

# Implementing an Approach to Measure Annual Daylight Illuminance Distributions

---

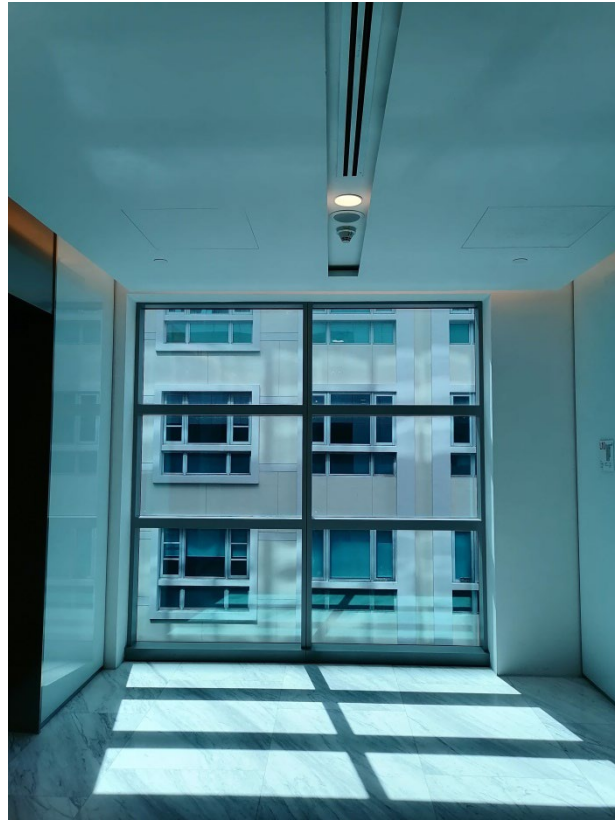
Radiance Workshop, 2022 | Toronto, Canada

