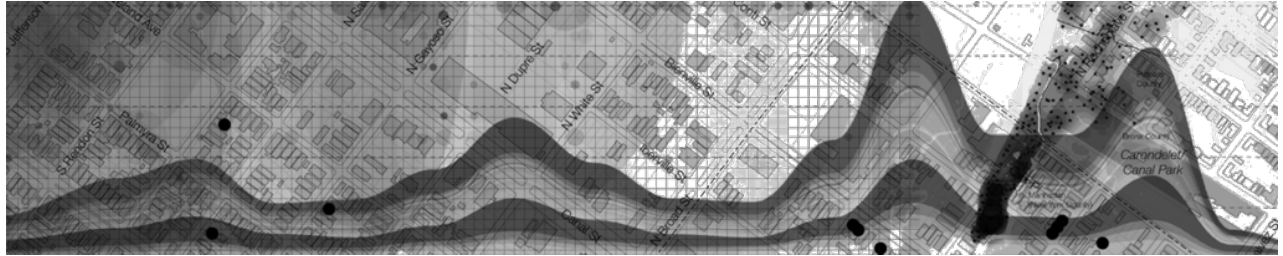


Datascapescapes & the Informal City

Barnard + Columbia | Architecture
Special Topics | ARCH V3312 | Section 2
203 Diana Center | Mondays & Wednesdays | 2:10PM - 4:00PM
Professor: Leah Meisterlin | office: 503B Diana
lmm2132@columbia.edu, lmeister@barnard.edu



Syllabus: Fall 2015

“With too little data, you won’t be able to make any conclusions that you trust.
With loads of data you will find relationships that aren’t real ...
Big data isn’t about bits, it’s about talent.”
(Douglas Merrill¹)

Course Overview

Description Increasingly, our cities — their products, processes, and policies — are described and governed by the data they generate. In the last decade, urban areas in the developed and developing worlds alike have seen vast changes in population, industry, employment, services, and governance, alongside the parallel changes in their built environments from housing settlement to infrastructure provision. With these shifts, new technologies have enabled the tracing, collection, and analysis of ever more data on everything from population demographics to consumer spending, from crime statistics to transit ridership, from the efficacy of municipal legislation to the performance of environmentally sustainable building technologies.

It is no wonder that digital data visualization has become a favorite graphic activity within the architectural community. The implications of this “turn toward data” within architecture are staggering and conflicted: The optimist hopes the data we collect may reveal human(e) patterns within our societies, allowing for better decision making, better design, and more targeted intervention into the built environment, as we plan for the next generation of urban change; The cynic worries that previously private spaces are being folded inside-out, made public without warning or consent, while previously public spaces are retrofitted as open and unabashed panopticons. The application of data to architectural inquiry and design now occurs at all scales: the user interface in the design of experience, the development of building systems, the circulation of people through and around a site or city, the creation of policies that will dictate environmental decisions, the advocacy for community groups within various forums for public programming, and the global expansion and contraction of space (both, physical and virtual) within which architects must now design.

To design without data is to ignore what could be known, but to design with data is neither simple nor agnostic. Understanding and contextualizing the datasets that proliferate is not a straightforward matter of number-crunching, but rather a design process in its own right. A “raw,” “unbiased,” or “pure” dataset does not exist, and the analysis of any dataset requires assumption and ultimately asks the analyst for his or her personal judgment. Further, designing based on the results of data-driven analysis does not relieve the designer of his or her opinions, beliefs, politics, or theses. More than ever, our decisions may be grounded in information, but they are *our* decisions nonetheless.

¹ Douglas Merrill. (2012) “R is not enough for Big Data.” *Forbes*. <http://www.forbes.com/sites/douglasmerrill/2012/05/01/r-is-not-enough-for-big-data/>. (Accessed 23 July 2013).

