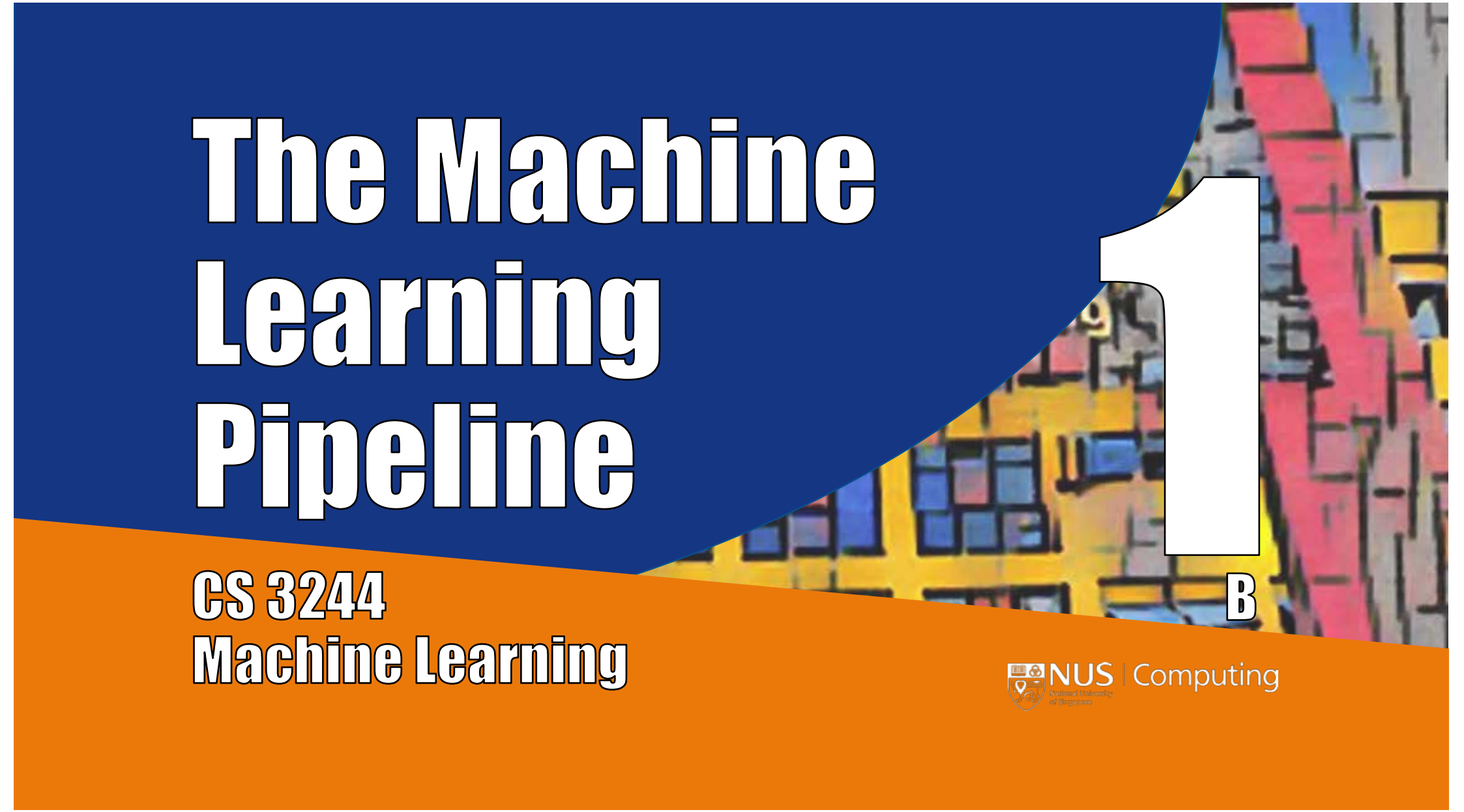
The Machine Learning Pipeline



1B

CS 3244
Machine Learning

NUS | Computing

Instructor:
Kan Min-Yen

kanmy@comp.nus.edu.sg

- Easy to remember: $min(x)$
- Ph.D./B.S. in CS, Columbia University

Research Interests

- Web
- Information Retrieval
- Natural Language Processing

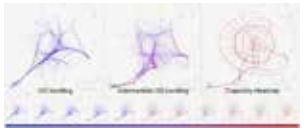
IoT Sensors | Health Behavior Change | Data Analytics

