



## Biological systems that learn

January 6 – 10, 2025 | NITMB @ John Hancock Center

### Monday January 6<sup>th</sup>

*Chair: Margaret Gardel*

*Speakers & Facilitators: Andrea Liu, Vincenzo Vitelli, Arvind Murugan, Eric Dufresne, Varda Hagh, Stephanie Palmer, Jen Schwarz, Suri Vaikuntanathan, Lisa Manning & Aaron Dinner*

Time	Event Description
8:30 AM	Light Breakfast
8:55 AM	Welcome, Introduction of Institute & Housekeeping - NITMB Leadership
9:00 AM	Workshop Overview Talk – Andrea Liu & Vincenzo Vitelli
9:30 AM	Whole Group Discussion
10:00 AM	Coffee Break
10:15 AM	Brief Self-Introductions
11:00 AM	Overview Talk: Local rules for training effective interactions – Arvind Murugan & Eric Dufresne
11:15 AM	Whole Group Discussion
12:00 PM	Lunch
	Small Group Discussions
1:00 PM	Discussion 1: Memory vs learning – Varda Hagh & Stephanie Palmer
	Discussion 2: Local Rules vs. Gradient Descent vs. Evolution – Jen Schwarz & Suri Vaikuntanathan
	Discussion 3: Why is learning framework useful? - Lisa Manning & Aaron Dinner
	Discussion 4: [democratic selection from AM talks] – TBD & TBD
	Discussion 5: [democratic selection from AM talks] – TBD & TBD
2:30 PM	Break
3:00 PM	Report Back
4:00 – 5:00 PM	Poster session & drinks

## Tuesday January 7<sup>th</sup>

*Chair: Andrea Liu*

*Speakers & Facilitators: Xiaoming Mao, Varda Hagh, Bill Bialek, Adrienne Fairhall, Paul Francois, Matthew Bull, Paul Janmey, Fridtjof Brauns, Greg Handy, Stephanie Palmer, Jen Schwarz & Chris Kempes*

Time	Event Description
8:30 AM	Light Breakfast
8:55 AM	Welcome & Housekeeping
9:00 AM	Overview Talk: Metamaterials – Xiaoming Mao & Varda Hagh
9:15 AM	Whole Group Discussion
9:45 AM	Overview Talk: Neuroscience – Bill Bialek & Adrienne Fairhall
10:00 AM	Whole Group Discussion
10:30 AM	Coffee Break
10:45 AM	Overview Talk: Cell Information Processing – Paul Francois
11:00 AM	Whole Group Discussion
12:00 PM	Lunch
1:00 PM	Small Group Discussions
	Discussion 1: Biological mechanical networks – Paul Janmey & Fridtjof Brauns
	Discussion 2: Computational Neuroscience: how much complexity needed? – Greg Handy & Stephanie Palmer
	Discussion 3: How does size impact learning – Jen Schwarz & Chris Kempes
	Discussion 4: [democratic selection from AM talks]
	Discussion 5: [democratic selection from AM talks]
2:30 PM	Break
3:00 PM	Report Back
4:00 – 5:00 PM	Poster session & drinks

## Wednesday January 8<sup>th</sup>

*Chair: Lisa Manning*

*Speakers & Facilitators: Marc Miskin, Itai Cohen, Sid Goyal, Chris Kempes, Margaret Gardel, Suzanne Rafelski, Sid Nagel, Andrea Liu, Gasper Tkacik, Francis Corson, Paul Macklin, Itai Cohen, Tsvi Tlusty & Will Jacobs*

Time	Event Description
8:30 AM	Light Breakfast
8:55 AM	Welcome & Housekeeping - Lisa Manning
9:00 AM	Overview Talk: Robotics – Marc Miskin & Itai Cohen
9:15 AM	Whole Group Discussion
9:45 AM	Overview Talk: Ecological – Sid Goyal & Chris Kempes
10:00 AM	Whole Group Discussion
10:30 AM	Coffee Break
10:45 AM	Overview Talk: Cell State Transitions – Suzanne Rafelski & Margaret Gardel
11:00 AM	Whole Group Discussion
12:00 PM	Lunch
1:00 PM	Small Group Discussions
	Discussion 1: Darwinian vs. Lamarckian evolution – Sid Nagel & Andrea Liu
	Discussion 2: Fidelity with variation: Robustness vs. versatility – Gasper Tkacik & Francis Corson
	Discussion 3: Training dynamical systems – Paul Macklin & Itai Cohen
	Discussion 4: Protein structure and function – Tsvi Tlusty & Will Jacobs
	Discussion 5: Noise and uncertainty in learning - Peko Hosoi & Thomas Witten
2:30 PM	Break

3:00 PM	Report Back
4:00 – 5:00 PM	Excursion (off site)

## Thursday January 9<sup>th</sup>

*Chair: Ed Munro*

*Speakers & Facilitators: Mehran Kardar, Thierry Emonet, Lisa Manning, Ed Munro, Carl Goodrich, Jerelle Joseph, Crisy Xiyu Du, Kristina Trifonova, Nachi Stern, Doug Durian & Martin Falk*

Time	Event Description
8:30 AM	Light Breakfast
8:55 AM	Welcome & Housekeeping
9:00 AM	Overview Talk: Immunity – Mehran Kardar & Thierry Emonet
9:30 AM	Whole Group Discussion
9:45 AM	Overview Talk: Development – Lisa Manning & Ed Munro
10:00 AM	Whole Group Discussion
10:30 AM	Coffee Break
10:45 AM	Overview Talk: Training self-assembly – Carl Goodrich & Jerelle Joseph
11:00 AM	Whole Group Discussion
12:00 PM	Lunch
1:00 PM	Small Group Discussions
	Discussion 1: Training Self-Assembly – Crisy Xiyu Du & Jenelle Joseph
	Discussion 2: Overparameterization without overfitting – Doug Durian & Martin Falk
	Discussion 3: Molecular reaction networks - Kristina Trifonova & Nachi Stern
	Discussion 4: Learning with multiple cues - Eleni Katifori & Noah Mitchell
	Discussion 5: [democratic selection from AM talks]
2:30 PM	Break
3:00 PM	Report Back
4:00 – 5:00 PM	Reception/Dinner (in suite)

## Friday January 10<sup>th</sup>

*Speakers & Facilitators: N/A*

Time	Event Description
8:30 AM	Light Breakfast
8:55 AM	Welcome & Housekeeping

9:00 AM	Wrap up Discussions
10:00 AM	Coffee Break
10:30 AM	What's Next Planning
12:00 – 1:00 PM	Lunch
1:00 – PM	Stay as long as you like!