This course will ask students to consider the use of data representing informality and the “unseen” within urban environments, through theoretical readings and case studies, while working toward critical and argumentative design and visualization projects. Here, “informality” is broadly defined – beyond “illegal,” “illicit,” or “illegitimate.” Instead, the “informal” may be understood as the “un-formalized” such that it encompasses that which is left unquantified, unmeasured, or otherwise unseen and thus intangible, within the vast landscape of urban data. Through this broad definition, the class will explore the implications of visualizing that which is not visible and giving form to that which is informal.

Students will be asked to generate written and graphic (both printed and digital) deliverables. Digital deliverables will utilize drawing techniques already familiar to architecture students combined with other technologies, with training and skills-development workshops provided in class. A core premise of this course is that data analysis when paired with analytical drawing can be used to learn from the city’s unseen “datascares” as much as it is used to create more traditional forms of architectural work, offering another dimension to our understanding, interrogation, speculation, and critical discussion of our environment.

Through the discussions and related assignments, students will be asked to address issues of data reliability, ethics, and design authorship, while considering questions of scale, architectural process, and representation.

Learning Objectives Generally speaking, the course’s learning objectives include gaining a familiarity with the topic of informality in urban contexts as well as a critical approach to data visualization through the application of architectural drawing techniques. Specifically, students will learn to:

- (a) visually communicate architectural concepts and research using discipline-specific techniques,
- (b) work independently and in collaborative groups on design and research projects,
- (c) verbally and graphically communicate architectural concepts in multiple media formats,
- (d) understand historical and theoretical contexts for the design, use, and discussion of qualitative and quantitative data with respect to architectural and urban issues,
- (e) work between theoretical texts and architectural propositions, and
- (f) utilize, at an advanced and critical level, spatial analysis and digital mapping technologies in the design process.

Prerequisites Students must attend the first class for instructor permission into the class.

Familiarity with computer-based drawing techniques is expected. Students without sufficient experience in these skills will be expected to supplement (via tutorials, workshops with DAL teaching assistants, etc) outside of class.

Students will be expected to use Geographic Information Systems (GIS) software as well as basic spreadsheet software within this course. Familiarity with ArcGIS and Microsoft Excel is preferred, but not required. Workshops and supplementary tutorials for spatial data analysis will be provided as needed.

Class Format

Standard Information The class will meet twice weekly on Mondays and Wednesdays from 2:10PM to 4:00PM, save for exceptions described in the academic calendar and noted in the Course Schedule below. Barring any technical difficulties, class will begin promptly.

Method of Instruction The course is a hybrid seminar and workshop. Generally speaking, Tuesday sessions will be reserved for seminar discussion while Thursday sessions will be comprised of ‘workshop activities’ such as desk crits, round-table pin-ups, or technical skills development. In the latter half of the semester, this routine will shift to allow for more workshoping of the final project deliverables.

Guest Lectures The course will feature one guest lecture/discussion sessions (refer to the Course Schedule). Readings for this discussion sessions will be circulated before the lecture.

Evaluation and Grading

Reading & Participation (10% of final grade) Students are expected to complete all readings prior to class and to engage in the seminar discussions. Because of the relative newness of “big data” and the possibilities of interactive mapping, much of what will be discussed in the semester is currently considered “cutting edge,” and many of the ideas, theories, and uses, are up for debate and speculation. Thus, while the readings will provide the basic underpinning of thoughts pursued, the course will derive and generate much of its value from the conversation in class.

For full discussion participation points (which constitute 10% of the total final grade), students will be expected to actively and thoughtfully contribute to seminar discussion *and* collaborative learning activities. In keeping with the operational duality of the course format, students are expected to contribute to the seminar and workshop sessions, both in class and online using the course blog.

In-Class Case Study Presentation (10% of final grade) Seven classes, students will present a short (~20 minutes total) critique of a series of case studies of their choosing on topics related to the discussion and the course. A detailed assignment description will be distributed in class. Briefly, these presentations are an opportunity for the class to engage several examples and methods through which spatial data visualization is used in architectural research and practice.