NUS Ubicomp Lab

Apps and Analytics for Smart Cities and Healthcare

http://ubiquitous.comp.nus.edu.sg

Explainable Artificial Intelligence



Interactive Data Visualization

[Instructor] Brian Lim

brianlim@comp.nus.edu.sg

- Asst. Prof. in Computer Science
- Ph.D. in HCI, Carnegie Mellon University
- B.S. in Engineering Physics, Cornell University

Research Interests

- HCI: understand people with tech, help people with tech
- Explainable Artificial Intelligence
- Ubiquitous Computing
- Data analysis and visualization
- Smart Health and Smart Cities

Forecast

Learning Outcomes for this week:

- Understand the rationale for our course's structure, the why of our module
- Recall the components of the course and their weightages and general deadlines
- Execute a basic machine learning workflow in Google Colab
- Conceptualize the division of labor in a typical machine learning project

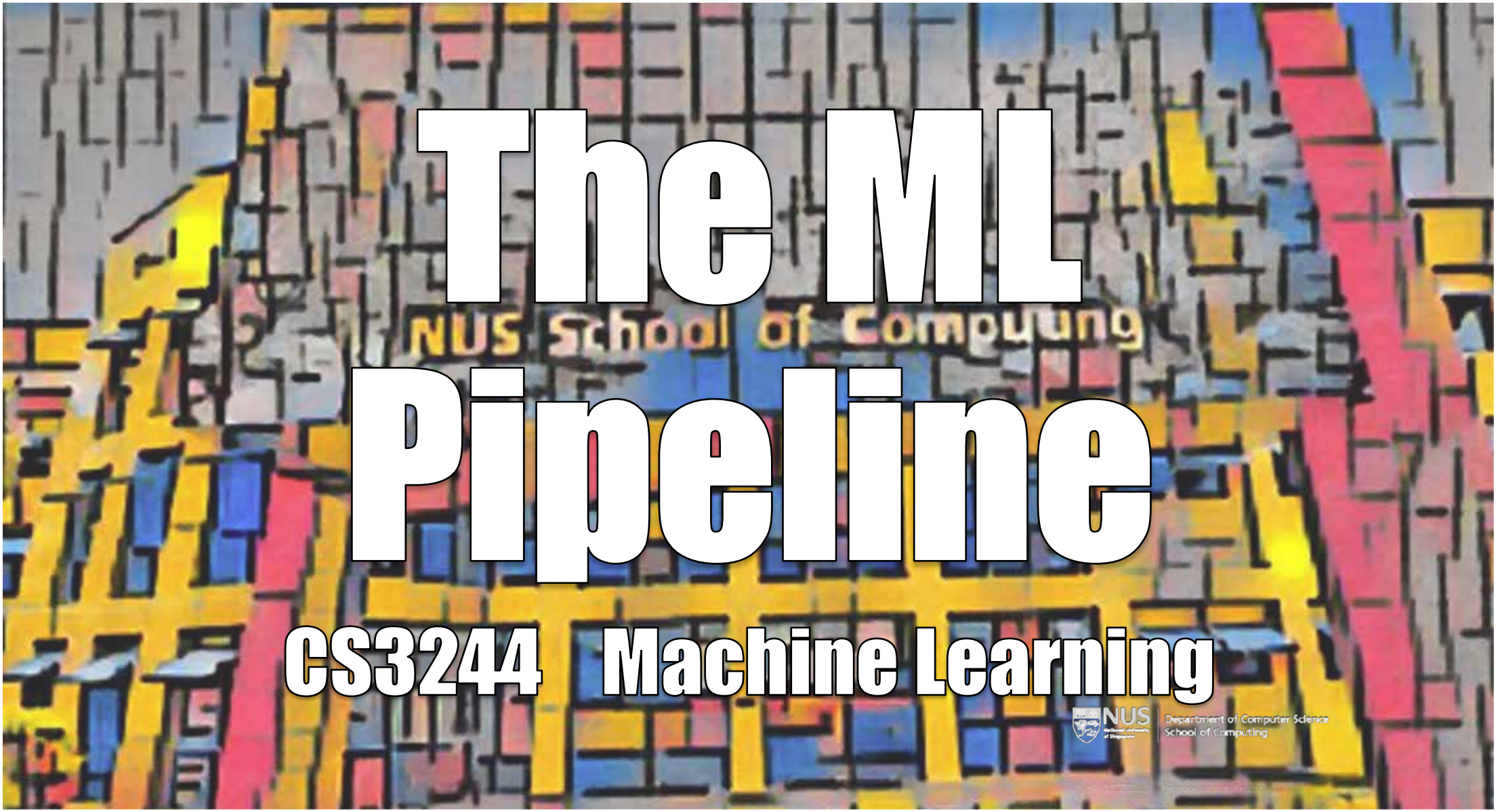
slack cs3244-2110.slack.com

You'll need this for this lecture.

https://bit.ly/cs3244-join-slack

👉 Use your NUS @nus.edu.sg or @u.nus.edu address.

👉 Use your LumiNUS name for your display name.


The ML
Pipeline
CS3244 Machine Learning
NUS School of Computing
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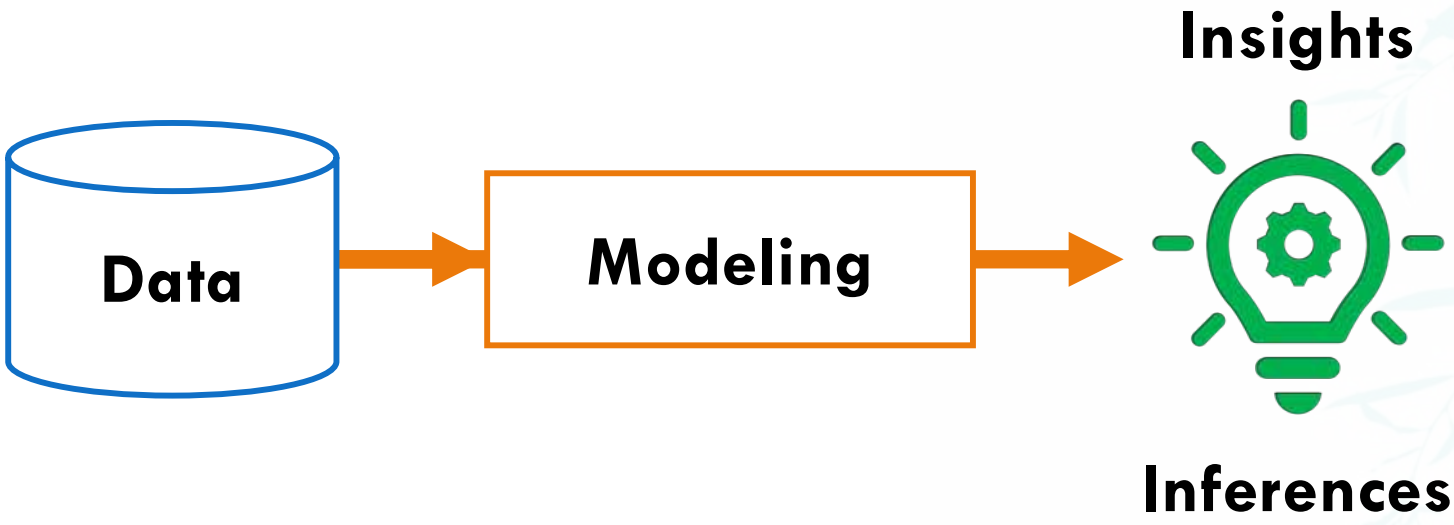
Department of Computer Science
School of Computing

Machine Learning Pipeline



What do you think a ML Pipeline is? What is its purpose?