Michael Kent, PhD

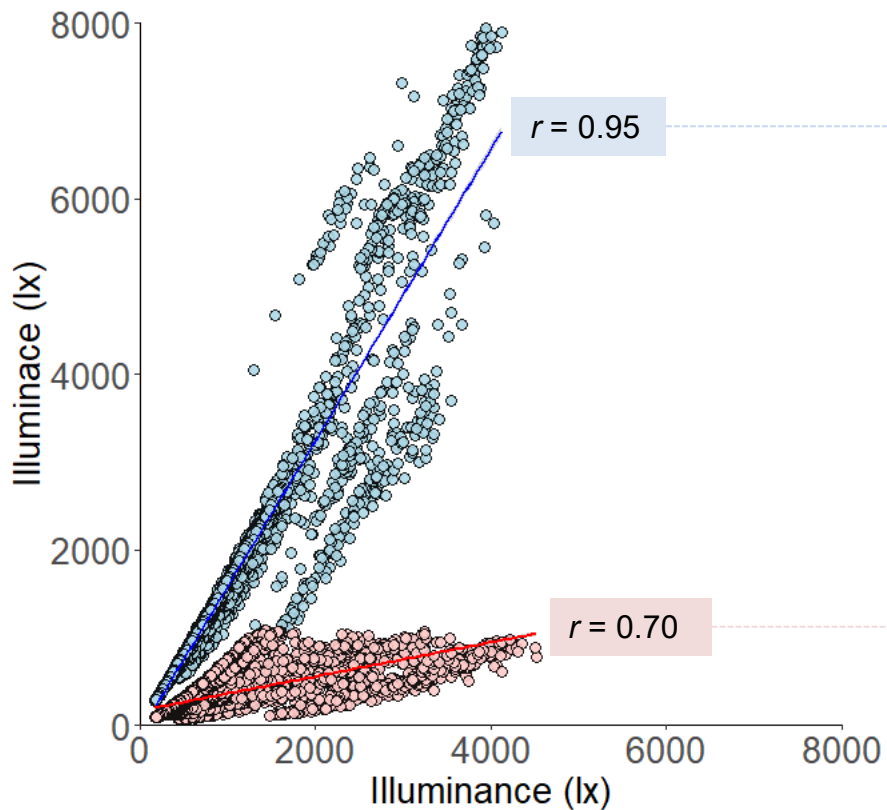
05/08/2022



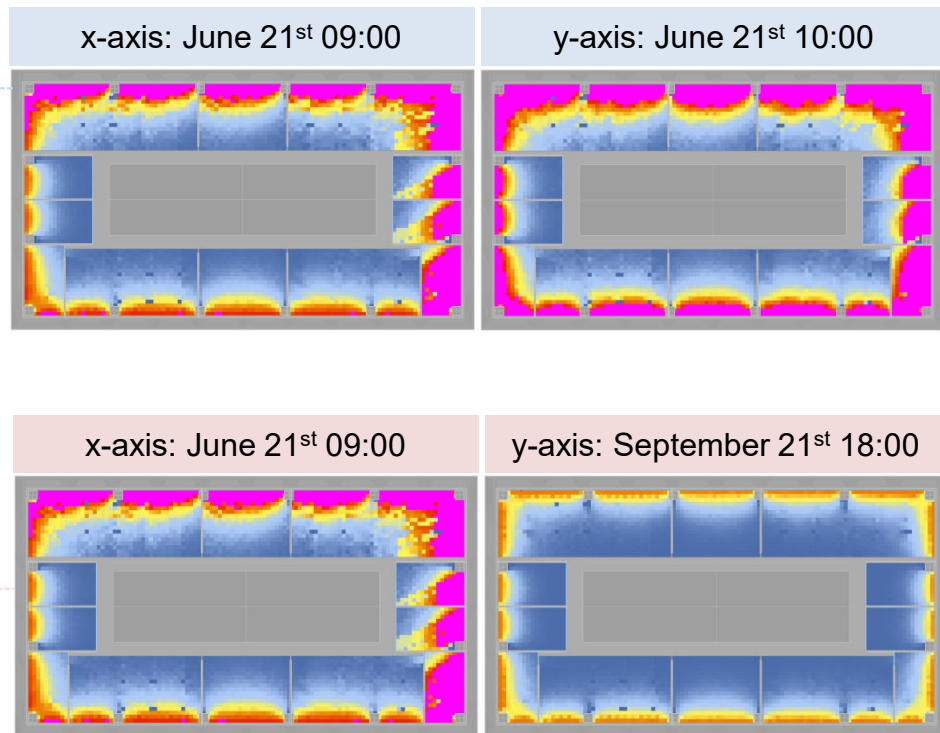
# Why is daylight distribution important?

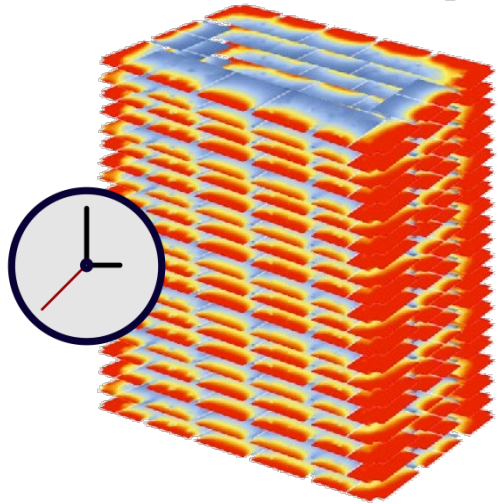
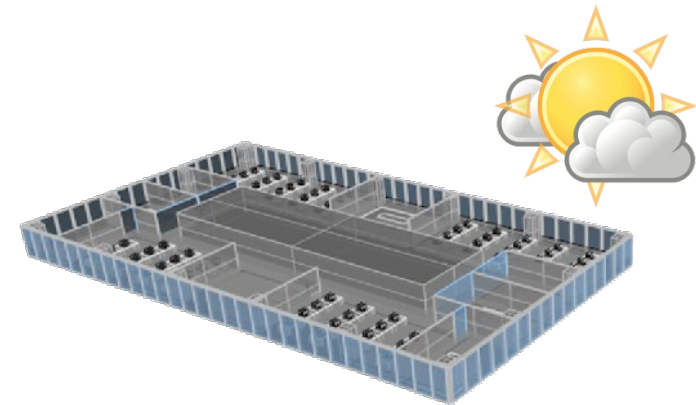


