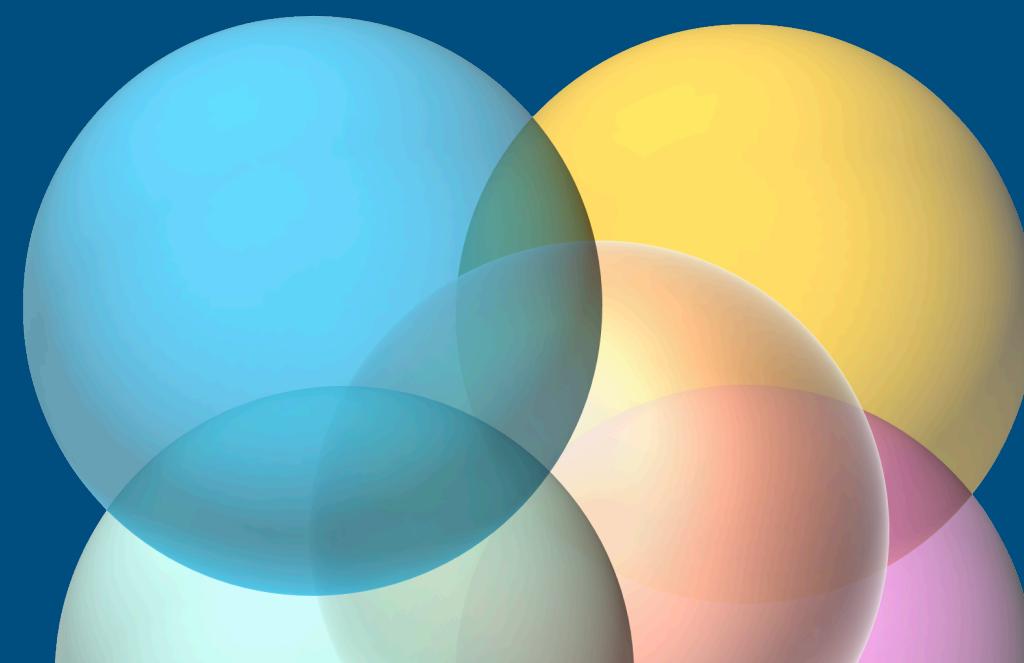
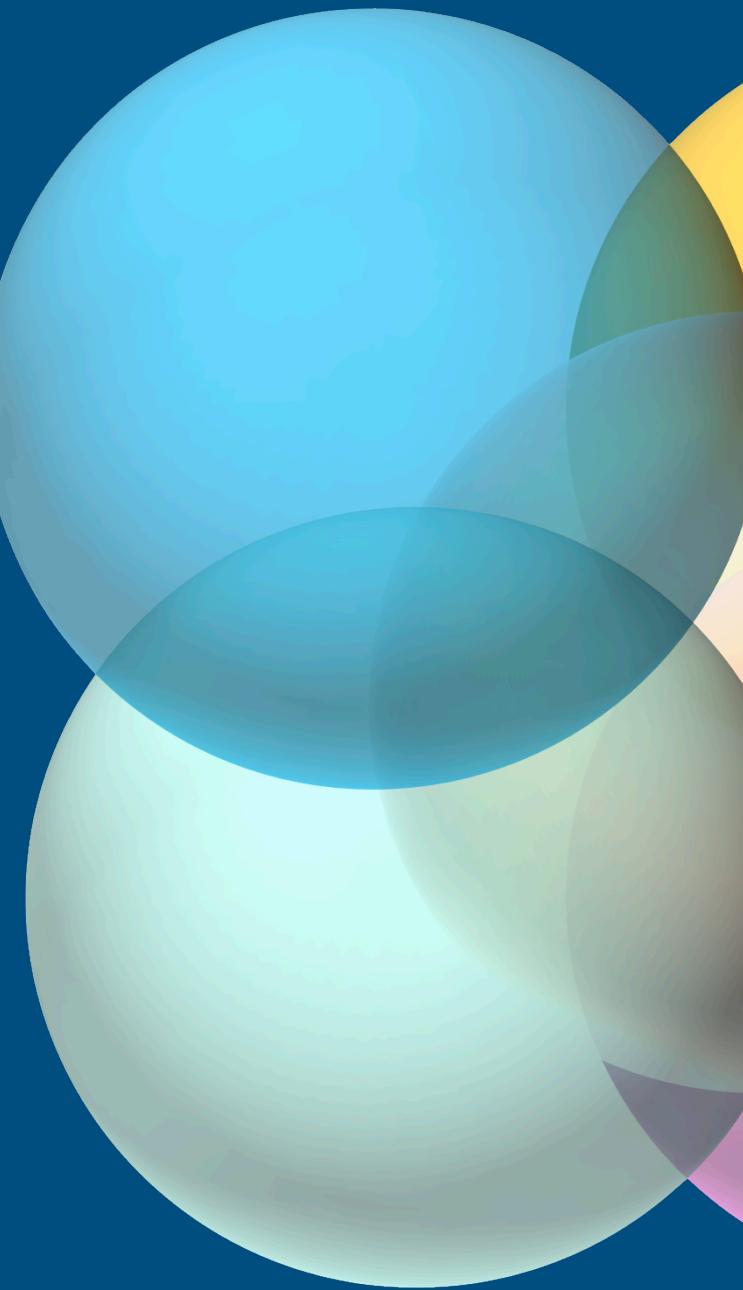
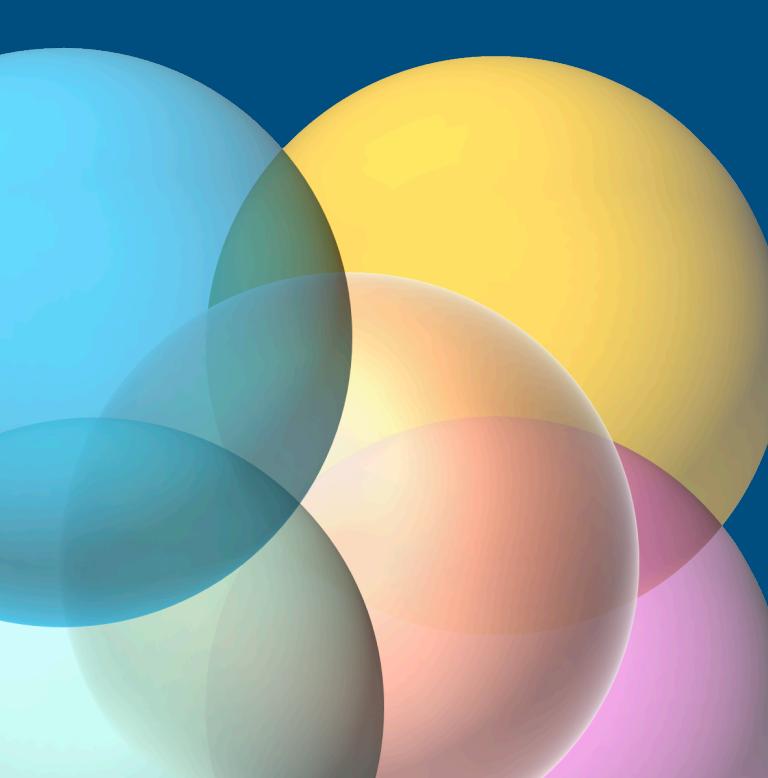
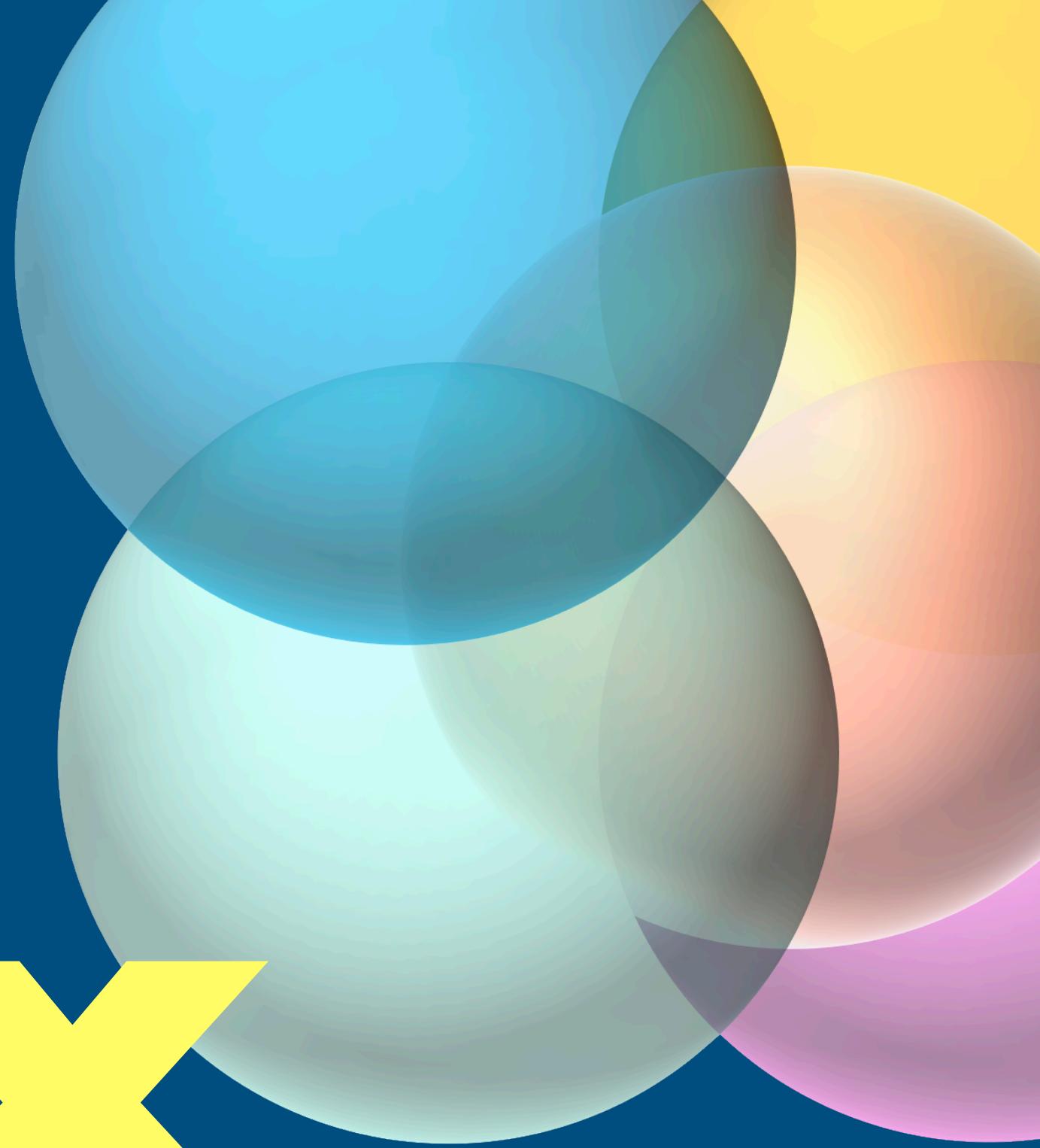




Complex Systems



The Trouble With Learning In **Complex** **Systems**





Jason Hand



Microsoft

 jasonhand

Q-Con - New York
June 2019

Two Types Of Systems

There are systems
in which we can
determine cause
and effect...

&

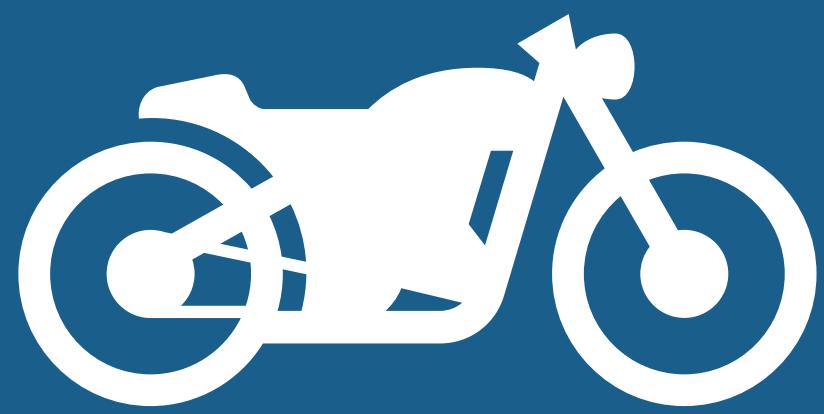
there are
those in which
we cannot.

Ordered

Un-ordered

Ordered Systems

Complicated



Obvious



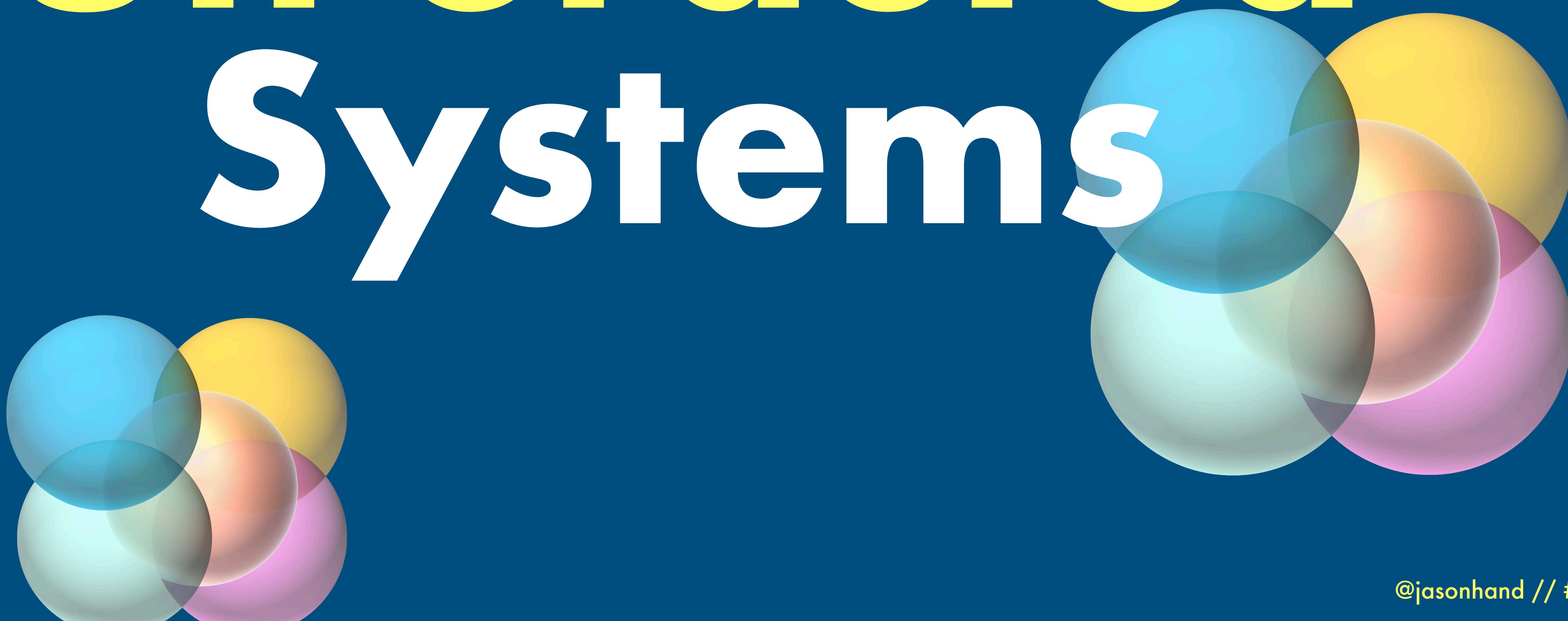
“Something unknown
is doing we don’t
know what.”