Go to Slack, on the #general channel

Post an answer to our thread. A short 1-2 sentence or phrase will do.

If you'd prefer just to upvote another's answer, feel free to do that (too).

In-Lecture Activity: Noteboard

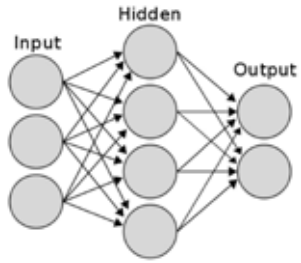
What is a model?

$y = ax + b$

Equation (Line)

```
If Rain, then Stay Home
Else Go Out
```

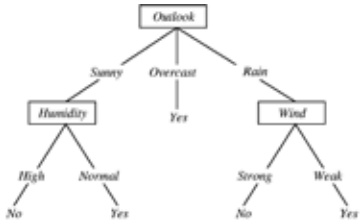
Code? Rules



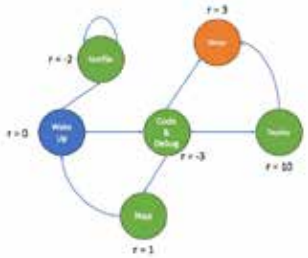
Neural Network (NN)

$y = ax^2 + bx + c$

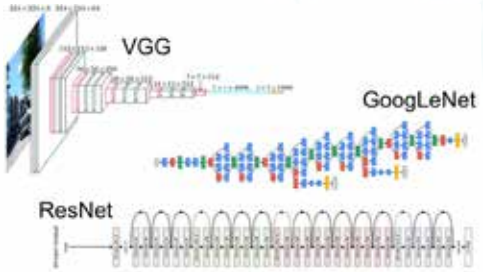
Equation (Nonlinear)



Decision Tree



Bayesian Graph



Deep NN

A **model** is a mathematical representation of a behavior

Machine Learning Pipeline

1. Data collection
2. Data extraction (Feature engineering)
3. Data understanding (with Visualization)
4. Data pre-processing
5. Model choice / design
6. Model training
7. Model validation (Evaluation)
8. Model understanding (Visualization / Explainability)
9. Model deployment

Machine Learning Pipeline

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Machine Learning Pipeline

1. Data collection
2. Data extraction (Feature engineering)
3. Data understanding (with Visualization) [W08]
4. Data pre-processing [W08]
5. Model choice / design [W01–06, 10–12]
6. Model training [with Step 5]

"Machine learning"

7. Model validation (Evaluation) [W07]
8. Model understanding (Explainability [W10] / Visualization [W08])
9. Model deployment

Machine Learning Pipeline

5. Model choice / design [W01–06, 10–12]
   - Paradigms of ML
     - Supervised Learning
     - Unsupervised Learning
     - ~~Reinforcement Learning~~
   - Bias and Variance

Machine Learning Pipeline

5. Model choice / design
   - Paradigms of ML [W02]
     - Supervised Learning [W02…]
     - Unsupervised Learning [W11]
     - ~~Reinforcement Learning~~
   - Bias and Variance [W05]

Machine Learning Pipeline

5. Model choice / design
    - Paradigms of ML [W02]
        - Supervised Learning
            - Decision trees [W03]
            - Linear models [W04]
            - Support Vector Machines [W04]
            - Perceptron and Neural Networks [W09]
            - Deep Learning [W10]
        - Unsupervised Learning [W11]
    - Bias and Variance [W05]

