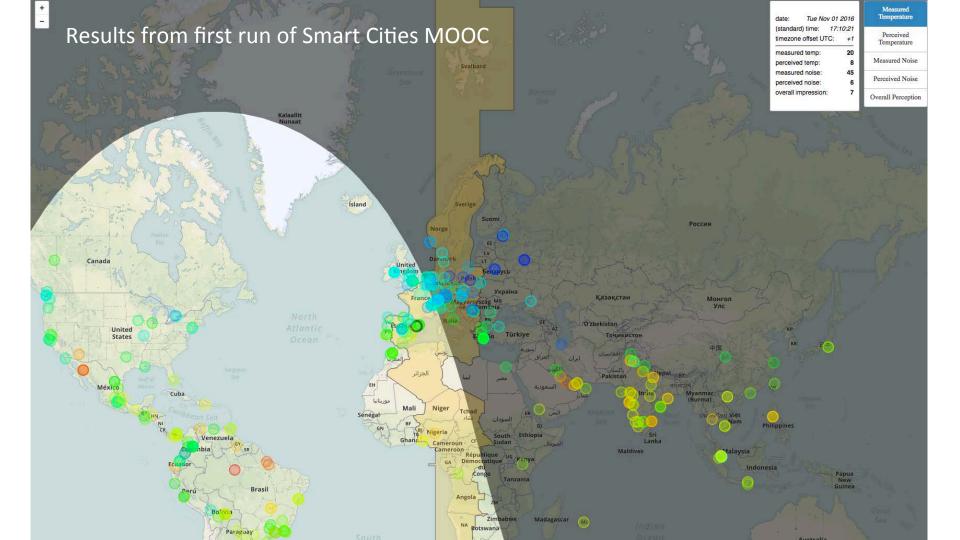
The World Data Map

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http://ia.arch.ethz.ch/datamap/





ETH zürich

Q Reset

- Question bank
- E Repositories
- Legacy course files
- A Competencies
- 197 V

Switch role to...

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- Smart cities
- Big data and stocks and flows of information
- > Measurements and simulations in the city
- Citizen-design science
- Complexity science
- Smart governance
- Smart livability
- > From smart cities to responsive cities

My courses

Upload the document here in moodle by 27.02.2017

MOOC discussion panel: This first week you will be ask to make groups of 3 to 4 people and start looking at the discussion developing in the discussion panel of the MOOC. After seminar week (27.03.2017) each group has to choose one interesting discussion and start participating by writting comments about the topic beign discussed. The last lecture (15.05.2017) each group will have a 7 minutes presentation about the discussion they followed and how they contributed.

Lecture 1

Smart cities

1 Lecture 2

Big data and stocks and flows of information

Lecture 3

Measurements and simulations in the city

Compulsory Exercise 2

(BASED ON THE EXERCISE ON THE SMART CITIES MOOC)

Instructions for Exercise 2:

This week you learned about data collection in the city. In this exercise, you can put into action what you learned and collect qualitative and quantitative data in your city. Select one urban area in your city and collect data from the following variables:

1. Temperature (in degrees Celsius, °C)

(you can use a simple tool like a thermometer or download a smart phone application)

2. Thermal perception

(from 1 to 10 - 1 being "very cold" and 10 "very warm")

3. Noise (in decibel, dB)

(you can use a sound/decibel meter with a smart phone application)

4. Noise perception

(from 1 to 10 - 1 being "no noise" and 10 being "a lot of noise" -)

5. General satisfaction

(Do you like the place you selected? from 1 to 10 - 1 being "not at all" and 10 "yes, very much" -)

(Note: Please make sure you are in an outdoor space.)

If you do not own a smartphone please skip variables 1 and 3.

When you submit your data you don't need to mention your date and time as it will be recorded by app. You can access online data collection tool using the following link:

http://ia.arch.ethz.ch/datamap/

Additional part for ETH course:

- 1. Different from the MOOC exercise, for the course you most select two places, one that you like and another one that you dislike. Make the two data entries for each location in the web map and make a screen shot of both. Create a word document and add the screen shot together with a description of the two places you selected. Describe also the aspects you like or dislike about each of the places.
- 2. Using this world map (http://www.ia.arch.etx.ch/datamap/show.htm) with the results from last semester, select world oplaces in the world where participants added data. Look at the data measured and the perceive data (qualitative and quanitative data) and try to analyze how people perceive the place in relation to the measured data. For instance, you can see that in one place the difference between the measured and perceived is not that different while in another place it is extremely different, or you can also analyze the data collected with the overall perceive). Rease make screen shot of the data from both places and create a word document with the analysis.
- Please use the same document for both parts of the exercise.

Upload the document here in moodle by 27.03.2017



Additional part for ETH course:

1. Select two places, one that you like and another one that you dislike. Make the two data entries for each location in the web map and make a screen shot of both. Describe the two places you selected including the aspects you like or dislike about each of the places.

2. Using this <u>world map</u> with the results from last semester, select two places in the world where participants added data. Look at the data measured and the perceive data (qualitative and quantitative data) and try to analyze how people perceive the place in relation to the measured data. Please make screen shot of the data from both places and create a word document with the analysis.

Please use the same document for both parts of the exercise.

Upload the document here in moodle by 27.03.2017



Summary

- Urban research requires measurements, resulting in data. If data are combined, they turn into information. If information is combined, it turns into knowledge
- Information and knowledge, combined with observation and compliance, are needed to improve a city
- To understand urban systems, measurements are important on all scales: buildings and neighbourhoods, districts and cities, regions and territories
- Measurements are a necessary (but not sufficient) activity for quantitative and qualitative urban improvements
- Ignoring information and knowledge, or not having access to it, can be deadly → transportation → Pompei