Welcome!

Computation, Parametrics and Data Analysis in Practice

September 22, 2015 2:00 PM - 3:00 PM EDT
Earn 1.0 AIA LU
Moderator

Robert Yori is the Senior Digital Design Manager at Skidmore, Owings and Merrill in New York, where he explores innovative uses of technology to better design, visualize, and deliver SOM’s projects. He manages technology-related R&D efforts, provides strategic guidance, designs and maintains learning curricula, and teaches. He co-leads Firmwide Digital Design initiatives including knowledge sharing, big data analysis, and computational design literacy. Robert is the 2016 Chair of TAP, an Advisory Board Member of the NYC College of Technology’s Department of Architectural Technology, and co-leads the RTC Design Technology Summit. He has presented at ACADIA, Autodesk University, BIMForum, and RTC, has been published in DesignIntelligence and the Journal of Building Information Modeling.
Nate Miller is the founder of PROVING GROUND. His new business venture is focused on the innovative applications of data in the building industry. As a consultant, he has advised leaders and teams in some of the most reputable organizations in the building industry. Whether it is offering strategic insight or developing new computational workflows, Nate strives to help his clients leverage data to improve the building process. With deep project experience, Nate has worked with his clients to deliver leading-edge solutions for projects ranging from high-rise towers, corporate office spaces, mixed-use master plans, and Olympic-sized sports venues.
Andrew Heumann leads the Design Computation team at NBBJ, overseeing strategy, development, and implementation of computational tools for diverse projects and applications. He has developed a suite of tools for NBBJ’s corporate and commercial practice, which aid in the management of project metrics, environmental and urban analysis, and façade design. Andrew is trained in both architecture and computer science, and has lectured and taught seminars at Cornell University, Yale University, California College of the Arts, and the University of Washington. His work has been published in Wallpaper magazine, CLOG journal, and presented at conferences including SIMAUD, ACADIA, the AEC Technology Symposium, and Facades+. 
Questions?

Submit a question to the moderator via the chat box.

Content-related questions will be answered during the Q&A portion at the end as time allows.

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Course Description

This seminar will introduce and define the related concepts of Computational Design, Parametric Modeling, Algorithms, and Data Analysis in the context of architectural practice. Mastery of these technologies and approaches is becoming increasingly important for design practices to manage complexity, streamline processes, and gain insight. Examples drawn from practice will illustrate the application of computation to real-world projects, and introduce strategies for increasing adoption and application.
Learning Objectives

1. Describe the concepts of parametric design, data analysis, and design computation in general
2. Relate the concepts to areas of architectural practice
3. Seek opportunities within their own practices and projects to leverage such strategies
4. Assess the success of applied strategies in project work to better align them in the future
Our built world is becoming ‘datafied’.
Disney MagicBand—Enhance the park experience, control access, collect visitor data.
Google's Project Sunroof

55 Casa Way, San Francisco, CA, United States

Analysis complete. Your roof has:

1,870 hours of usable sunlight per year
Based on day-to-day analysis of weather patterns

2,042 sq feet available for solar panels
Based on 3D modeling of your roof and nearby trees

$14,000 savings
Estimated net savings for your roof with a 20-year lease

FINE-TUNE ESTIMATE
SEE SOLAR PROVIDERS

Wrong roof? Drag the marker to the right one.
Nest – A thermostat that learns and adapts to your behavior.
Data has been described as the ‘new oil for the digital economy.’
What does a **Data-Driven** process look like?
Early-stage parametric modeling, RTKL w/ CASE
Early-stage energy analysis, HDR Architecture w/ Proving Ground
Interoperability and Data Mining workflow with BIM, Proving Ground
How can architects implement a data-driven strategy?
Choose the right data sources for your business.
20,500 Families

645,000 Instances

Content Analysis and Standardization, NBBJ w/ CASE
Focus on tangible outcomes.
## SOLAR ANALYSIS

<table>
<thead>
<tr>
<th>Louver Angle</th>
<th>% Reduction from Louvers</th>
</tr>
</thead>
<tbody>
<tr>
<td>-15</td>
<td>51.1125438</td>
</tr>
<tr>
<td>0</td>
<td>51.736603</td>
</tr>
<tr>
<td>15</td>
<td>52.236696</td>
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<tr>
<td>-10</td>
<td>50.931375</td>
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<tr>
<td>0</td>
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<td>10</td>
<td>52.485053</td>
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<td>50.02593</td>
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<td>5</td>
<td>54.071131</td>
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<td>-2.5</td>
<td>49.00238</td>
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<tr>
<td>0</td>
<td>49.23105</td>
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<tr>
<td>2.5</td>
<td>53.15905</td>
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<td>5</td>
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<td>-2</td>
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<td>2</td>
<td>50.69043</td>
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<td>-1.5</td>
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<tr>
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<td>42.21958</td>
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<tr>
<td>0</td>
<td>42.51287</td>
</tr>
<tr>
<td>0.5</td>
<td>49.71897</td>
</tr>
</tbody>
</table>