# How can this be resolved?

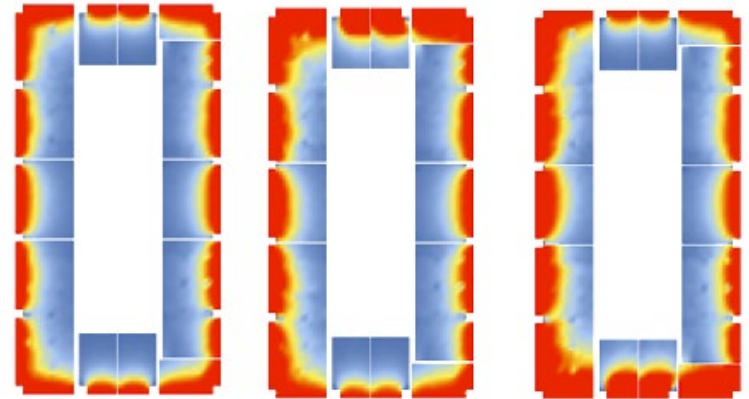


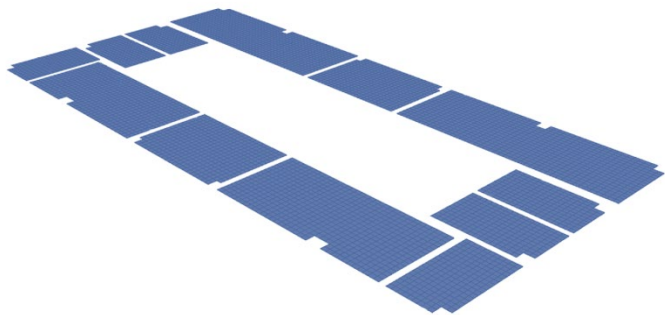
## Scale





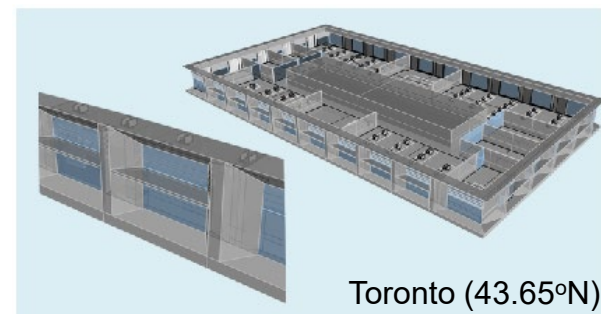
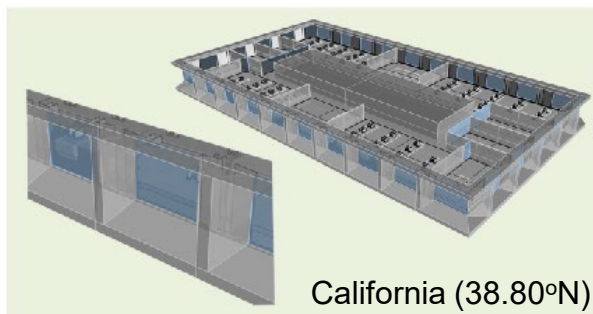
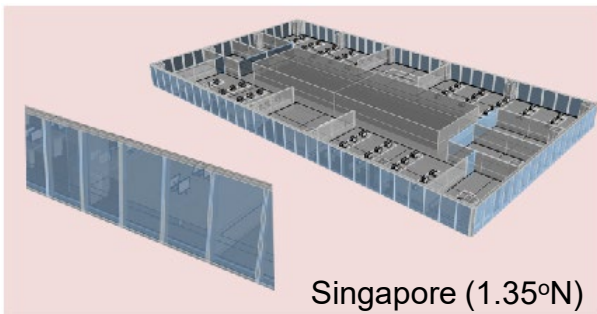
### Representative Illuminance Distributions





### Overview:

- 0.78m sensor elevation
- 3934 grid sensors
- 0.5hr time-step interval

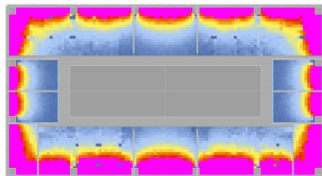


Component	Explained (%)	Total (%)
1	74	74
2	14	88
3	4	92

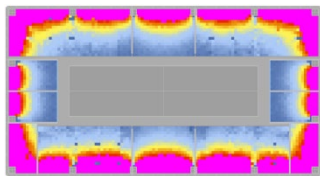
Component	Explained (%)	Total (%)
1	50	50
2	15	65
3	12	78

