

# **BS6220: Spatial and Multi-omics Data Analytics and Machine Learning**

Overview of week 8 & 13 schedule  
and assessment format

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# Self-introductions



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- Bioinformatics Institute @A\*STAR  
(Computational Biology & omics analysis group)
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## Research Interest<sup>2</sup>

- Develop innovative causal process modeling & data-driven approach to elucidate actionable insights regarding biological & biotechnological systems
- Leverages multi-omics data analyses and systems biology & AI modelling

1. <https://www.linkedin.com/in/hock-chuan-yeo-22ab4221/?originalSubdomain=sg>

2. [https://scholar.google.com.sg/citations?hl=en&user=cw4XSBQAAAAJ&view\\_op=list\\_works&sortby=pubdate](https://scholar.google.com.sg/citations?hl=en&user=cw4XSBQAAAAJ&view_op=list_works&sortby=pubdate)

# Schedule of topics to cover

## Week 8 (16<sup>th</sup> Jan)

- Application of ML for output optimization in synthetic biology
- Deep modeling & exploration of cell-wise metabolism using single-cell RNA-seq data

## Week 13 (20<sup>th</sup> Feb)

- Optimal experimental design for machine learning
- Reproducibility, pitfalls & leakage in ML-based sciences
- Presentation of self-directed group learning on given topic

# What we could learn from group learning (besides subject matter)

*Group work may be messy, but it teaches vital skills for the real world that you can't learn alone:*

Straits time, 6th Jan 2026

- Self-direct learning
- Articulate ideas
- How to work synergistically as a team
- Think critically
- Initiative/leadership
- Realization that team work carry you further
- Self awareness & empathy, ...

→ Apply ourselves

## The power of learning through collaboration deserves more attention

Group work may be messy, but it teaches vital skills for the real world that you can't learn alone.

Istian Azura Mokhtar

At the Singapore Institute of Technology (SIT), I teach modules on Social Innovation and Change Management. Both modules involve group-work and collaborative learning. Recently, with the conclusion of one of the classes, I received an insightful reflection from one of the students.

I am completing this module with a stronger belief in its ability as students to contribute meaningfully to societal challenges. We may not be professional designers yet, but through structured, human-centred design and effective teamwork, we've chosen that youth-driven change is not only possible – it's necessary.

The student should have recognised as part of a task that required collaboration to share the group workload together. The positive response was encouraging, and it was also a reminder that learning isn't confined to solitary study or passive absorption of information. It is a dynamic and interactive process – one that thrives on collaboration.

At its heart, collaborative learning is simple. It's a group of individuals meeting and working together to address challenges, solve problems, and develop and integrate different perspectives.

Whether in classrooms or workplaces – virtual or physical – this method of learning can be a powerful engine for deeper understanding, innovation and personal growth.

However, to fully harness the potential of collaborative learning, we must consider how we design educational experiences. This means acknowledging that we're not just teachers talking and students listening. It requires educators to shift away from traditional lecture-and-ask group-work projects that speak of students' creativity.

Realisations need to be made that encourage collaboration – they need to equip and empower the people who make it possible. That means intentional and training for teachers to develop and improve the skills to guide students and facilitate learning. It also means they should be given the space to design learning opportunities that allow students to experience and learn collaboratively and learn from others.

Such experiences help students learn to design and solve meaningful issues by opening the doors to new perspectives. When the conditions are right, collaboration does something remarkable.

### SCHOOL FOR HUMANS

engage with the problems and solutions at hand, which in turn results in deeper understanding of concepts and a greater ability to apply them.

At the National University of Singapore, Design Year Three (DYS3) was introduced in 2016 to allow undergraduate students to co-create learning experiences with their peers and faculty.

Since 2020, the Singapore University of Technology and Design has introduced the FutureLearn Curriculum that integrates design thinking, critical inquiry and collaborative problem-solving from the first year.

At the SIT, where I teach, as students are trained to be industry leaders, they are also required to build on skills such as communication, collaboration, intrapersonal learning, teamwork and reflective practice. This is done through teachers

RESEARCHER'S PERSPECTIVE

Research shows that collaborative learning enhances critical thinking, innovation



### DEVELOPING A CULTURE OF COLLABORATION

One of the key challenges in education is how to foster a culture of collaboration. This requires intentional design and training for teachers to develop and improve the skills to guide students and facilitate learning. It also means they should be given the space to design learning opportunities that allow students to experience and learn collaboratively and learn from others.

### THE POWER OF COLLABORATION

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### THE BENEFITS OF COLLABORATION

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### THE CHALLENGES OF COLLABORATION

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### THE FUTURE OF COLLABORATION

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# Mode of learning: experientially

- Learning by doing rather than being spoon-fed
- Real-world connection: emphasis on skilful application & innovation
- Active engagement: take initiative & make decisions
- Multiple capabilities: self-learning, technical, communication, etc.
- Reflection: what was learned that is applicable to your area of interest?

# Assessment format & grading criteria

# Assessment format

## Team-based self-learning & presentation

- 20% of overall assessment
- ~6 person per team: member list & *algorithm* to present  
to be submitted by team leader  
via NTUlearn by 23<sup>rd</sup> Jan 2026
- Assessment: (i) max 7 min in class presentation  
(ii) pre-recorded presentation  
(iii) PowerPoint slides (ppt format)
- To be submitted by team leader  
via NTUlearn by 22<sup>rd</sup> Feb 2026 2359 hrs
- Usage of generative AI allowed **as per university guidelines**



# Grading criteria

## Key sections of slides (40%)

- Purpose of ML algorithm chosen by team
- One real-world application (Keep it Simple)
- Explain how algorithm works, using a numeric example<sup>1</sup>  
(Keep it Simple)

## Format (10%)

- Non-verbose (key words/phrases)
- (Notes may be made in Powerpoint's Note section)
- References
  - Aptos font suggested: header font size 36-40, content font size 16-28

1. e.g., <https://www.frontiersin.org/journals/ecology-and-evolution/articles/10.3389/fevo.2022.1010278/full><sup>9</sup>

# Grading criteria

## Outperformance (50%)

- Intuitive, self-explanatory slides
- Good flow
- Instructive for peers
- Effective sharing via class presentation & recording

**Explicitly** acknowledge what resources have been used & the specific ways they are used (e.g., gen AI)

# Grading criteria

Last slide to state *significant* contribution  
of individual team members, e.g.,

- *Class presentation: Peter, ... (1 to 2 pax expected)*
- *Recorded presentation: Lee (1 pax expected)*
- *Research & slides preparation: Sue, ... (2 to 3 pax expected)*
- *Numeric example of algorithm computation: ... (1 to 2 pax expected)*
- *Coordination: ... (1 pax expected)*
- Individuals may contribute in more than one area

# List of ML algorithms for group-learning & presentation

Deep learning is heavily used in many domain applications.  
Select one of following related algorithms for your learning:

- Forward propagation (Neural network)
- Back propagation (Neural network)
- Forward propagation (Mathematical expression)
- Back propagation (Mathematical expression)
- Bayesian belief propagation

Question?