(Iterative) Machine Learning Pipeline

1. Data collection
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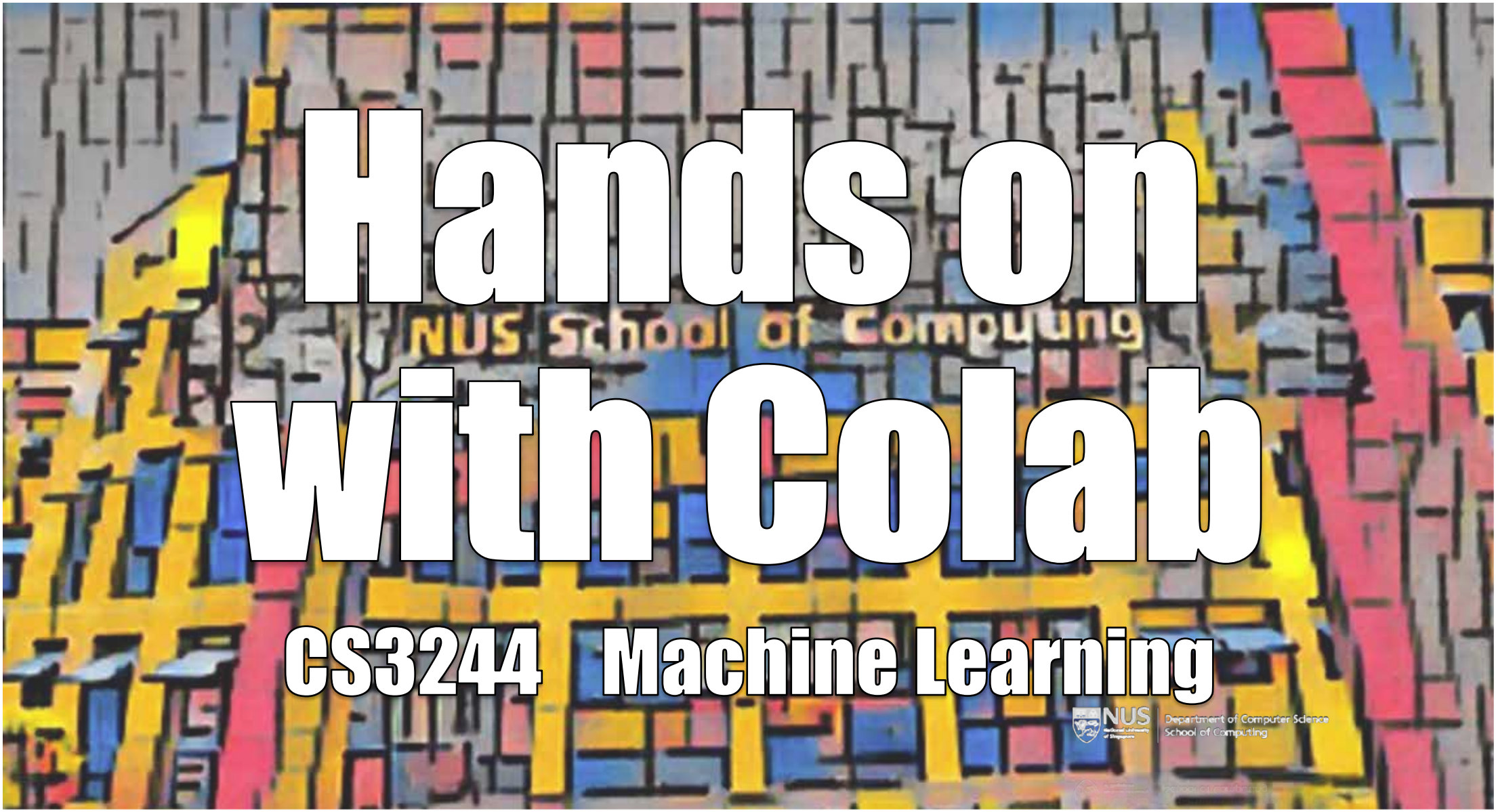
Hands on
with Colab
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Hands-On ML Model w/ Colab (30 minutes)

Let's Go!