- Arthur Eddington

Ordered

Un-ordered

Un-ordered Systems



Complicated



Obvious



Complex



Chaotic

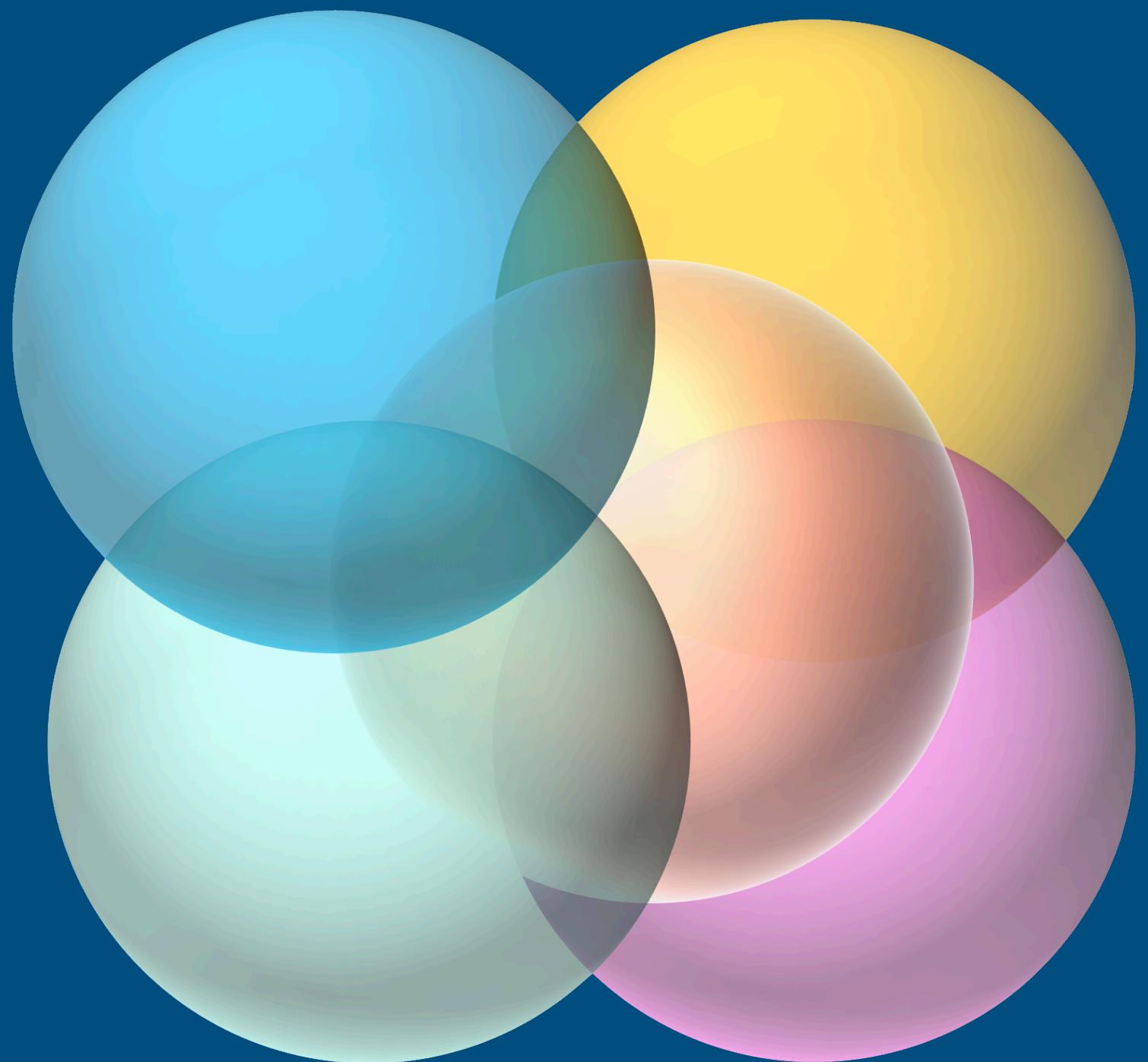


Sociotechnical Systems

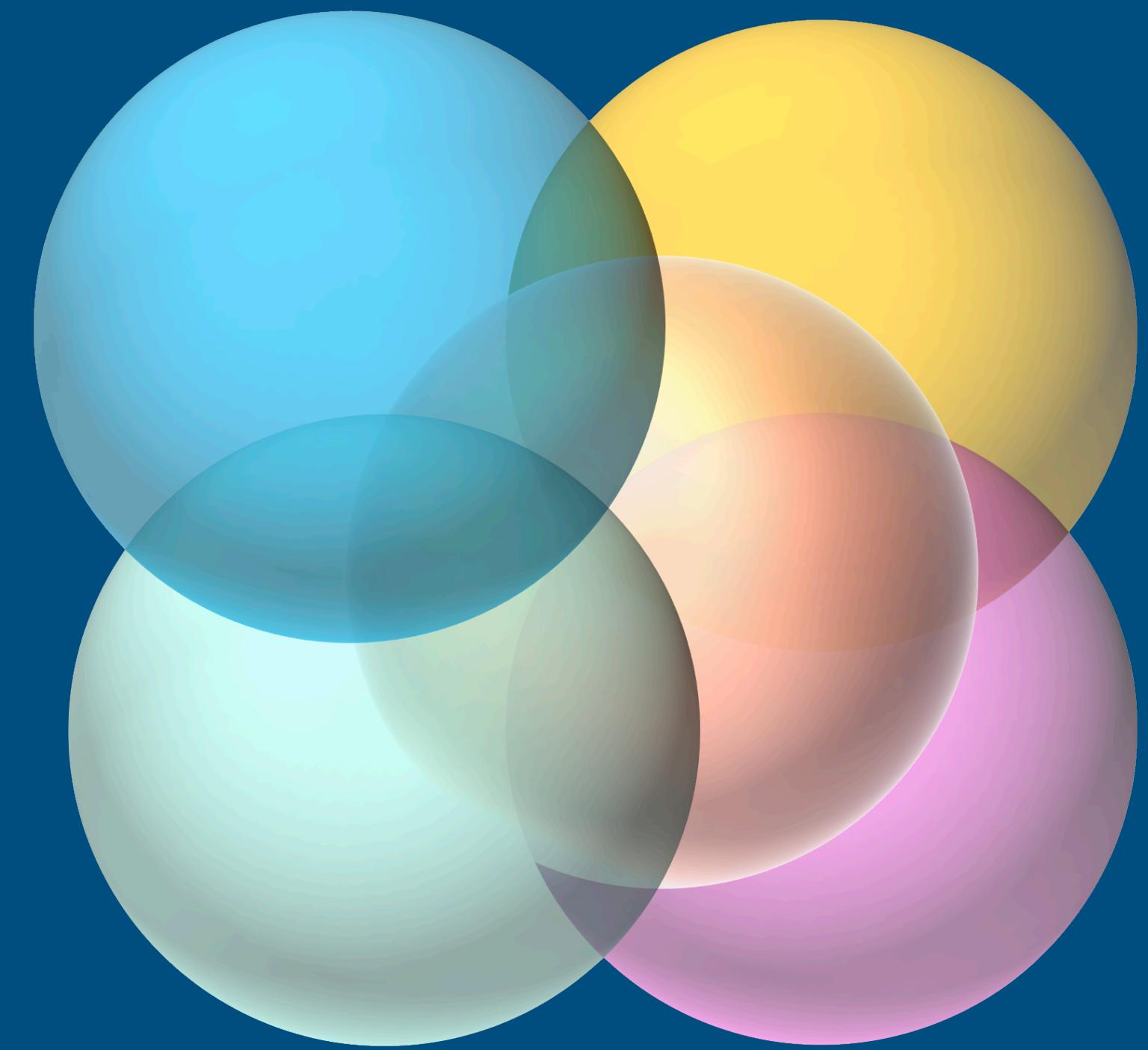
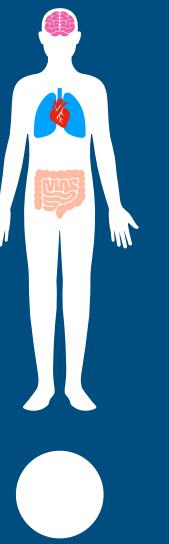


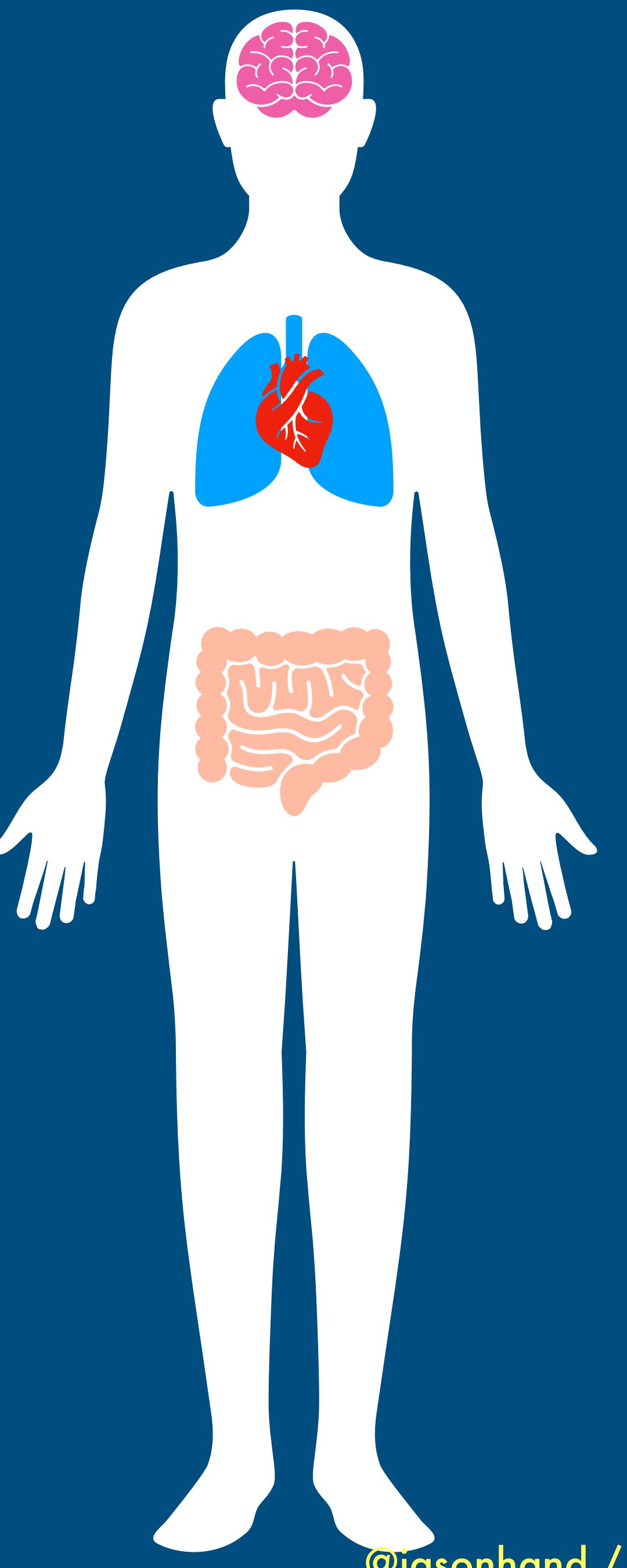
In complex systems,
causality can only be
examined, understood,
and determined in...