Component	Explained (%)	Total (%)
1	59	59
2	12	71
3	11	82

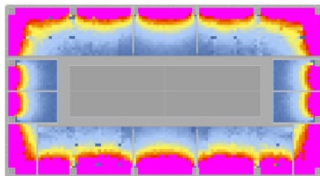
PC1



25 Dec. 13:00

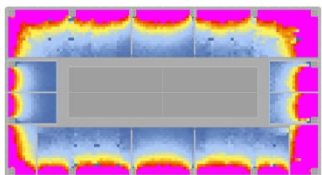


25 Dec. 14:00

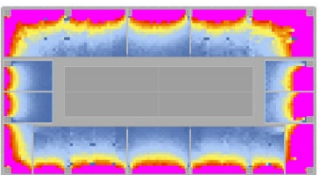


1 Sept. 12:00

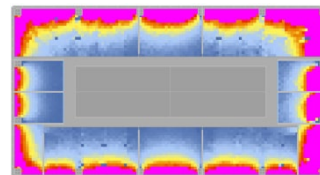
PC2



24 Aug. 10:00

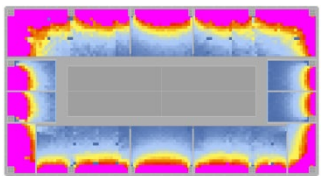


16 Aug. 10:00

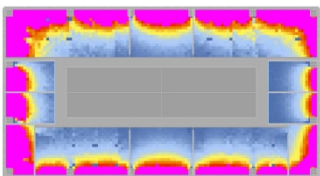


30 Jul. 10:00

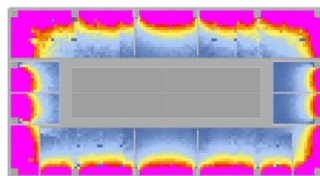
PC3



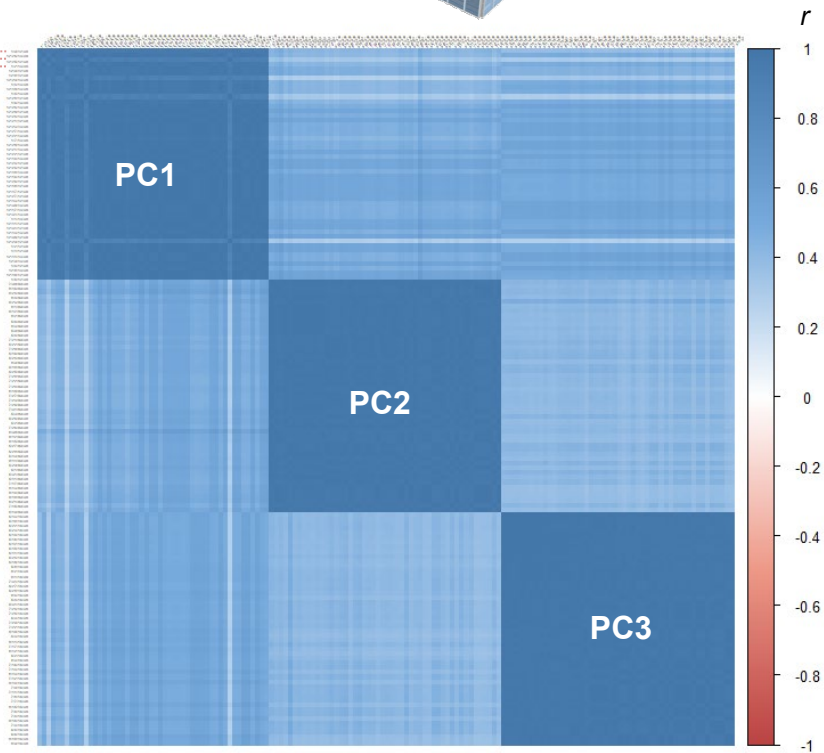
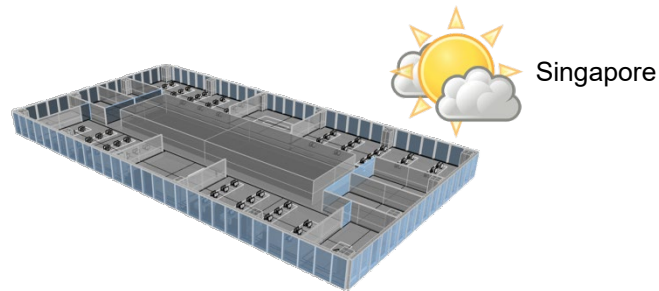
22 May 17:00