### Value Scale

**Max**
- % Reduction from Louvers: 80
- % Reduction from Louvers + Window: 95
- Transmitted into Building: 95

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**Louver Optimization, SNØHETTA w/ CASE**
Louver Optimization, SNØHETTA w/ CASE
Build up your front lines.
Workshops for Leadership & Staff, HDR Architecture
Simple Tools for Gaining Insight into Data, Proving Ground
Project Management for Building Teams, Proving Ground
Knowledge Assessment Methodology, Proving Ground
You can use data to deliver value in your business and drive performance in your buildings.
DESIGN → PERFORMANCE → EVALUATE → AESTHETICS → COST → EXPERIENCE → ...

ITERATE
digital practice

BIM
APP DEVELOPMENT
DESIGN COMPUTATION
VISUAL COMMUNICATION
PERFORMANCE ANALYSIS
DESIGN COMPUTATION LEADERSHIP

SEATTLE ● ● ● ● ● ● ●
COLUMBUS ●
SAN FRANCISCO ●
NEW YORK ● ●
LOS ANGELES ● ●
BOSTON ●
LONDON ● ●
SHANGHAI ● ●
LET CONCEPTS DRIVE COMPUTATION
FLEX YOUR MODELS

Geometry Parameters

Bed
- Bed Width: 3'
- Bed Length: 7'3"

Clearances
- Foot of Bed: 4'
- Side of Bed: 3'9"

Toilet Room
- Length: 9'7"
- Depth: 7'4"

Major Planning
- Planning Module
- Bay Depth: 21'9"

Inboard
- Outboard
- Same-handed
- Mirrored

Corridor Width: 70
Corridor Shift: 0.000

Patient Room Geometry
- Restroom Rotation: 0.000
- Restroom Shift: 0.000
- Bed Rotation: 0.000
- Restroom Chamber: 0.0

Fine Tuning

Sightline Display
- Patient to Patient
- Caregiver to Patient
- Patient to Window

Isovist Display
- Patient
- Caregiver

Metrics
- Patient Distance to Toilet Room: 12.5 ft
- Percent Window View: Not Calculated

Configurations
- Preset Name
- Saved Presets
- Default
- Restore
FLEX YOUR MODELS

Geometry Parameters

Bed
- Bed Width: 3'
- Bed Length: 7'3''

Clearances
- Foot of Bed: 4'
- Side of Bed: 3'9''

Toilet Room
- Length: 9'7''
- Depth: 7'4''

Major Planning
- Planning Module: 16'
- Bay Depth: 2'13''

- Inboard
- Outboard
- Same-handed
- Mirrored

Corridor Width: 70''
Corridor Shift: 0.000

Patient Room Geometry
- Restroom Rotation: 0.000
- Restroom Shift: 0.000
- Bed Rotation: 0.000
- Restroom Chamber: 0.0

Fine Tuning

Sightline Display
- Patient to Patient
- Caregiver to Patient
- Patient to Window

Isovist Display
- Patient
- Caregiver

Metrics
- Patient Distance to Toilet Room: 6.7 ft
- Percent Window View: Not Calculated

Configurations
- Presets
- Saved Presets
- Default: Outboard
- Save
- Restore
FLEX YOUR MODELS

Geometry Parameters

Bed
- Bed Width: 3'
- Bed Length: 7'3"

Clearances
- Foot of Bed: 4'
- Side of Bed: 3'9"

Toilet Room
- Length: 9'7"
- Depth: 7'4"

Major Planning
- Planning Module
- Bay Depth: 21'9"

Options:
- Inboard
- Outboard
- Same-handed
- Mirrored

Corridor Width: 70
Corridor Shift: 0.000

Patient Room Geometry
- Restroom Rotation: 0.000
- Restroom Shift: 0.000
- Bed Rotation: 0.000
- Restroom Chamber: 0.0

Fine Tuning

Sightline Display
- Patient to Patient
- Caregiver to Patient
- Patient to Window

Isovist Display
- Patient
- Caregiver

Metrics
- Patient Distance to Toilet Room: 6.8 ft
- Percent Window View: Not Calculated

Configurations

Saved Presets
- Default: Outboard-Mirrored

PRESETS
- [View]
### Geometry Parameters

**Bed**
- Bed Width: 3'
- Bed Length: 7'3"'

**Clearances**
- Front of Bed: 4'
- Side of Bed: 3'9"

**Toilet Room**
- Length: 9'7"
- Depth: 7'4"

**Major Planning**
- Planning Module: 18
- Bay Depth: 23'9"
  - **Inboard**
  - **Outboard**
- **Same-handed**
- **Mirrored**
- Corridor Width: 70
- Corridor Shift: 0.000