hind sight

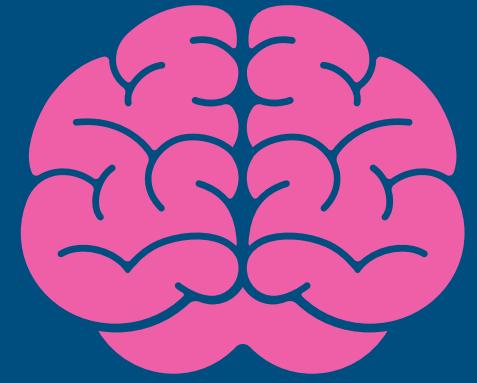


Human Body

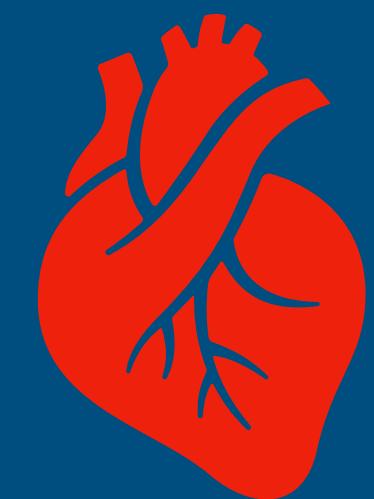




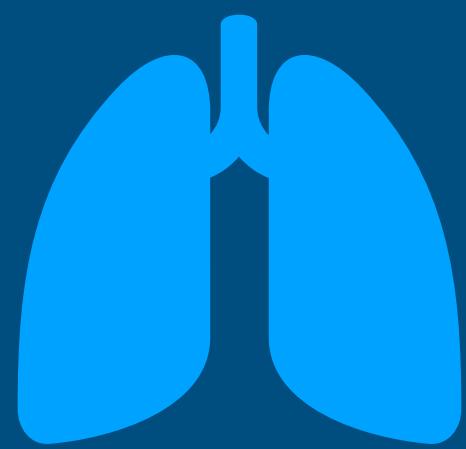
@jasonhand // #QConNYC



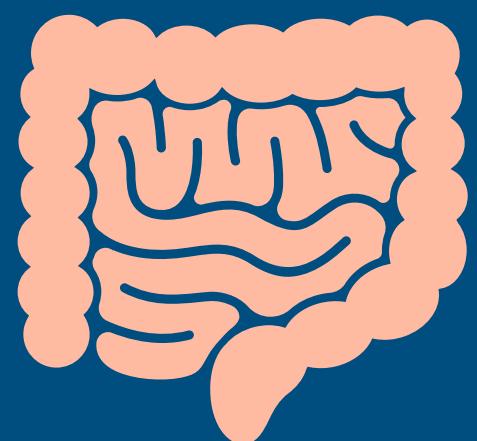
Brain Specialists



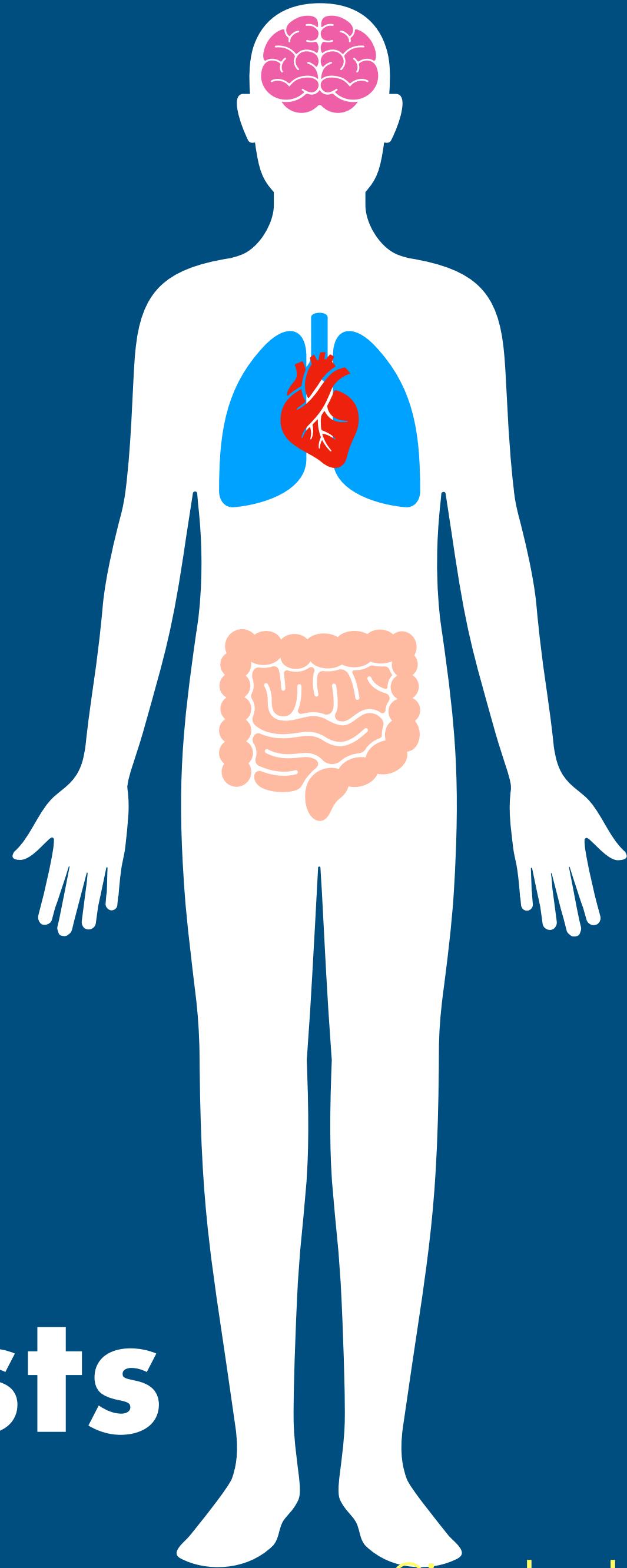
Heart Specialists

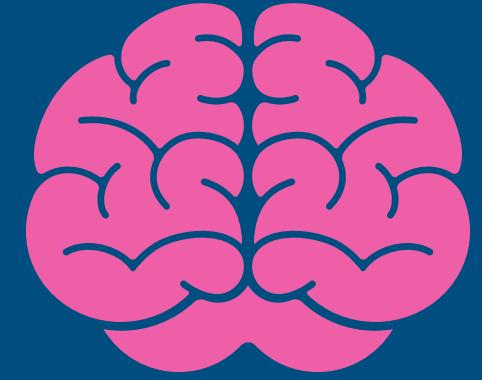


Lung Specialists

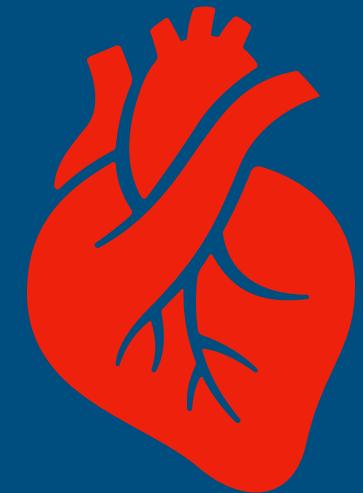


Digestive Specialists

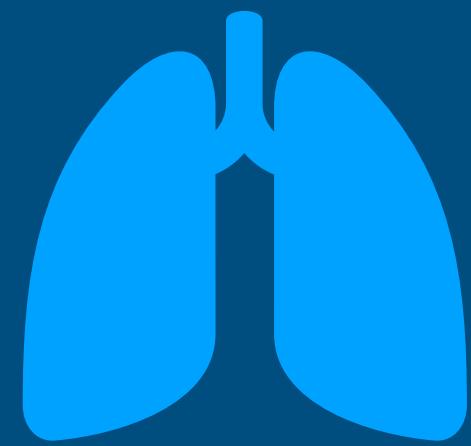




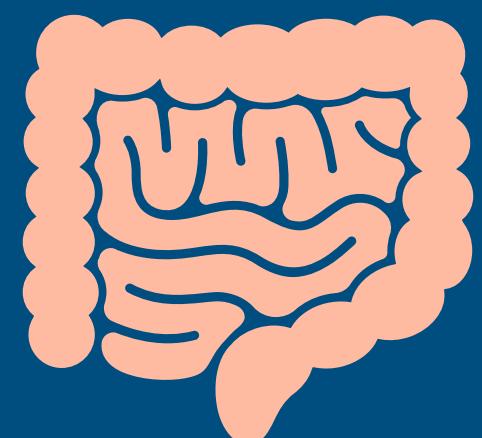
Application Specialists



Infrastructure Specialists



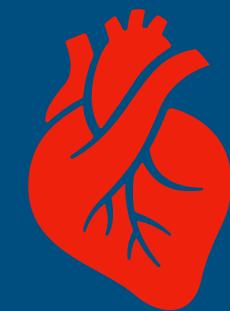
Database Specialists



Network Specialists



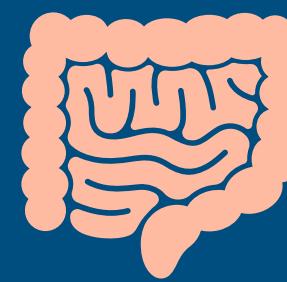
Application Specialists



Infrastructure Specialists

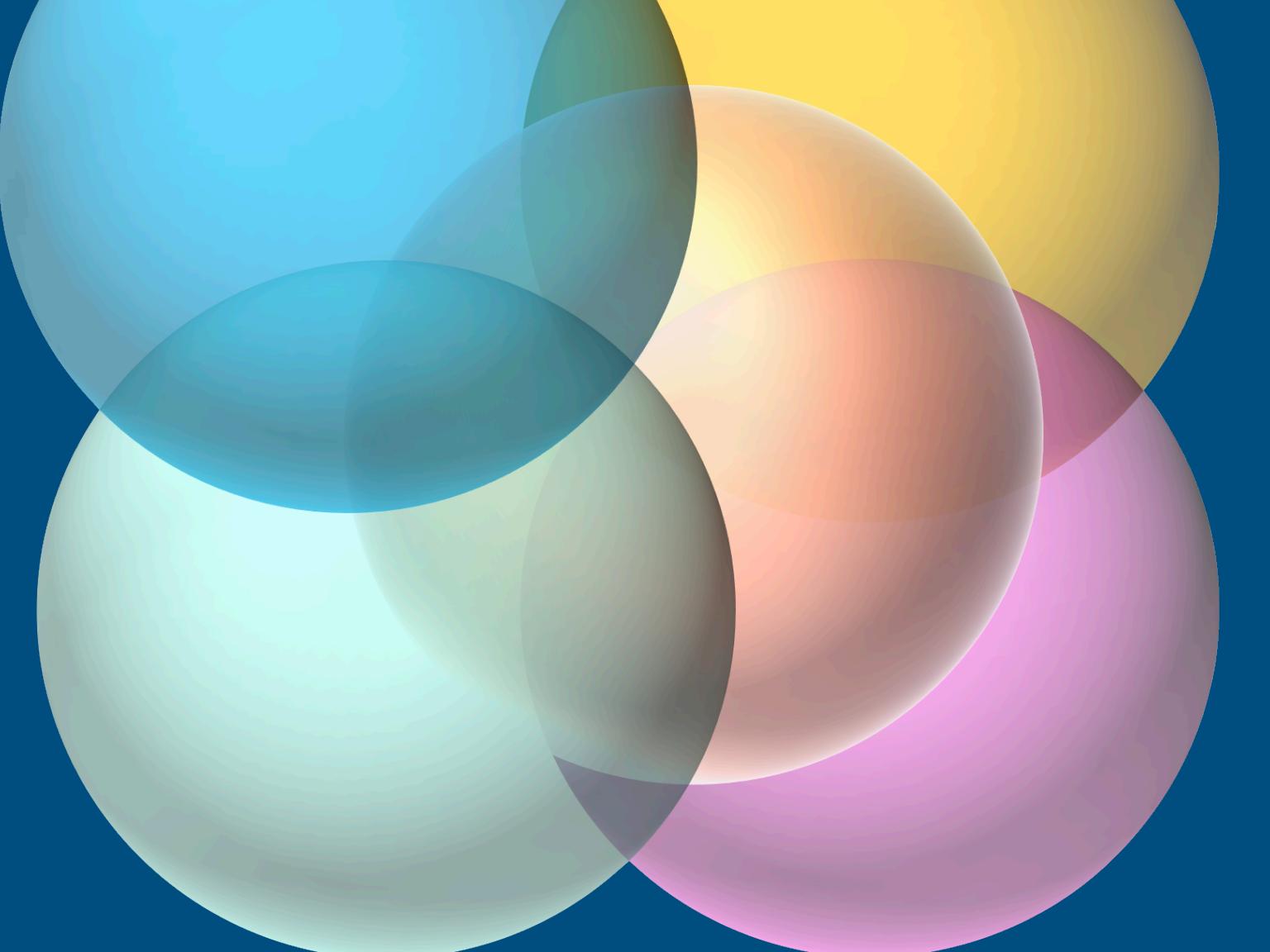


Database Specialists



Network Specialists





Imperfect Information

Requirements to Learning





@jasonhand // #QConNYC

Success



Failure

Improvement
Requires

Set Back

challenges

+
to

Learning

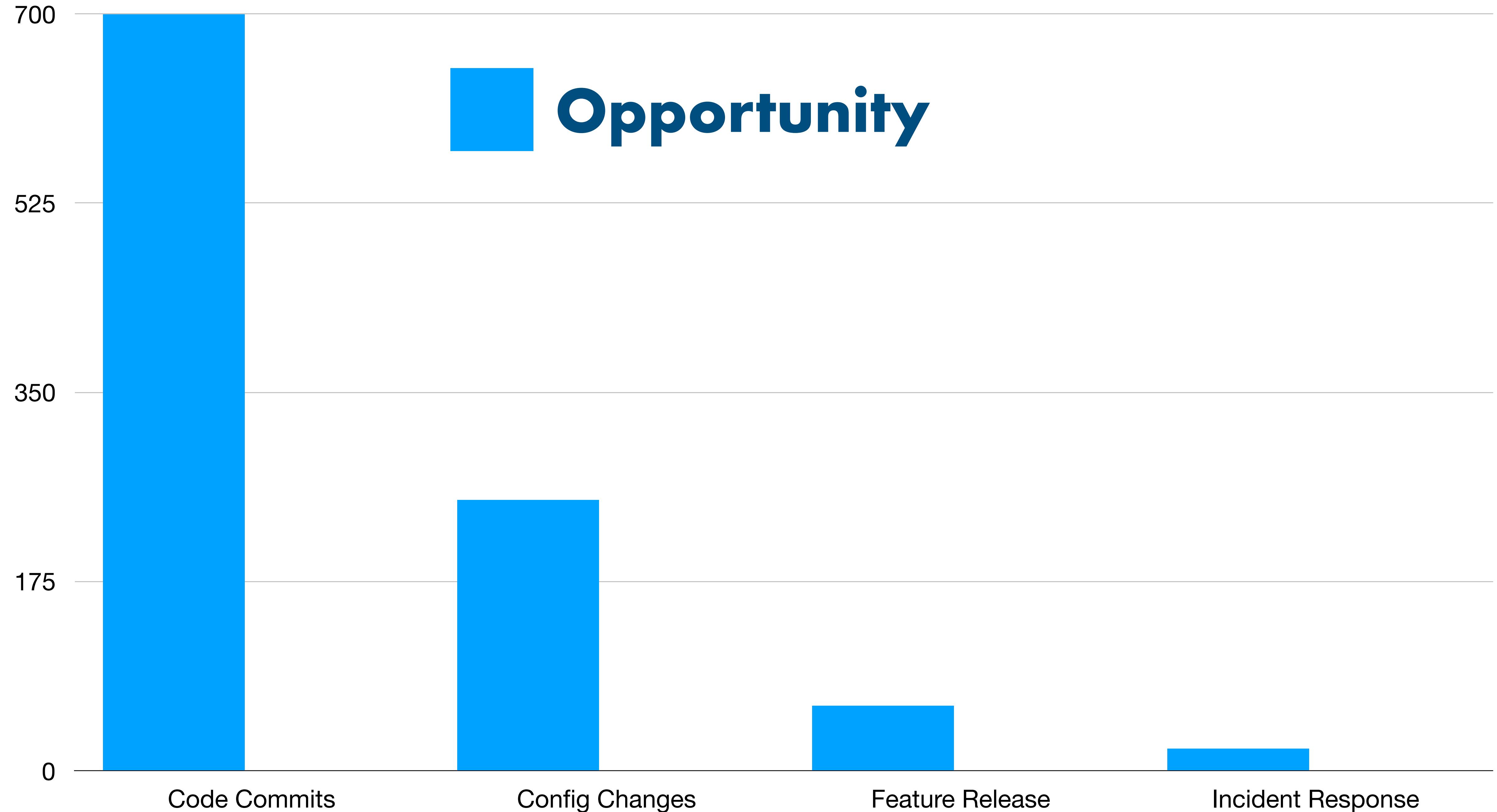


Learning Opportunities

Are NOT Distributed Evenly

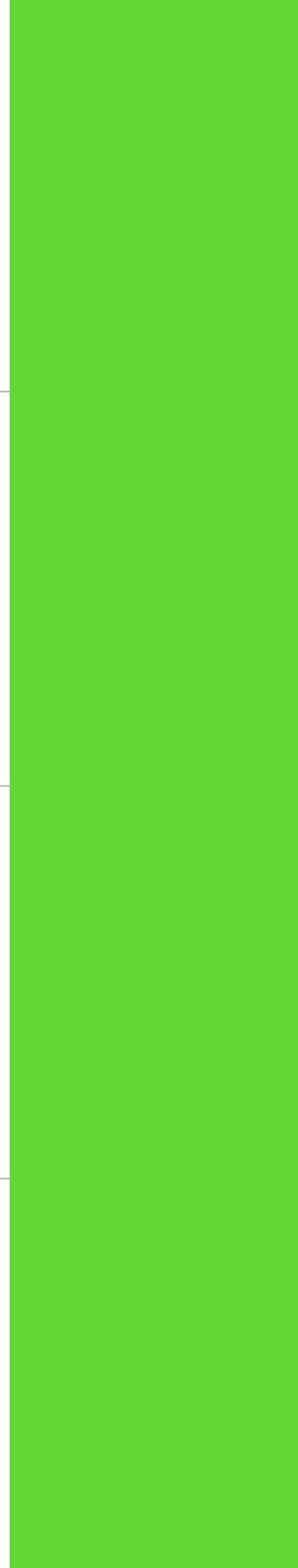


Opportunity





Consequence of Failure



Code Commits

Config Changes

Feature Release

Incident Response

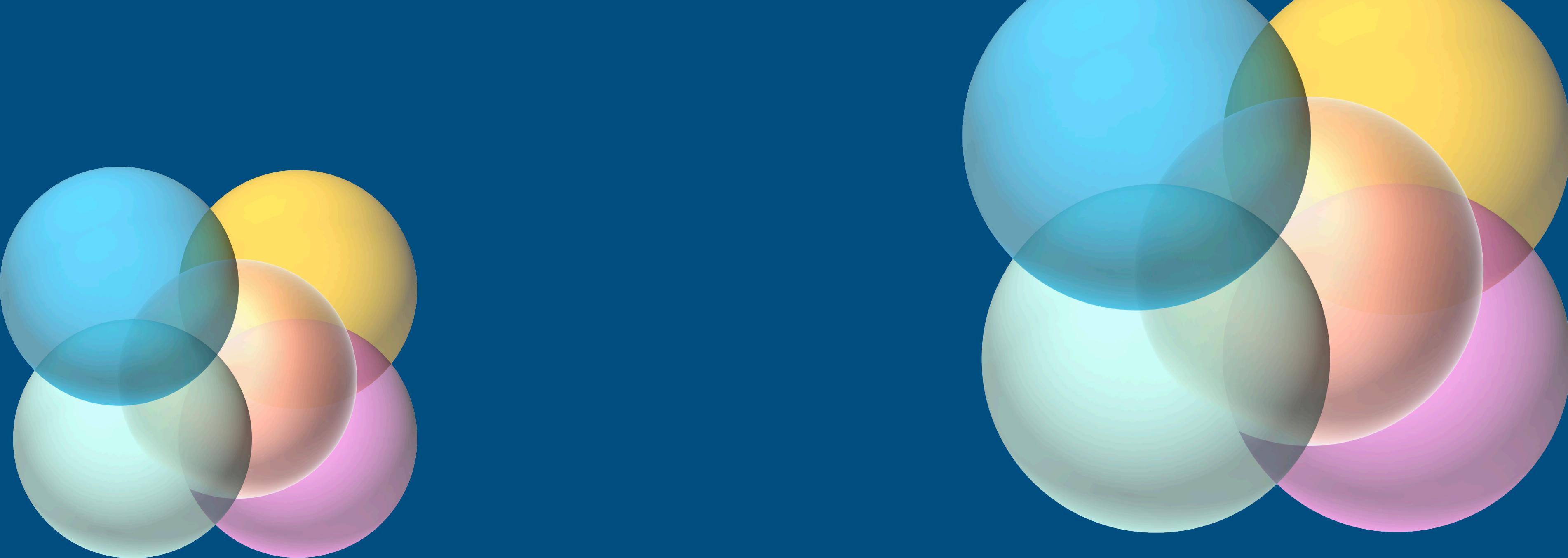
~~Low stakes~~ + high frequency
= high opportunity

~~High stakes~~ + low frequency
= low opportunity

Frequency = opportunity

What even is an incident?