Projects Two brief research and design projects will be assigned early in the semester to introduce students to the topics and techniques used in the final project. For each, students will submit small interim deliverables prior to the final submission (refer to the Course Schedule below). Detailed assignment descriptions will be distributed in class.

(20% of final grade) **Project 1** is a small design and visualization project wherein students will critique and create graphic deliverables exploring an urban dataset through spatial analysis techniques. The dataset and site will be determined by the instructor. Project 1A (written) will comprise 10% of the final grade; Project 1B (graphic) will also comprise 10% of the final grade.

(20% of final grade) **Project 2** is a small design and visualization project wherein students will critique and explore the possibilities of analysis through animated mapping and graphic representations of an urban dataset through the combination of spatial analysis and representation techniques. As in the first project, the dataset and site will be determined by the instructor. Project 2A (written) will comprise 10% of the final grade; Project 2B (graphic) will also comprise 10% of the final grade.

(40% of final grade) The Final **Project 3** builds upon the questions and techniques developed in first two preliminary projects. Students will explore datasets of their choosing for contiguous sites along a corridor assigned by the instructor – creating critical visualizations of their data and designing argumentative representations of their analyses. Within these projects, students are encouraged to heavily interpret and critique the physical site, the data, and the implications and relationships between the two via architectural drawing and visualization conventions. Where appropriate, challenging these conventions is similarly encouraged. Project 3 will contribute to the final grade according to the following percentages: Part 3A (topic proposal) – 10%, Part 3B (final deliverables, including drafts for in-class pin-ups) – 30%.

Attendance Given the value placed on discussion, students are expected to attend every class meeting. As such, attendance sheets will be maintained throughout the semester. Students with excessive absences (greater than 2) without appropriate reason will see a reduction in their final grades in increments of one-third of a letter grade (A- to B+) beginning with the third absence.

Students who will miss class due to religious holidays or other appropriate reasons should email Leah in the first week of classes with the dates (and purposes) of their foreseen absences.

Submission Each assignment description will outline the specific requirements for its submission format.

Save for extenuating circumstances for which extensions will be given only with *prior* approval and compelling reasons, absolutely no late assignments will be accepted without a late penalty. The concepts and skills covered in this course are cumulative, and thus it is imperative that students keep pace with the syllabus, turning assignments in on time. As a deterrent to late submissions, the late penalty is a reduction of 50% of the total *possible* (i.e., not scored or

earned) points within the first 24 hours after the deadline and an additional 25% of the total possible points up to 48 hours after the deadline.

Grading Assignments will be graded on a 100-point percentage scale, from which final grades will be calculated according to the percentages listed above. In the interest of avoiding confusion, the translation from percentage points to letter grades for the purpose of this class is as follows: A+ ≥ 100 > A ≥ 95 > A- ≥ 90 > B+ ≥ 85 > B ≥ 80 > B- ≥ 75 > C+ ≥ 70 > C ≥ 65 > C- ≥ 60 > D ≥ 50 > F.

Any students holding a grade of less than B- after the second project (roughly the midterm) will be notified, and a meeting will be scheduled to discuss expectations for the latter half of the semester.

Expectation of Academic Honesty As always and as with every other course, this class is conducted in accordance with University policy on matters of academic honesty and integrity and with attention to the College's Honor Code. Note that instances of plagiarism will not be tolerated – whether in written text, in research design, in data acquisition and creation, or in graphic work – and will result in an automatic failure in the course. In research and design we build on the work of others: give credit where credit is due.

Additionally, this course contains a few considerations which should be stated. At several points in the course, students will be encouraged to look to their peers for collaborative problem solving and troubleshooting especially within the workshop and studio settings. Further, group work will be expected at different points in the semester. Except where otherwise stated in specific assignments, collaboration is welcomed but individual assignments must be conceived and completed individually.