**Patient Room Geometry**
- Restroom Rotation: -0.215
- Restroom Shift: 0.231
- Bed Rotation: -0.246
- Restroom Chamber: 4.8

---

### Sightline Display
- Patient to Patient
- Caregiver to Patient
- Patient to Window

### Isovist Display
- Patient
- Caregiver

### Metrics
- Patient Distance to Toilet Room: **9.9 ft**
- Percent Window View: **Not Calculated**

### Configurations

**Preset Name**: [Save]

**Saved Presets**
- Outboard-Angled
  - **Restore**
# Flex Your Models

**Geometry Parameters**

<table>
<thead>
<tr>
<th>Bed</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bed Width</td>
<td>3'</td>
<td></td>
</tr>
<tr>
<td>Bed Length</td>
<td>7'3&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**Clearances**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot of Bed</td>
<td>4'</td>
<td></td>
</tr>
<tr>
<td>Side of Bed</td>
<td>3'9&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**Toilet Room**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>9'7&quot;</td>
<td></td>
</tr>
<tr>
<td>Depth</td>
<td>7'4&quot;</td>
<td></td>
</tr>
</tbody>
</table>

**Major Planning**

<table>
<thead>
<tr>
<th>Planning Module</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bay Depth</td>
<td>21'9&quot;</td>
</tr>
</tbody>
</table>

**Inboard**
- [ ]

**Same-handed**
- [ ]

**Corridor Width**
- [ ]

**Corridor Shift**

- 0.313

**Patient Room Geometry**

<table>
<thead>
<tr>
<th>Room Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotation</td>
<td>0.000</td>
</tr>
<tr>
<td>Shift</td>
<td>1.000</td>
</tr>
<tr>
<td>Rotation</td>
<td>0.304</td>
</tr>
<tr>
<td>Room</td>
<td>3.1</td>
</tr>
</tbody>
</table>

**Sightline Display**

- [ ] Patient to Patient
- [ ] Caregiver to Patient
- [ ] Patient to Window

**Isovist Display**

- [ ] Patient
- [ ] Caregiver

**Metrics**

- Patient Distance to Toilet Room: 8.6 ft
- Percent Window View: Not Calculated

**Configurations**

- Preset Name: [ ]
- Saved Presets: [ ]
FLEX YOUR MODELS

Geometry Parameters

<table>
<thead>
<tr>
<th>Bed</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bed Width</td>
<td>3'</td>
<td></td>
</tr>
<tr>
<td>Bed Length</td>
<td>7'</td>
<td>3'</td>
</tr>
</tbody>
</table>

Clearances

| Foot of Bed | 4'   |       |
| Side of Bed | 3'   |       |

Toilet Room

| Length   | 9''  |       |
| Depth    | 7''  |       |

Major Planning

| Planning Module | 18   |       |
| Bay Depth       | 213''|       |

Patient Room Geometry

| Restroom Rotation | 0.000|       |
| Restroom Shift    | 1.000|       |
| Room Rotation     | 0.304|       |
| Room Chamber      | 3.1  |       |

Fine Tuning

Sightline Display

- Patient to Patient
- Caregiver to Patient
- Patient to Window

Isovist Display

- Patient
- Caregiver

Metrics

Patient Distance to Toilet Room

8.6 ft

Percent Window View

38% Field of View

Configurations

Saved Presets

MVH
FLEX YOUR MODELS

Geometry Parameters

Bed
- Bed Width: 3'
- Bed Length: 7'3"

Clearances
- Foot of Bed: 4'
- Side of Bed: 3'9"

Toilet Room
- Length: 9'7"
- Depth: 7'4"

Major Planning
- Planning Module: 18
- Bay Depth: 22'9"
- Inboard
- Outboard
- Same-handed
- Mirrored
- Corridor Width: 18
- Corridor Shift: 0.313

Patient Room Geometry
- Restroom Rotation: 0.000
- Restroom Shift: 1.000
- Bed Rotation: 0.304
- Restroom Chamber: 3.1

Fine Tuning

Sightline Display
- Patient to Patient
- Caregiver to Patient
- Patient to Window

Isovist Display
- Patient
- Caregiver

Metrics
- Patient Distance to Toilet Room: 8.6 ft
- Percent Window View: Not Calculated

Configurations

Preset Name
Saved Presets
- MVH
FLEX YOUR MODELS

Geometry Parameters

Bed
- Bed Width: 3'
- Bed Length: 7'3"

Clearances
- Foot of Bed: 4'
- Side of Bed: 3'9"

Toilet Room
- Length: 9'7"
- Depth: 7'4"