Incidents are:



Subjective



**Feared &
Avoided**

Prevention Is a Fool's Game

**“It cost you an outage
to get to that data.”**

- Nida Farrukah (Monitorama PDX 2019)

To label incidents and disruptions
as bad is not just a
misunderstanding of how complex
systems work
...it is counterproductive.

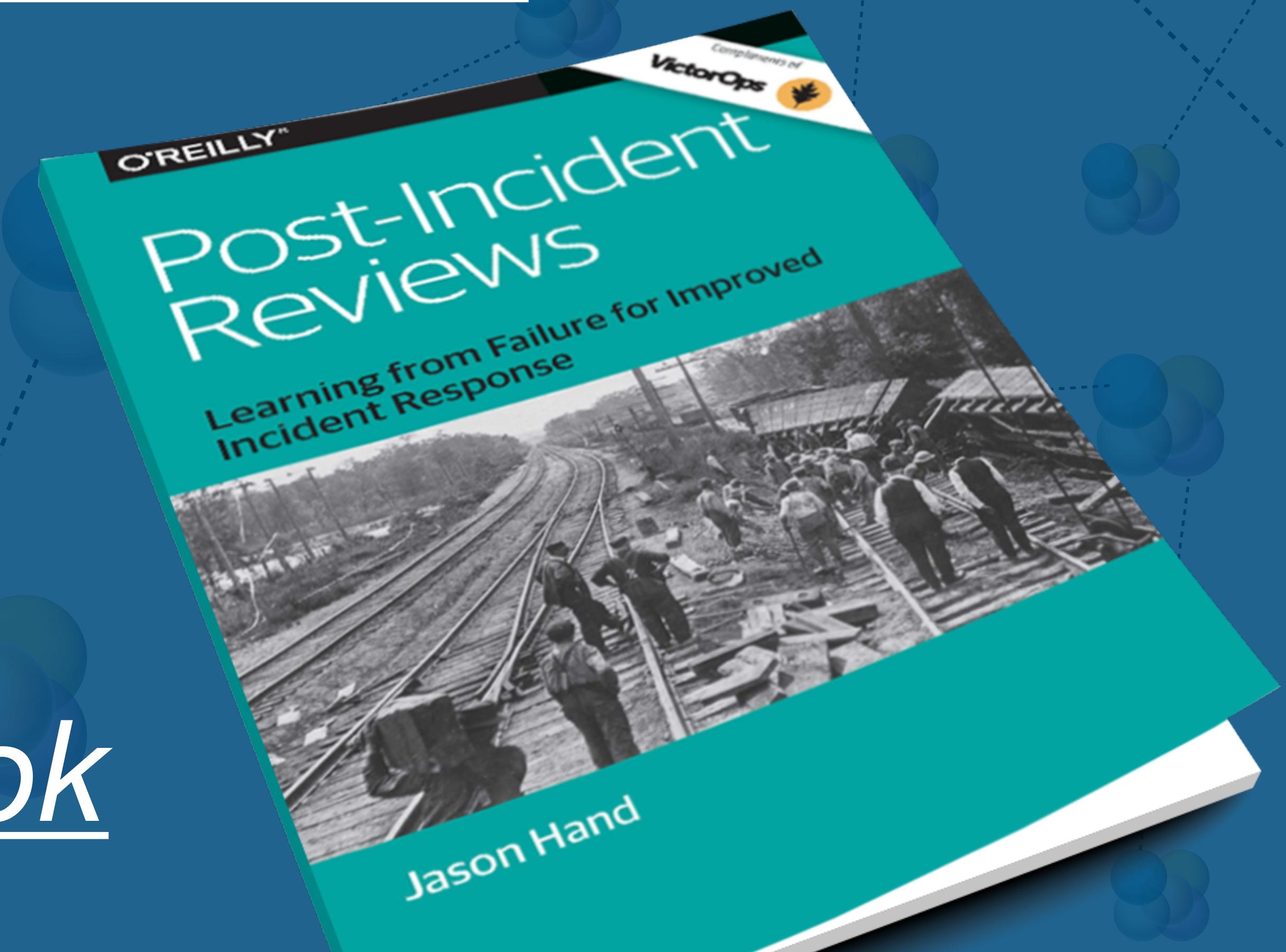
Incidents are the
continuous feedback of
your complex system

Techniques To Learn

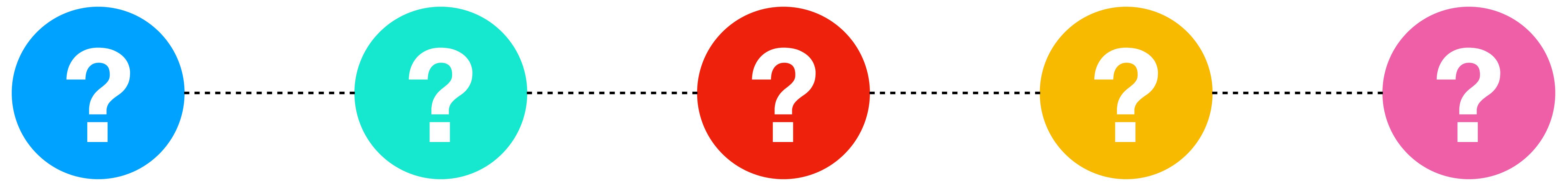
Root Cause Analysis is insufficient!

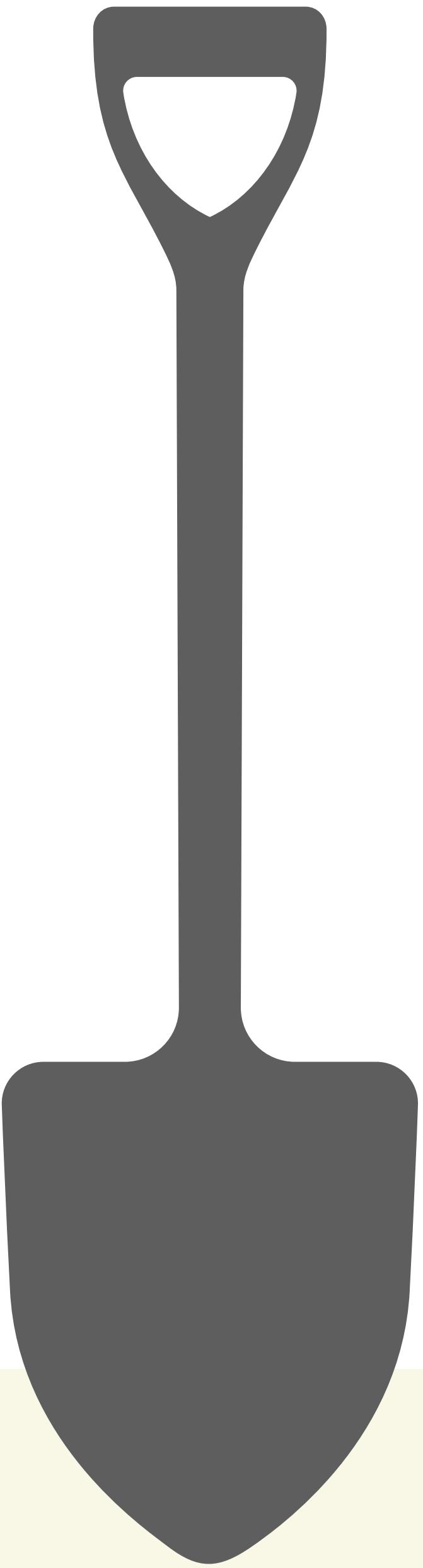
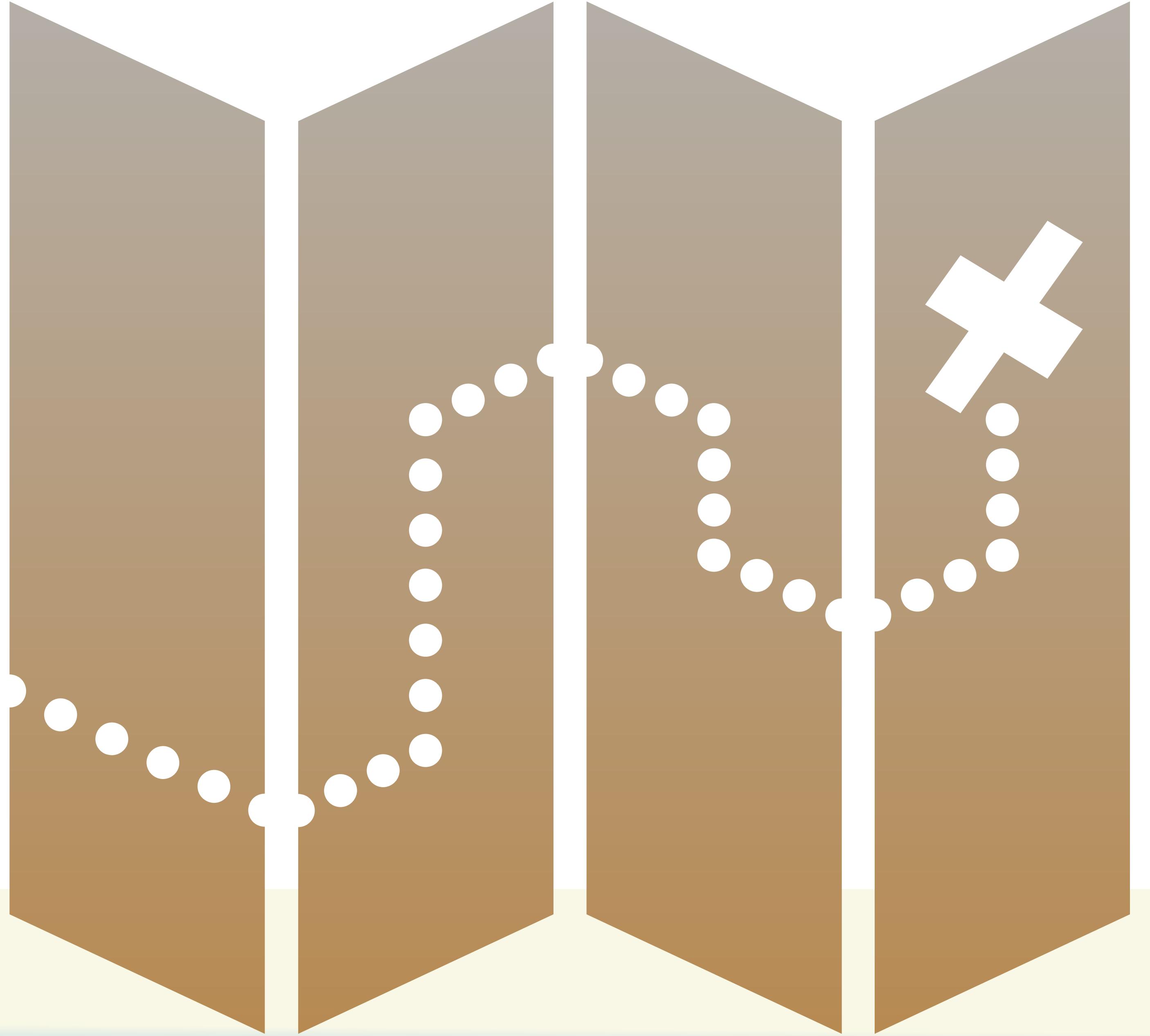
We need more data