Students with Disabilities Students with disabilities who will be taking this course and may need disability-related accommodations are encouraged to make an appointment to see me as soon as possible. Disabled students who need such accommodations must be registered in advance with the Office of Disability Services (ODS) in 105 Hewitt.

Resources & Materials

Software The computers in the DAL (see below) will have available all of the software necessary for the course. Additionally, students may request an educational license of ESRI's ArcGIS Desktop bundle for their personal computers from the instructor during the first week of class. Please note that these licenses are available for Windows operating systems only.

Purchases There are no required textbook purchases associated with this course. Readings that are not available electronically as open sources or through the University Libraries will be distributed as PDFs via Courseworks.

Students are encouraged to have an external hard drive with a minimum capacity of 20GB available.

DAL Students will be granted 24-hour access to the Digital Architecture Lab on the fourth floor of the Diana Center. Please note that this access does not extend to the studio spaces. The studio should be locked at all times for your personal safety and your belongings' security. The DAL will be shared with other studio courses; the room is open to all enrolled students at all times. Please respect other critics and students while courses are in session. Extra care should be taken in order to avoid unnecessary disruption.

The architecture department also provides a dedicated teaching assistant for the DAL, who offers technical assistance and may offer software-specific tutorials through the semester. More information regarding resources offered by the TA will be distributed in class and via email.

Courseworks All course materials will be distributed through Courseworks. In addition to the course's readings, assignments (along with any relevant data) will be posted on the day they are assigned.

EdBlog The class will have a blog established via the University's EdBlogs. This site is only visible and usable to participants enrolled in the course and as such should be viewed as a space for open and deliberative discussion and collective troubleshooting.

Participation in the blog-based discussion is expected as a component of students' participation grade. This is particularly important in commenting and responding to digital pin-ups conducted through the blog.

- ERL* The Barnard Libraries' Empirical Reasoning Lab is located in 200 Lehman (at Barnard) on the second floor of the library. The ERL has consultants on hand for guidance in empirical research question formulation as well as technical support concerning software for data analysis. Students seeking additional working help should consider making an appointment for questions on data availability and collection. The ERL's website (<http://erl.barnard.edu/>) also contains several tutorials, including dozens for Microsoft Excel, at <http://erl.barnard.edu/tutorials>.
- DSSC* The Digital Service Science Center is located on the lower level of Lehman Library (at SIPA) and is a great resource for GIS data and technical questions. DSSC collects spatial data and may have what you need for your project. Further, if they don't have the data you're looking for, the data librarians can usually help you find it. DSSC also has technical consultants available for questions regarding data as well as those related to performing certain GIS operations. Their facility is equipped with computer stations (with extremely nice monitors). Check their hours of operation before visiting on the Columbia Libraries website: <http://library.columbia.edu/content/libraryweb/individ/dssc.html>.
- ArcGIS Resources* The ESRI ArcGIS Resource Center is an excellent resource for technical GIS software questions. There you will find extensive "help" documentation on processes and tools within ArcGIS 10.2 as well as a blog, forum, and videos. It is very highly recommended that you search this site when you have a question. <http://resources.arcgis.com/en/help/main/10.2/>
- Other Software Resources* In addition to ESRI ArcGIS, the course will make ample use of a variety of software for the visualization of spatial data, online and off. For most of these, an incredible collection of tutorial materials is available. Some of these will be assembled and distributed via Courseworks and the class EdBlog. Students are encouraged to use the class blog to share additional resources encountered during their work.
- Office Hours* I hold weekly office hours in the Diana 503B on Thursdays from 11AM-1PM, beginning with the third week of classes. For the first two weeks, office hours vary and are posted on the office-hour sign-up sheet on the Architecture Department bulletin board (fifth floor of the Diana Center). Individual meetings can be arranged for times outside office hours by appointment.
- Notes on Email* I will often not be able to respond to emailed questions right away. Therefore, it is very important (especially during "crunch times") that you manage your time wisely and use the other resources available to you. With specific attention to technical questions: There are several ways (many of which are listed directly above) to find help if you need it. Absolutely, do not let an as-of-yet unanswered email hold you back. Independent and collaborative trouble-shooting is an expectation of the course and, frankly, the best way to learn the technical skills presented. The landscape of computer-based tools is in constant development and flux; Learning self-driven adaptability and resourcefulness is a greater technical skill than the mastery of any given collection of software.
- If you email me a technical question, be sure to include enough information to receive an adequate and helpful response. Necessary information includes, but is not limited to, (1) a complete and suitably specific description of what you are trying to accomplish and the problem(s) you are encountering, (2) any relevant information regarding the datasets you are using, (3) the steps you have already taken to address your problem *and* the results of each troubleshooting attempt, and (4) all relevant screenshots to help me understand what you are doing when I am not sitting in front of your computer.