18 Aug. 17:00

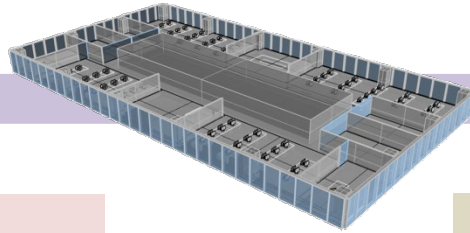


13 May 17:00

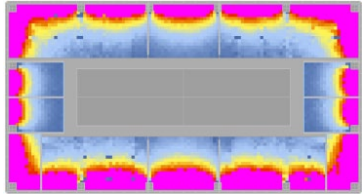


# Comparison to design practice

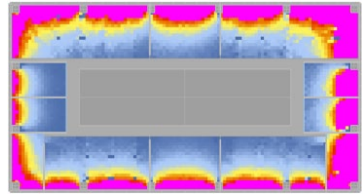
Principal components



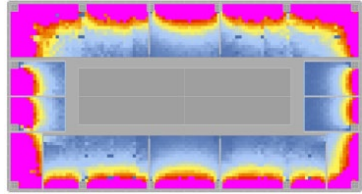
~Fall/Autumn equinox



**1 September 12:00**  
Min/Avg. = 0.20  
Avg. = 2395 lx

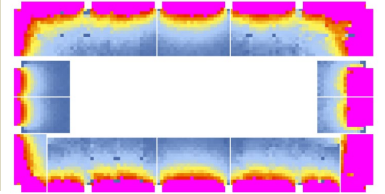


**30 July 10:00**  
Min/Avg. = 0.17  
Avg. = 1496 lx

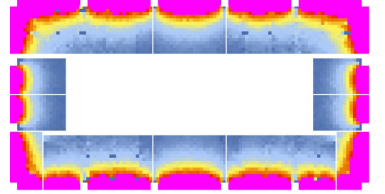


**13 May 17:00**  
Min/Avg. = 0.16  
Avg. = 1784 lx

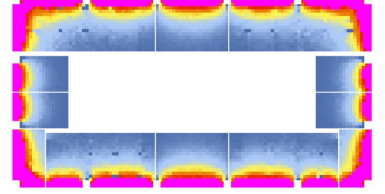
**21 September 10:00**  
Min/Avg. = 0.17  
Avg. = 1870 lx



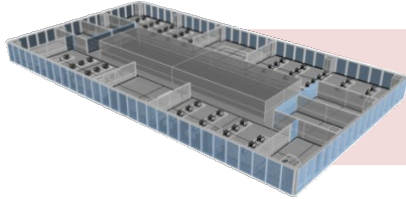
**21 September 13:00**  
Min/Avg. = 0.22  
Avg. = 1692 lx



**21<sup>st</sup> September 16:00**  
Min/Avg. = 0.22  
Avg. = 1025 lx



# Main points



Model dependent  
Geometry influences analysis



Considers climate  
Handles different weather files



Tool agnostic  
Interoperable between different software





**「Thank you」**

**For more information, please see or contact:**

Michael G. Kent

[michaelkent@berkeley.edu](mailto:michaelkent@berkeley.edu)

Berkeley Education Alliance for Research in Singapore

Kent, Schiavon, and Jakubiec. 2020. A dimensionality reduction method to select the most representative daylight illuminance distributions. *Journal of Building Performance Simulation*, <https://doi.org/10.1080/19401493.2019.1711456>