Major Planning
- Planning Module: 16
- Bay Depth: 22'3"
- Inboard: 1
- Outboard: 0
- Same-handed: 1
- Mirrored: 0
- Corridor Width: 18
- Corridor Shift: 0.313

Patient Room Geometry
- Restroom Rotation: 0.155
- Restroom Shift: 1.000
- Bed Rotation: 0.498
- Restroom Chamber: 3.1

Sightline Display
- Patient to Patient
- Caregiver to Patient
- Patient to Window

Isovist Display
- Patient
- Caregiver

Metrics
- Patient Distance to Toilet Room: 8.9 ft
- Percent Window View: Not Calculated

Configurations
- Preset Name: [Input Field]
- Saved Presets: MVH
- Restore
FLEX YOUR MODELS

Geometry Parameters

Bed
- Bed Width: 3'
- Bed Length: 7'3"

Clearances
- Foot of Bed: 4'
- Side of Bed: 3'9"

Toilet Room
- Length: 9'7"
- Depth: 7'4"

Major Planning
- Planning Module: 16'
- Bay Depth: 21'9"

Inboard / Outboard
- Same-handed / Mirrored

Corridor Width: 18'

Corridor Shift: 0.313

Patient Room Geometry
- Restroom Rotation: 0.000
- Restroom Shift: 1.000
- Bed Rotation: 0.304
- Restroom Chamber: 3.1

Fine Tuning

Sightline Display
- Patient to Patient
- Caregiver to Patient
- Patient to Window

Isovist Display
- Patient
- Caregiver

Metrics
- Patient Distance to Toilet Room: 8.6 ft
- Percent Window View: Not Calculated

Configurations

Saved Presets
- MVH

Settings Button: Restore
FLEX YOUR MODELS

Geometry Parameters

Bed
- Bed Width: 3'
- Bed Length: 7.5'

Clearances
- Foot of Bed: 4'
- Side of Bed: 3.5'

Toilet Room
- Length: 9.7'
- Depth: 7.4'

Major Planning
- Planning Module: 12'
- Bay Depth: 22.9
- Inboard
- Outboard
- Same-handed
- Mirrored
- Corridor Width: 18
- Corridor Shift: 0.313

Patient Room Geometry
- Restroom Rotation: 0.155
- Restroom Shift: 1.000
- Bed Rotation: 0.486
- Restroom Chamber: 3.1

Fine Tuning

Sightline Display
- Patient to Patient
- Caregiver to Patient
- Patient to Window

Isovist Display
- Patient
- Caregiver

Metrics
- Patient Distance to Toilet Room: 8.9 ft
- Percent Window View: Not Calculated

Configurations
- Preset Name: [Enter]
- Saved Presets: MVH

PRESETS
ASK YOUR MODEL QUESTIONS

Interior Visibility Factor

Window Access Factor

Daylight Factor

Average Travel Distance to/from location (same floor)

RUSSELL INVESTMENTS

SAMSUNG
INVEST IN BUILDING TOOLS

Views are calculated from every point on the facades of the three towers to the specified landmark. Darker colors indicate a better view of the landmark in question.
INVEST IN BUILDING TOOLS

This view analysis shows the percentage of views above 45° from street grade for both concepts A and C.2. We have identified two main potential view targets for our site: 1) Lake Union, displayed in magenta, and 2) the Seattle Space Needle, displayed in blue. The percentages shown are based on the concepts building mass and not from the baseline design. What we found is that the long skinny design of concept C.2, creates a much higher potential, about 30% more, than concept A for the given target views. The majority of the views will be toward Lake Union, but a surprisingly large amount in both schemes will get a view of the Seattle Space Needle.
ADDRESS CLIENT VALUE
ADDRESS CLIENT VALUE
ADDRESS CLIENT VALUE
ADDRESS CLIENT VALUE
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ADDRESS CLIENT VALUE
ADDRESS CLIENT VALUE
ADDRESS CLIENT VALUE
ADDRESS CLIENT VALUE
ADDRESS CLIENT VALUE
TRAIN EVERYONE!

Expert

Hacker

User

Thinker

Understands capabilities
Can utilize existing tools
Can modify and adapt existing tools
Can build sophisticated tools from scratch
TRAIN EVERYONE!

Expert
- Design Computation Leaders
  - Understands capabilities
  - Can utilize existing tools
  - Can modify and adapt existing tools
  - Can build sophisticated tools from scratch

Hacker
- Designers, Project Architects, BIM managers

User

Thinker
- Firm Leadership, Design Leaders, PMs
Q&A Time

If you have questions for today’s presenters, please submit them to the moderator via the chat box.

Content-related questions will be answered during this Q&A portion as time allows.
Thank you for joining us!

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*Tablet and smartphone users must copy down the above survey link.*

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