Course Schedule

* Readings marked with an asterisk are required.

Note that the readings collected in the syllabus stem from several disciplines, many of which are considerably more technical than others. Please use your judgment in deciding where to skim through technical discussions of programming, computer science, etc.

Introductions

WEEK 1

W 9 Sep	Seminar	Course Questions and Premises; Review of the Syllabus; Expectations
	Workshop	Course Infrastructure and Resources

Designing (with) Data

WEEK 2

M 14 Sep	Assigned	Project 1 & In-Class Presentations
	Seminar	(Architectural) Design & (Big) Data: Proposed Methods for Data in Design
	Readings	<p>*Keough, Ian and David Benjamin. "Multi-objective Optimization in Architectural Design." <i>SpringSim '10. Proceedings of the 2010 Spring Simulation Multiconference. Article N. 191.</i> Society for Computer Simulation International. San Diego, CA: 2010.</p> <p>*Kitchen, Rob. "Big Data, New Epistemologies and Paradigm Shifts." In <i>Big Data and Society.</i> (2014) 1, pp 1-12.</p> <p>*Manovich, Lev. "Chapter 27: Trending: The Promises and the Challenges of Big Social Data." in Gold, Matthew K. <i>Debates in the Digital Humanities.</i> Minneapolis, MN: University of Minnesota Press, 2012. [An open-access version of the entire book is available online. A direct link to Manovich's essay is here: http://dhdebates.gc.cuny.edu/debates/text/15.]</p> <p>Schumacher, Patrik. "Parametricism as Style -- Parametricist Manifesto." [Presented at the Dark Side Club, 11th Architecture Biennale, Venice 2008 and available online at http://www.patrikschumacher.com/Texts/Parametricism%20as%20Style.htm]</p>
W 16 Sep	Workshop	From Data to Map: the Basics

Interpretation, Representation, & Visualization

WEEK 3

M 21 Sep	DUE	Project 1A
	Seminar	The Role of Interpretation and Representation
	Readings	<p>*DiBiase, David, Et Al. "Animation and the Role of Map Design in Scientific Visualization." <i>Cartography and Geographic Information Systems.</i> 19:4, 1992. pp 201-214, 265-266.</p> <p>*MVRDV. "Chapter 3: (Im)possible Worlds: Speculations" and "Chapter 4: World of Regions: Specializations." <i>KM3: Excursions on Capacities.</i> Barcelona: Actar, 2005.</p> <p>Werle, Shannon. "Towards a New Urban Sound." in Neeraj Bhatia and Lola Sheppard, Eds. <i>Bracket "Goes Soft."</i> Barcelona, Spain and New York, NY: Actar, 2012.</p> <p>Yau, Nathan. "Chapter 1: Telling Stories with Data." <i>Visualize This: The FlowingData Guide to Design, Visualization, and Statistics.</i> Indianapolis, IN: Wiley Publishing Inc, 2011. [Full e-book is available through the Libraries.]</p>
W 23 Sep	Workshop	Density Mapping: "Heat Maps" and 3D Mapping