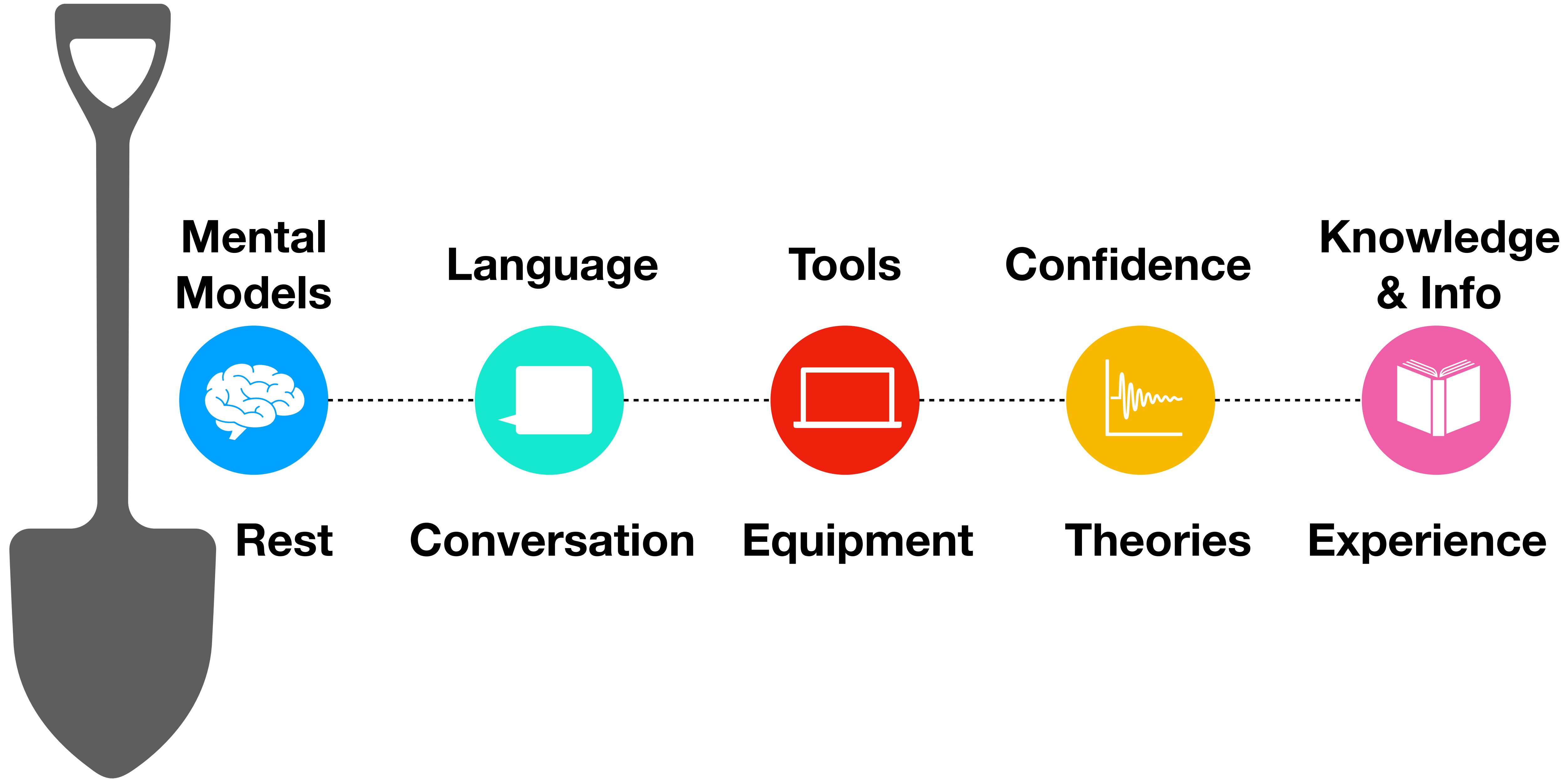
jhant.co/PIR book

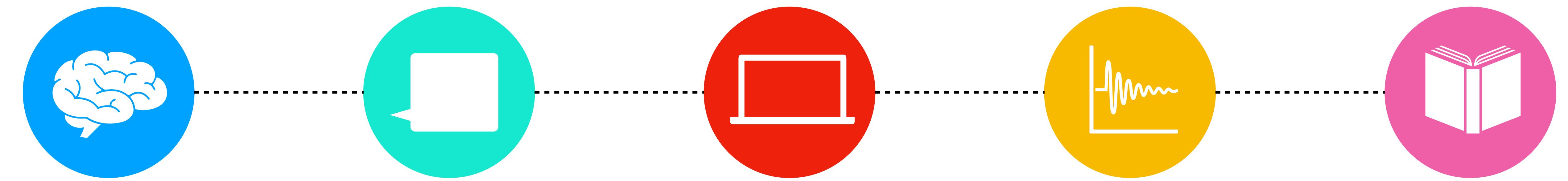


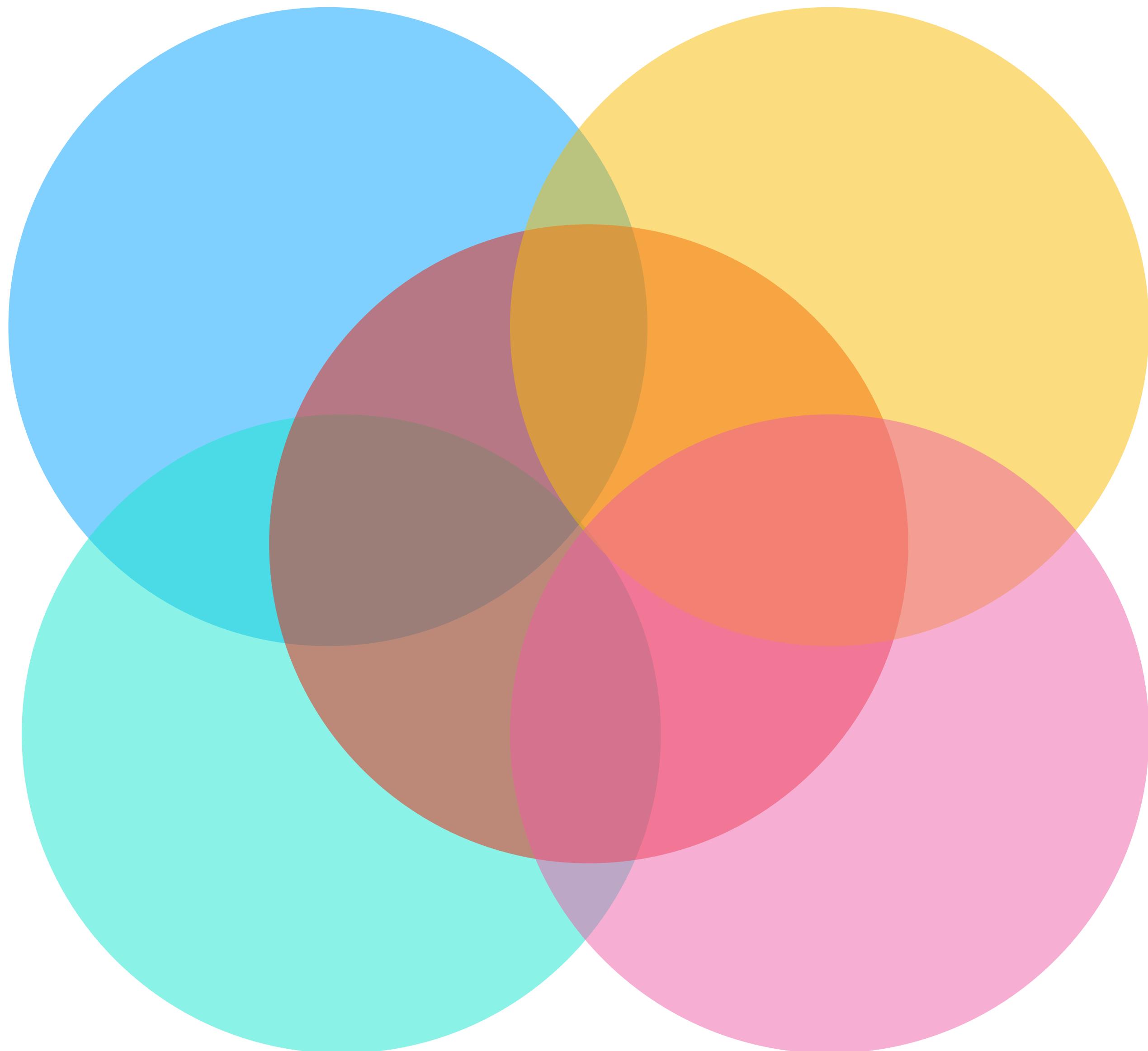


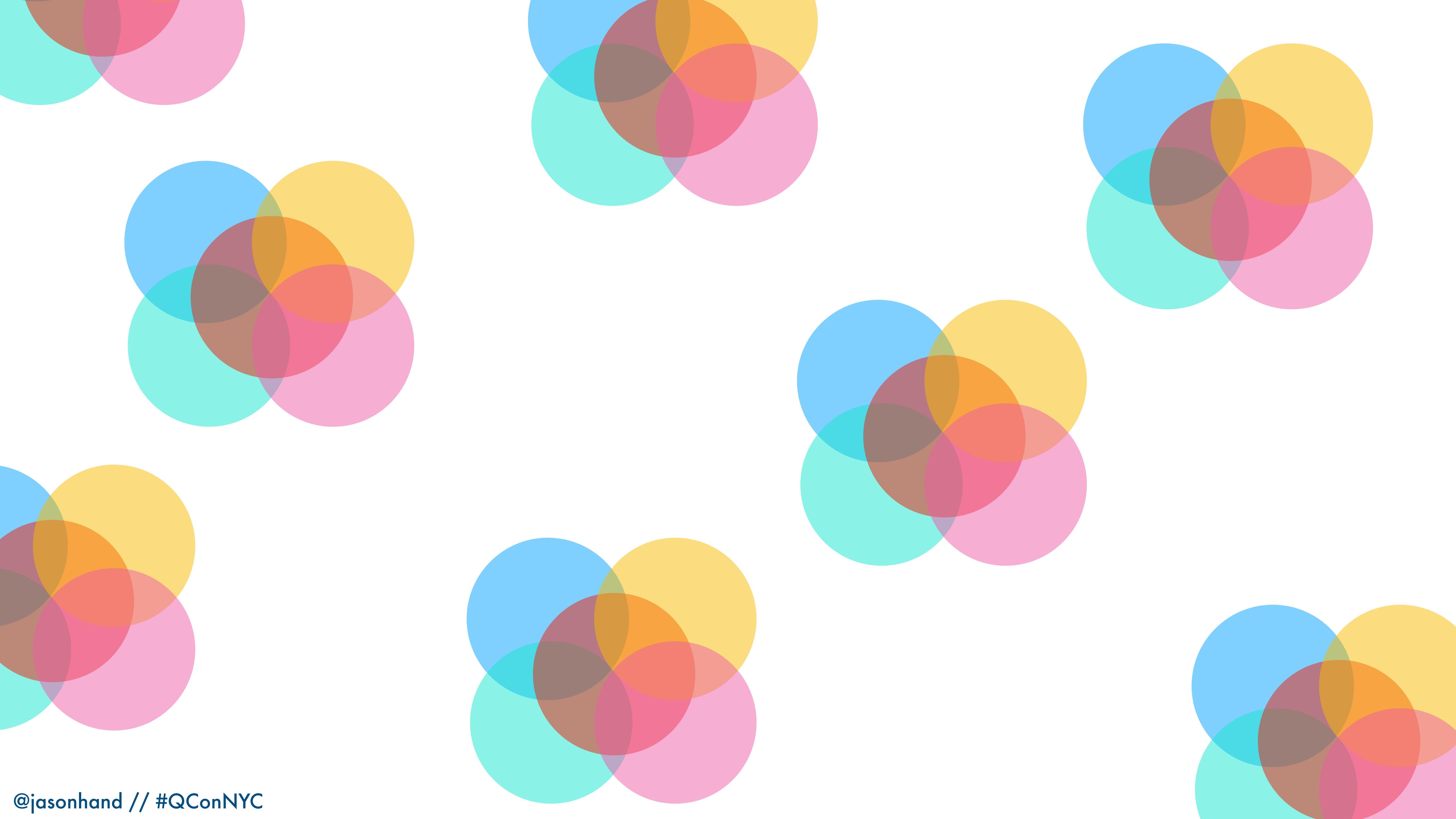






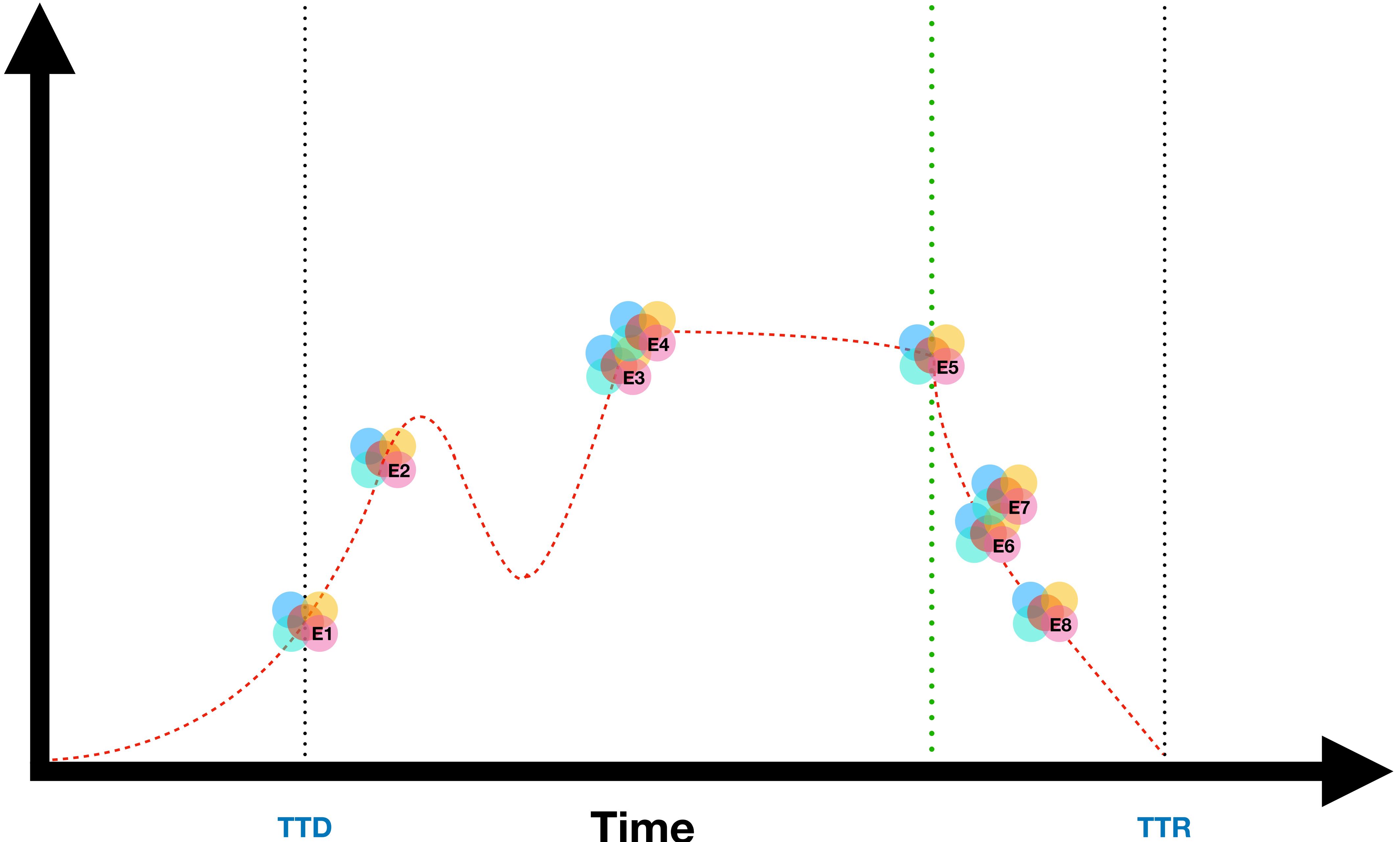






@jasonhand // #QConNYC

Impact



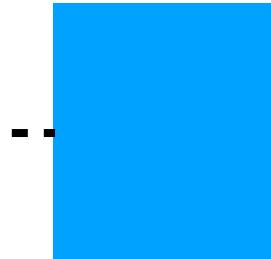
TTD

Time

TTR

Timeline of Events

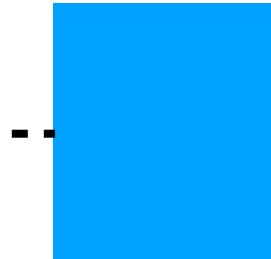
13:45:06



ALERT: SLO BREACH - Latency on:

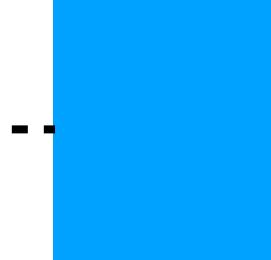
Db_User_Login_Prod - (Customers Impacted) - Sev03

13:46:34



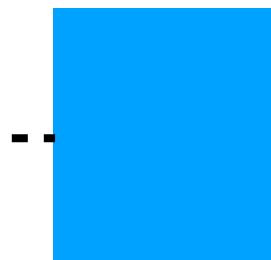
ACK: Primary On-call Engineer

13:49:27



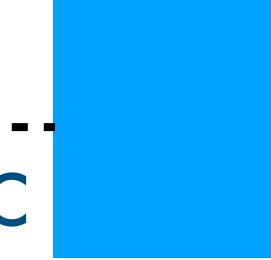
E1: Log Analytics shows we've been escalating rapidly since around 1:30 p.m.

13:50:53



E1: @E2 ... are you available to take a look? I'm not sure where to look next.

13:52:14



E2: Yep.. looking now. One sec.