WEEK 4

M 28 Sep	Seminar	Data Reliability & Ethics in Visualization
	Readings	<p>*Curry, Michael R. "Rethinking Rights and Responsibilities in Geographic Information Systems: Beyond the Power of the Image" <i>Cartography and Geographic Information Systems</i>. 1995, 22(1): 58-69.</p> <p>*Field, Kenneth. "Editorial: Reflections on a Criminal Crime Map." <i>The Cartographic Journal</i>. 2011, 48(1): 1-3. Map Students are expected to also examine the online map discussed in the editorial essay.</p> <p>*Monmonier, Mark. 1991. "Ethics and Map Design: Six Strategies for Confronting the Traditional One-Map Solution." <i>Cartographic Perspectives</i>. 1991, 10: 3-8.</p> <p>Onsrud, Harlan J. "Identifying Unethical Conduct in the Use of GIS." <i>Cartography and Geographic Information Systems</i>. 1995, 22(1): 90-97.</p>
W 30 Sep	DUE	Project 1B
	Workshop	Presentations and discussion of Project 1B.
	Assigned	Project 2

Scales, Systems, Sites, & Contexts

WEEK 5

M 5 Oct	Seminar	Informal Spaces & Data Flows
	Readings	<p>Brush, Brian, et al. "Dynamic Performance of Nature: Augmenting Environmental Perception through Social Media and Architectural Informatics." <i>Parsons Journal for Information Mapping</i>. 4:1, 2012.</p> <p>*Latour, Bruno and Emilie Hermant. <i>Paris: Ville Invisible</i>. Paris: Institut Synthelabo pour le progres de la connaissance, 1998. Text A full PDF of the English translation of the text by Liz Carey-Libbrecht (2006, corrections by Valerie Pihet) is available for download at Latour's website: http://www.bruno-latour.fr/virtual/PARIS-INVISIBLE-GB.pdf Images The images are assembled within an interactive site, also on Latour's website: http://bruno-latour.fr/virtual/EN/index.html</p> <p>*Manuel Castells, "Space of Flows, Space of Places: Materials for a Theory of Urbanism in the Information Age," in <i>The Cybercities Reader</i>, ed. Stephen Graham (London: Routledge, 2004), 82-93.</p> <p>*Roy, Ananya. 2005. "Urban Informality: Toward an Epistemology of Planning." In <i>Journal of the American Planning Association</i>. 71(2): 147-158.</p> <p>Sheppard, Lola. "From Site to Territory." in Neeraj Bhatia and Lola Sheppard, Eds. <i>Bracket "Goes Soft."</i> Barcelona, Spain and New York, NY: Actar, 2012.</p>
W 7 Oct	Workshop	Maps that Move: Basics

WEEK 6

M 12 Oct	DUE	Project 2A
	Seminar	Discussion of Project 2A findings and take-aways
W 14 Oct	Workshop	Maps that Move: Continued

WEEK 7

M 26 Oct	Seminar	Scales of Informality in Architecture & Urbanism
	Readings	Martin, Reinhold. "Multinational City: Inside Outsourcing" in Anthony Burke and Therese Tierney, Eds. <i>Network Practices: New Strategies in Architecture and Design</i> . New York, NY: Princeton Architectural Press, 2007. *Rowe, Colin, and Fred Koetter. "Crisis of the Object: the Predicament of Texture" <i>Collage City</i> . Cambridge, MA: MIT Press, 1983. *Spatial Information Design Lab. "The Pattern." (pamphlet). 2008. [available online at http://spatialinformationdesignlab.org/sites/default/files/publication_pdfs/ThePattern.pdf]
	Video	*Koolhaas, Rem and Bregtje van der Haak, directors. <i>Lagos wide and close: an interactive journey into an exploding city</i> . Amsterdam: Submarine Channel, 2005. [Available for viewing in Avery, Barnard, and Butler libraries and online at http://lagos.submarinechannel.com/]
W 28 Oct	DUE	Project 2B
	Workshop	Pin-Up with discussion
	Assigned	Project 3

Information, Informality, and Public Space

WEEK 8

M 2 Nov	Holiday	University Election Holiday – VOTE!
W 4 Nov	Guest	Guest Lecture – TBD

WEEK 9

M 9 Nov	Seminar	Informality & the Smart City
	Readings	Coleman, Scott. "Soft Progressivism in a Wasteland of Urban Code." in Neeraj Bhatia and Lola Sheppard, Eds. <i>Bracket "Goes Soft."</i> Barcelona, Spain and New York, NY: Actar, 2012. Greenfield, Adam and Mark Shepard. <i>Situated Technologies Pamphlets 1: Urban Computing and its Discontents</i> . New York, NY: The Architectural League of New York, 2007. [PDF available online at http://www.situatedtechnologies.net/files/UrbanComputing.pdf .] *Harrison, Colin and Ian Abbot Donnelly. "A Theory of Smart Cities." <i>Proceedings of the 55th Annual Meeting of the International Society for the Systems Sciences</i> . 2011. [PDF available online at http://journals.isss.org/index.php/proceedings55th/article/viewFile/1703/572] *Shepard, Mark. "Sentient City Survival Kit: Archaeology of the Near Future." In <i>Proceedings of the Digital Arts and Culture Conference, 2009. After Media: Embodiment and Context</i> . Digital Arts and Culture, 2009. [available online at http://escholarship.org/uc/item/4zp0c4x2].
W 11 Nov	DUE	Project 3A
	Workshop	Round-table topic proposal discussion and site assignments.

WEEK 10

M 16 Nov	Seminar	Participation & Politics
	Readings	<p>*Cruz, Teddy and Jonathan Tate. "Design Ops." in Esther Choi and Marrikka Trotter, Eds. <i>Architecture at the Edge of Everything Else</i>. Cambridge, MA: Work Books and the MIT Press, 2010.</p> <p>*Jacque, Andres. "Everyone an Expert" in <i>ARPA Journal</i>. 2014, issue 1. [available online at http://www.arpajournal.net/everyone-an-expert/]</p> <p>"Mapping for Change: Practice, Technologies, and Communication." <i>Participatory Learning and Action</i>. April 2006 (Issue 54).</p> <p>*Monmonier, Mark. <i>How to Lie with Maps, Second Edition</i>. University of Chicago Press, 1996. [Chapter 7: "Maps for Political Propaganda," pp. 87-112.]</p> <p>*Shoshan, Malkit. <i>Atlas of the Conflict: Israel-Palestine</i>. Rotterdam, NL: 010 Publishers, 2010. [excerpts]</p> <p>Skarlatidou, Artemis, et al. "Trust in Web GIS: The Role of the Trustee Attributes in the Design of Trustworthy Web GIS Applications." <i>International Journal of Geographical Information Science</i>. 2011, 25(12): 1913-1930.</p>
W 18 Nov	Workshop	Desk Crits

WEEK 11

M 26 Nov	Seminar	Sensing & Signaling
	Readings	<p>*Chen, Michael. "Signal Space: New York's Soft Frequency Terrain." in Neeraj Bhatia and Lola Sheppard, Eds. <i>Bracket "Goes Soft."</i> Barcelona, Spain and New York, NY: Actar, 2012.</p> <p>Filipponi, L., et al. "Smart City: An Event Driven Architecture for Monitoring Public Spaces with Heterogeneous Sensors," <i>Sensor Technologies and Applications (SENSORCOMM), 2010 Fourth International Conference on</i>, 18-25 July 2010, pp. 281-286.</p> <p>*Nam, Taewoo and Theresa A Pardo. "Conceptualizing smart cities with dimensions of People, Technology, and Institutions." <i>Proceedings of the 12th Annual International Digital Government Research Conference: Digital Government Innovation in Challenging Times</i>. 2011, pp. 282-291.</p>