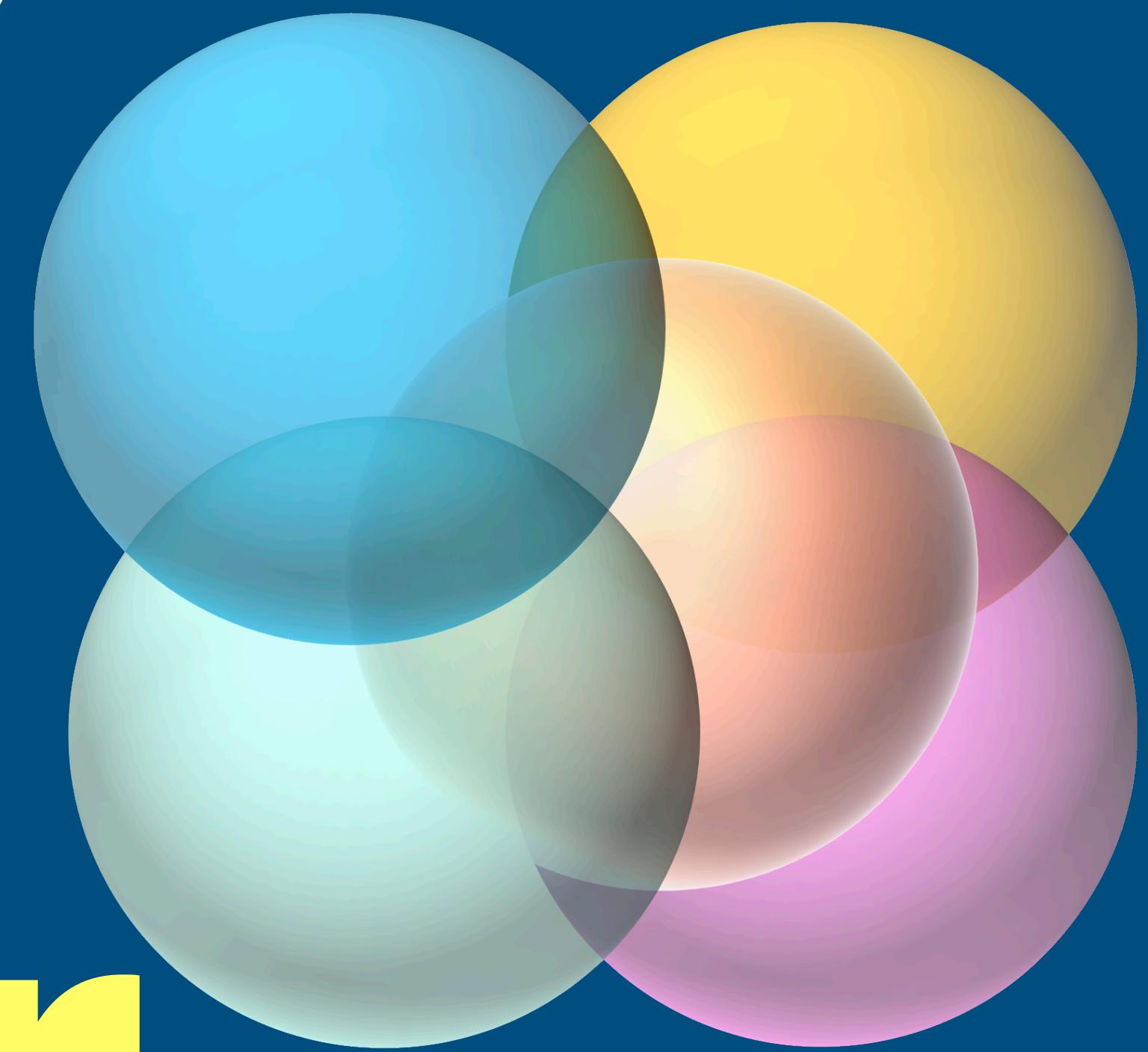
Incidents are

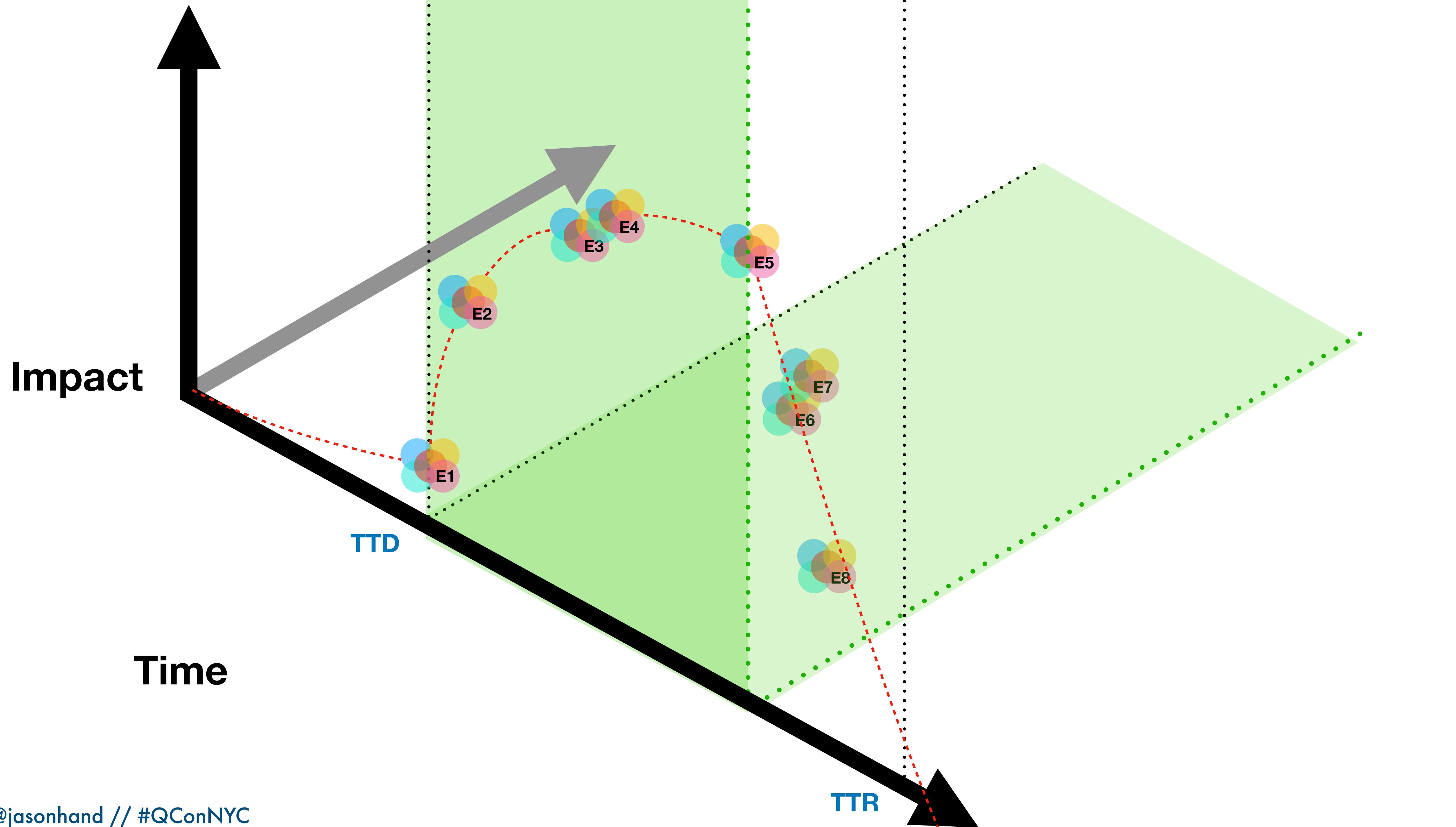
NOT:

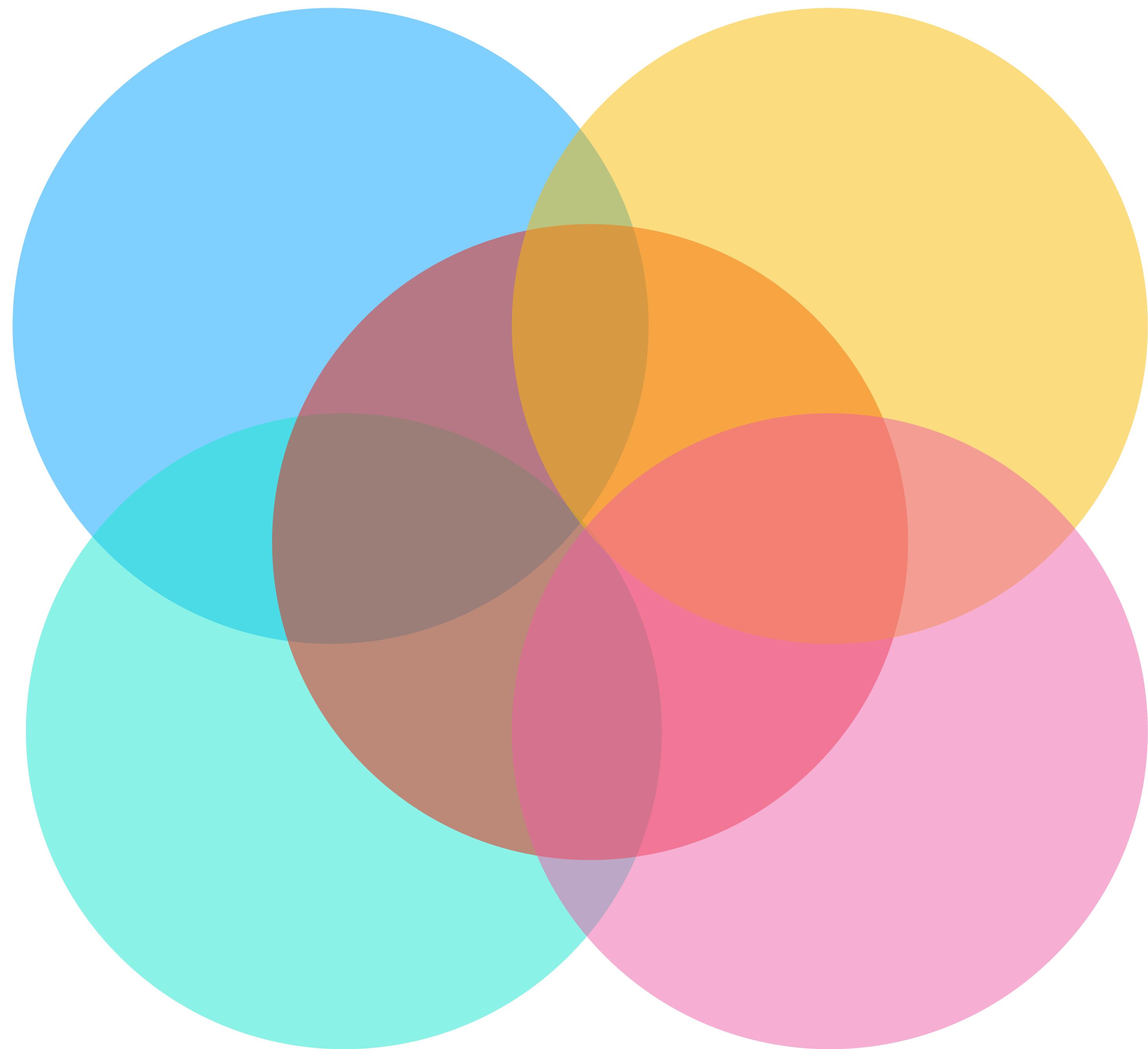
Linear

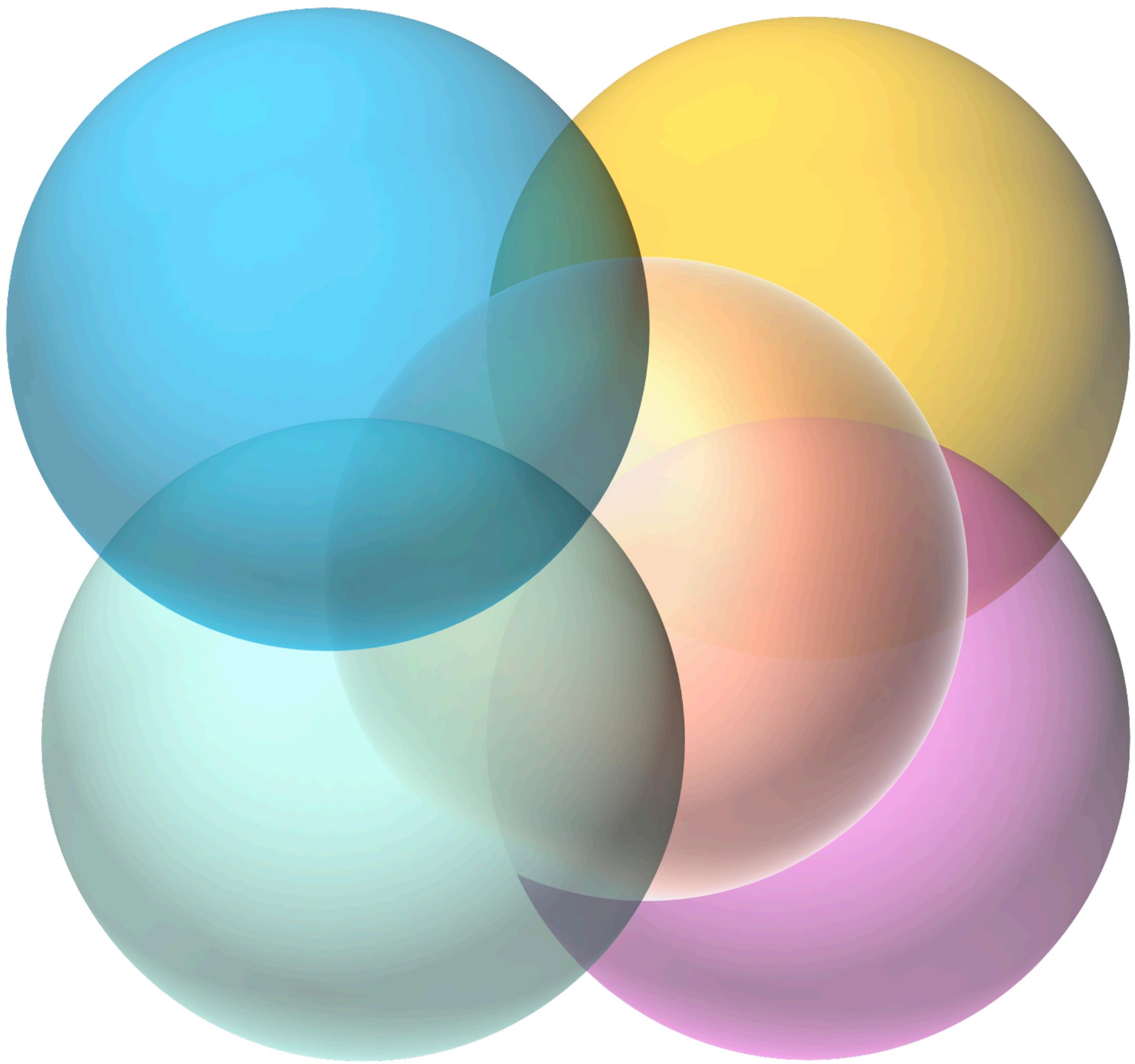
Reality

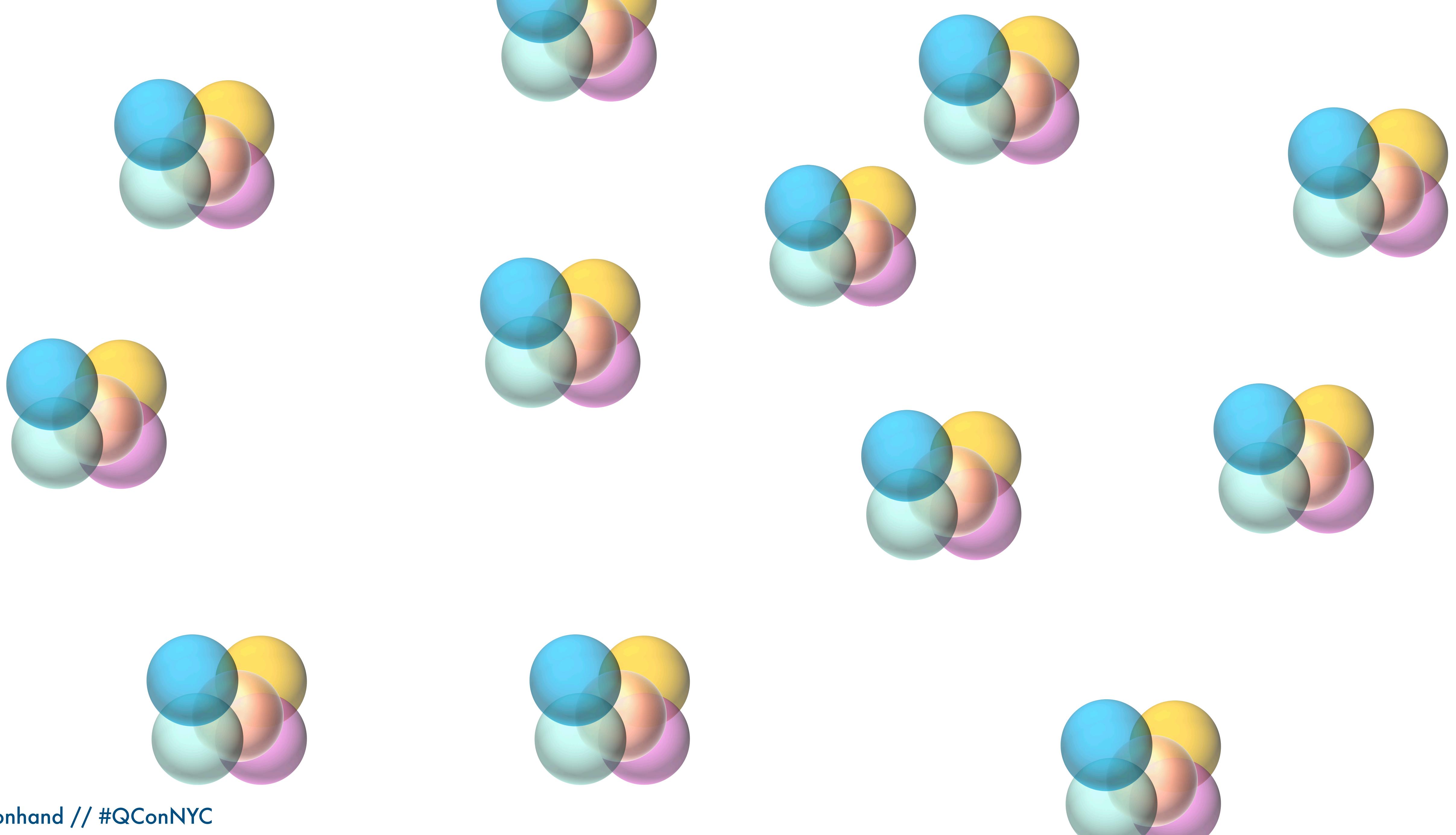
Isn't
Linear

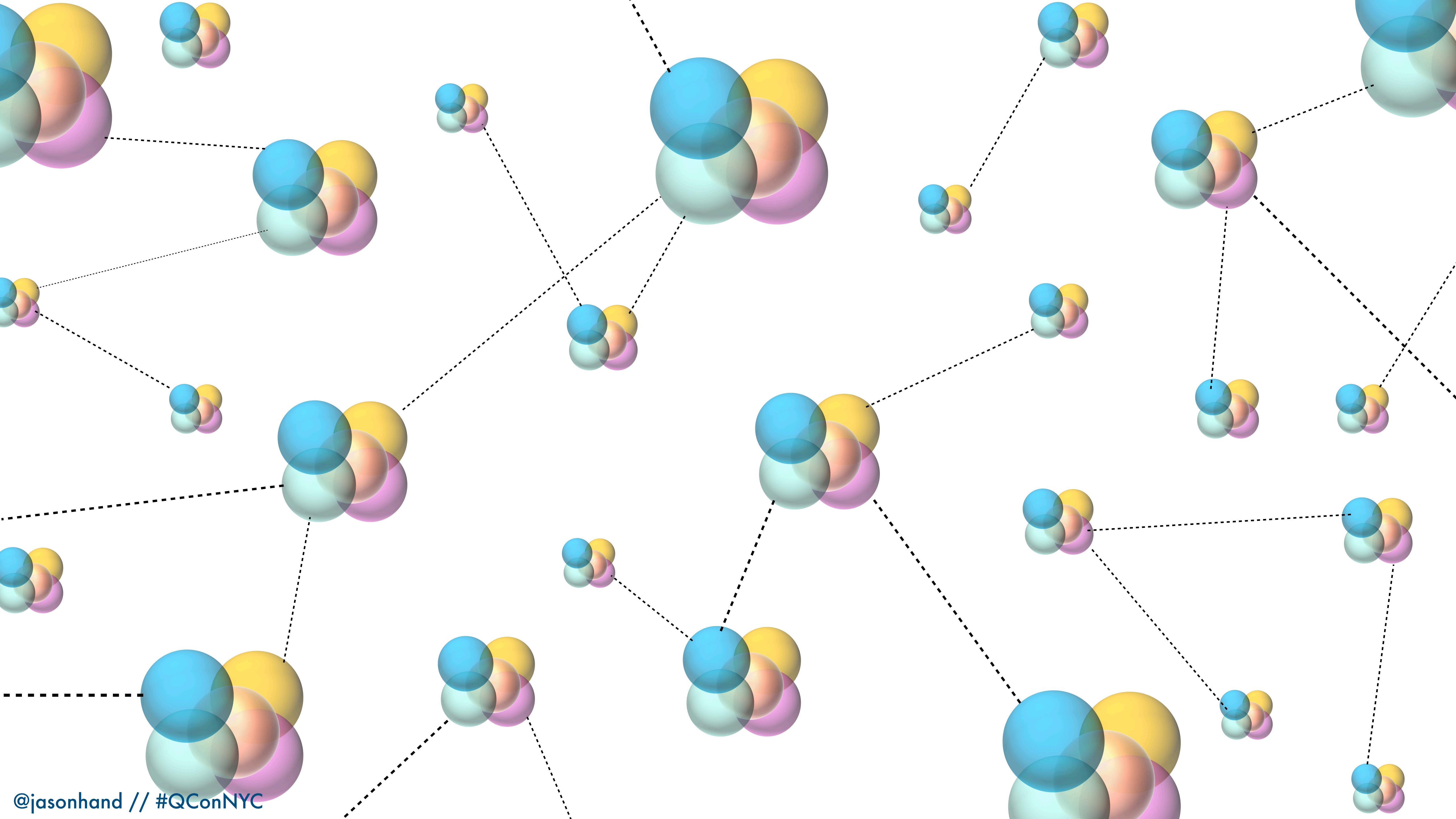








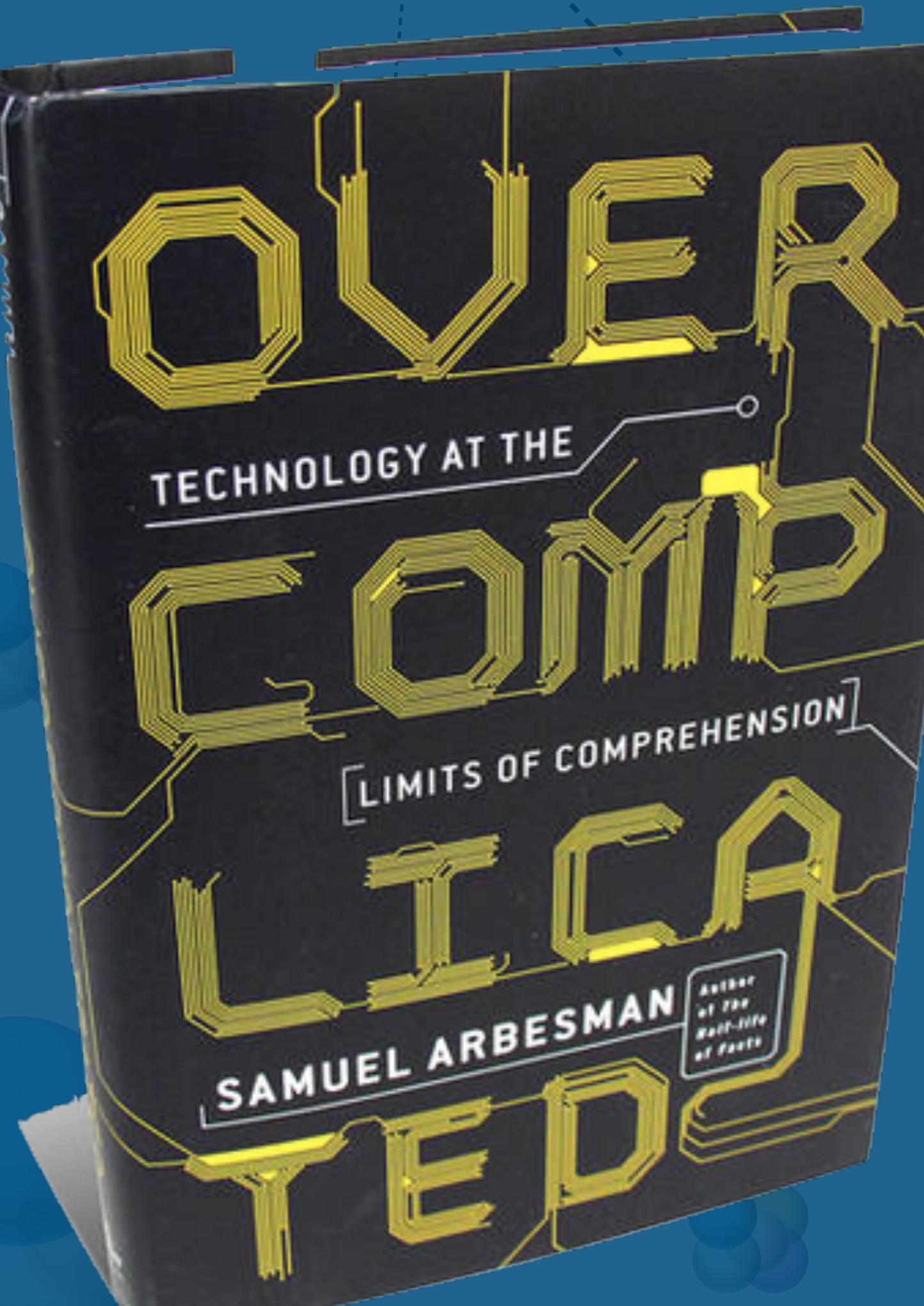


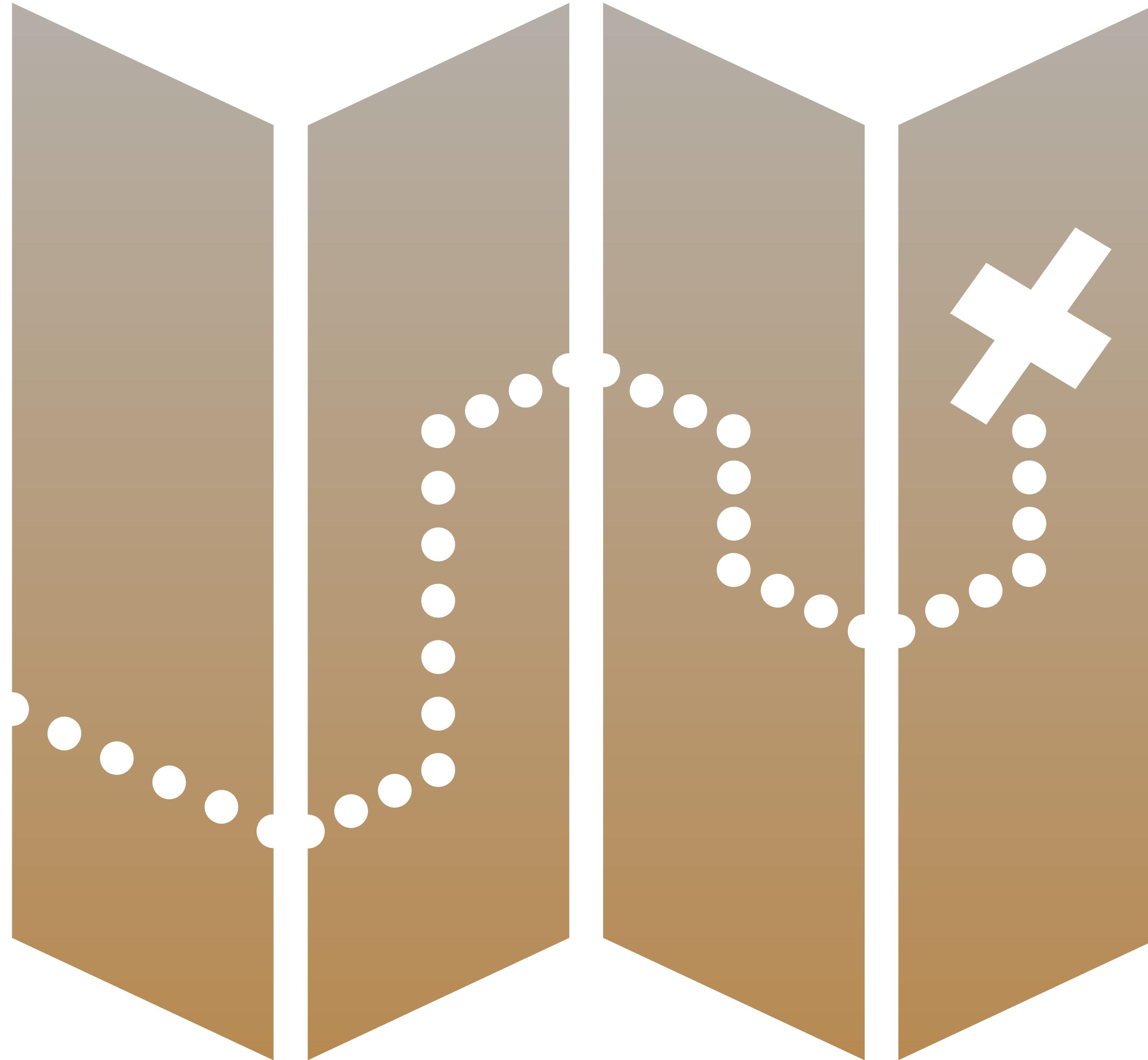


@jasonhand // #QConNYC

"If each (component) of a system has a total of six distinct inputs and outputs, and we have only ten modules, there are more ways of connecting all these modules together than there are stars in the universe."

- Samuel Arbesman
(Overcomplicated)





“A critical component of high resilience in organizations is continuous learning from events, ‘near miss’ incidents, and accidents.”