Final Project Development

W 25 Nov	Workshop	Pin-Up of image drafts
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WEEK 12

M 30 Nov	Workshop	Desk Crits
W 2 Dec	Workshop	Pin-Up of video/animation drafts

WEEK 13

M 7 Dec	Workshop	Desk Crits
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The Finish Line

W 9 Dec	Seminar	The Data Keep Changing: Notes on design processes & urban processes
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Readings Fuller, Matthew and Usman Haque. *Situated Technologies Pamphlet 2: Urban Versioning Systems 1.0*. New York, NY: The Architectural League of New York, 2008. PDF available online at <http://www.situatedtechnologies.net/files/UrbanVersioningSystem.pdf>

*Morishita, Yu. "Notes on Residual Space." in Esther Choi and Marrikka Trotter, Eds. *Architecture at the Edge of Everything Else*. Cambridge, MA: Work Books and the MIT Press, 2010.

WEEK 14

M 14 Dec DUE Final Project Presentations & Review

Appendix

Additional References There is no shortage in recent literature on technology, information, and data on cities and within architectural discourse. Likewise, the growing ability to trace urban phenomena has steadily increased the interest in informality and informal systems in scholarship and research. These references are merely a short and diverse starting point. Some of the sources below contain case studies and images which will be referenced in discussion.

Abel, Chris. *Architecture, Technology, and Process*. Amsterdam, NL and Boston, MA: Elsevier and Architectural Press, 2004.

Burdett, Ricky and Deyan Sudjic, Eds. *The Endless City: The Urban Age Project by the London School of Economics and Deutsche Bank's Alfred Herrhausen Society*. New York: Phaidon Press, 2008.

----. *Living in the Endless City: The Urban Age Project by the London School of Economics and Deutsche Bank's Alfred Herrhausen Society*. New York: Phaidon Press, 2011.

Few, Stephen. "Data Visualization for Human Perception." *The Encyclopedia of Human-Computer Interaction, 2nd Ed.* Soegaard, Mads and Dam, Rikke Friis (eds). Aarhus, Denmark: The Interaction Design Foundation, 2013. <http://www.interaction-design.org/encyclopedia/data_visualization_for_human_perception.html>

MacEachran, Alan. *How Maps Work: Representation, Visualization, and Design*. New York: The Guilford Press, 1995.

Mitchell, William J. *City of Bits: Space, Place, and the Infobahn*. Cambridge, MA: MIT Press, 1996.

Monmonier, Mark. *How to Lie with Maps*. Chicago: University of Chicago Press, 1991.

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Pourdenhnad, John, et al. "Systems and Design Thinking: A Conceptual Framework for Their Integration." *Proceedings of the 55th Annual Meeting of the International Society for the Systems Sciences*. 2011. PDF available online at <http://journals.iss.org/index.php/proceedings55th/article/viewFile/1650/592>.

Shepard, Mark. *Sentient City: Ubiquitous Computing, Architecture, and the Future of Urban Space*. Cambridge, MA and New York, NY: MIT Press and the Architectural League of New York, 2011.

Tufte, Edward. *Envisioning Information: Narratives of Space and Time*. Cheshire, CT: Graphics Press, 1990.

— —. *The Visual Display of Quantitative Information*. Cheshire, CT: Graphics Press, 1986.

Varnelis, Kazys, Ed. *The Infrastructural City: Networked Ecologies in Los Angeles*. Barcelona: Actar, 2008.

Ware, Colin. "Chapter 1: Foundations for an Applied Science of Data Visualization." *Information Visualization: Perception for Design*. Waltham, MA: Elsevier, 2013.