(Weick et al., 1999; Ringstad & Szameitat, 2000)

Operational Knowledge & Mental Models

Exploration

(Learning Reviews)

&

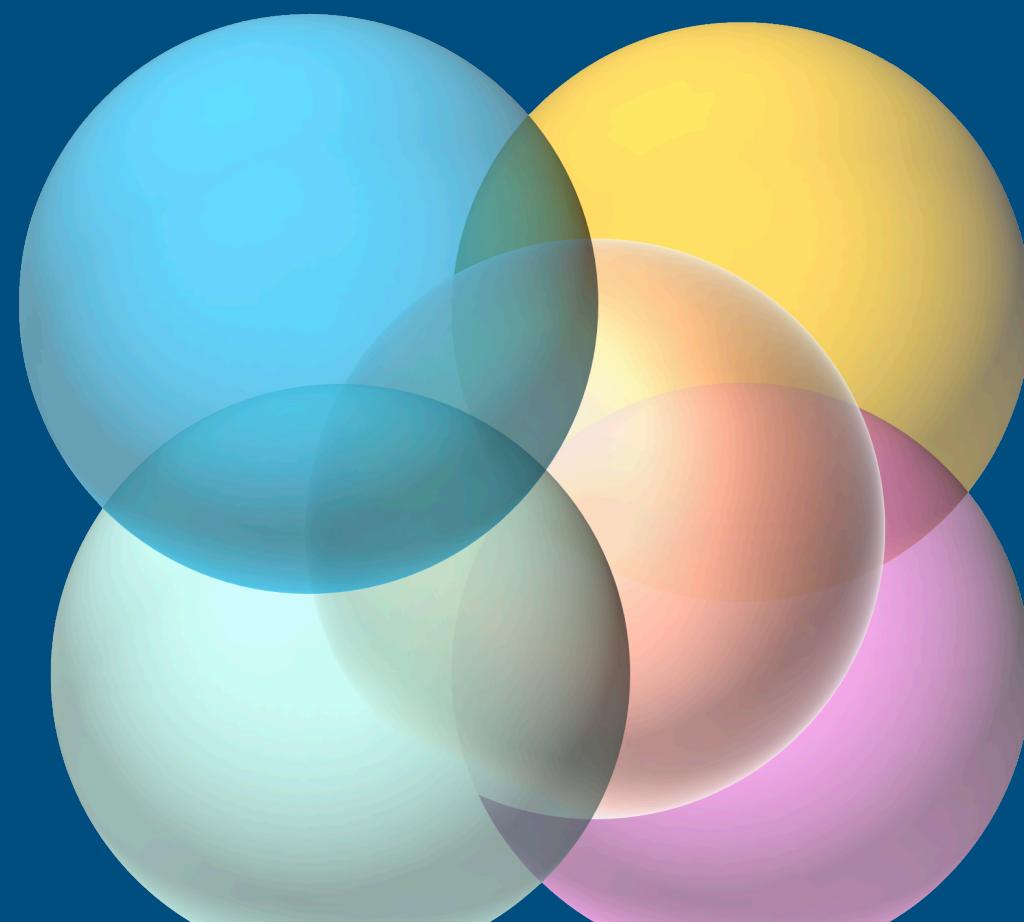
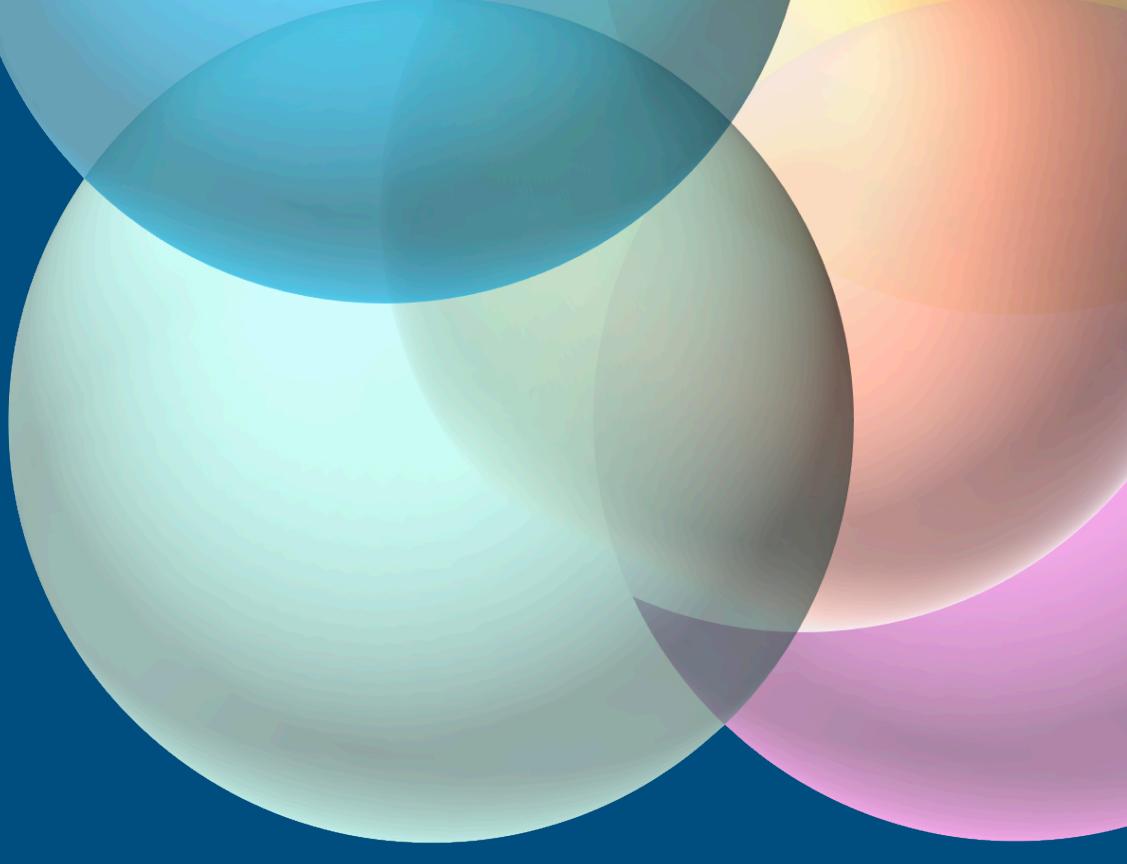
Experimentation

(Game Days / Chaos)

Learning Reviews



Set Context

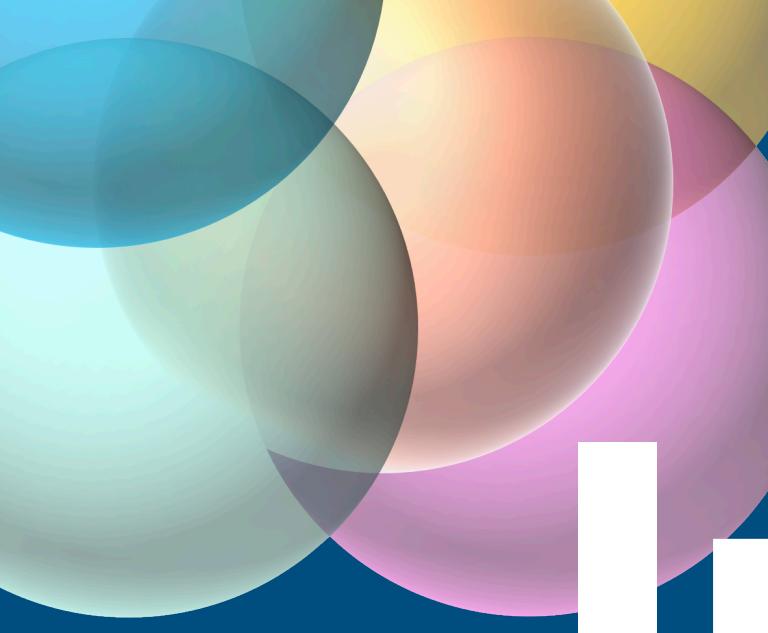


Discovery requires curiosity

We are here to LEARN

Extract

Reality



**Invite a broad and
diverse group to the
conversation**

Ask deeper questions (not just “why”)

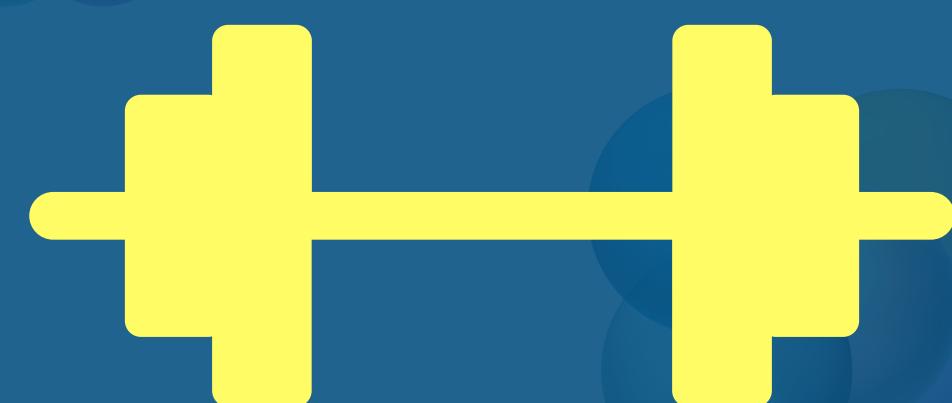
**Allowing
for time**

Spread the conversation out

Allow for reflection and synthesis

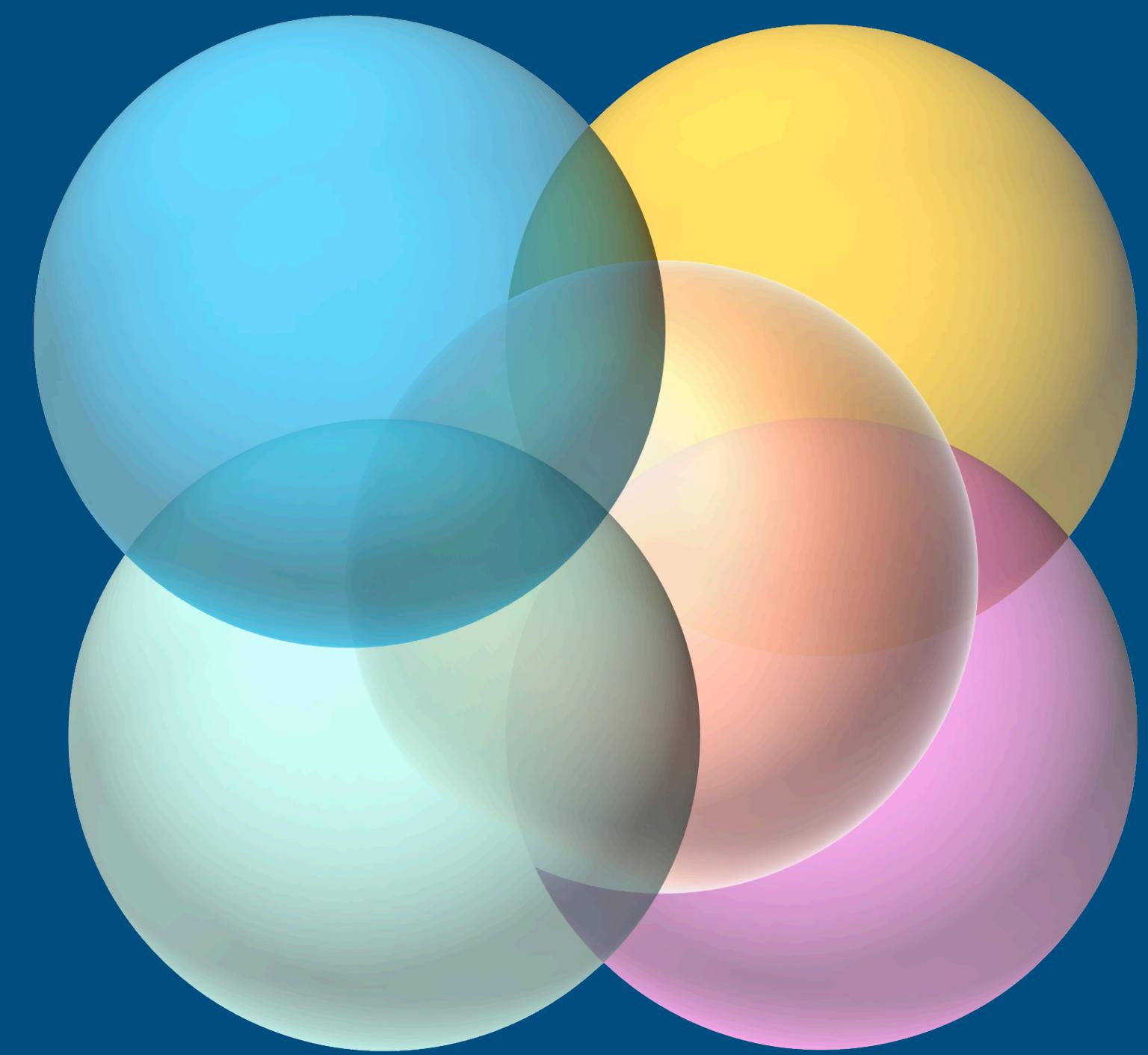
(themes, narrative details, actionable takeaways)

No Pain

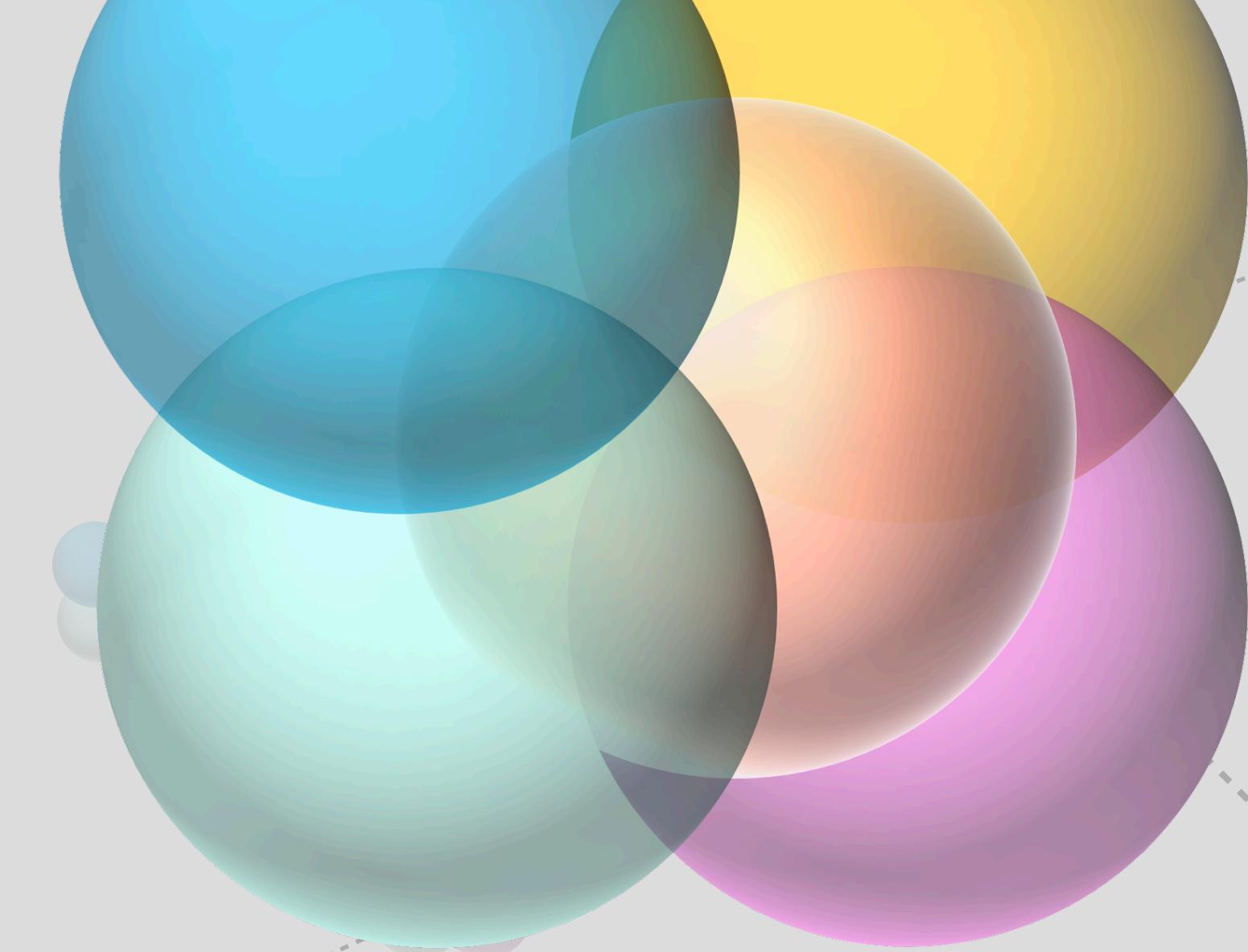


No Gain

Game Days



Decrease blind spots



**Increase
Knowledge &
Mental Models**



One Last Thing...

I, I don't want to move mountains
I like them just
Where they are

I, I want to lift the curtains
From my heart, from your heart

- Bonnie Paine (*Elephant Revival*) - “Will Carry On”



Thank You