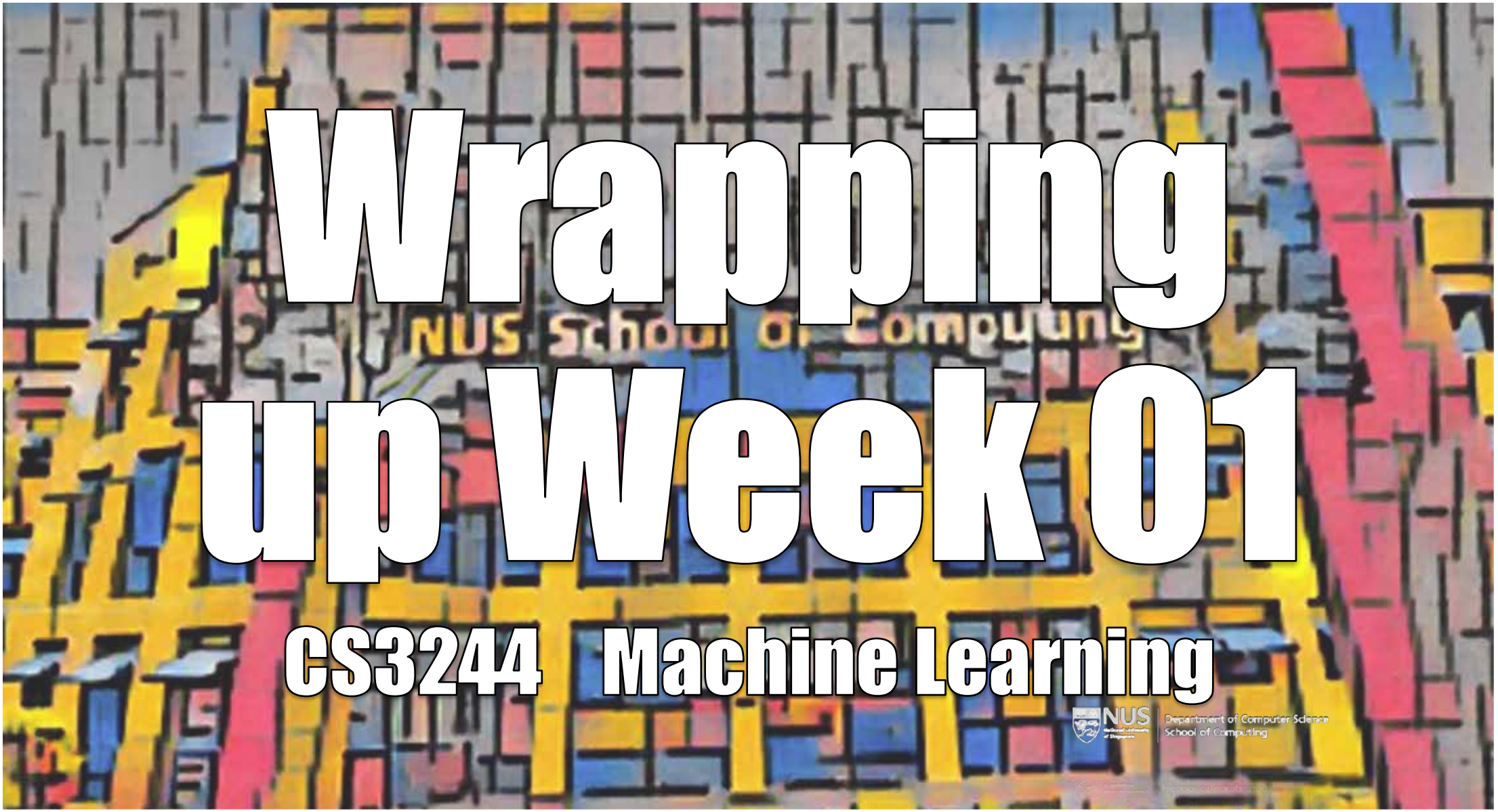
http://www.comp.nus.edu.sg/~cs3244/AY2122S1/01.colab.html

What did we learn?

We ran a ML classifier over a famous dataset, MNIST, for digit classification.

Procedurally, we also had a first try at:

- Using Google Colab.
- Using LumiNUS Quiz to submit your answers to in-Colab exercises.


Wrapping
up Week 01
CS3244 Machine Learning
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School of Computing

What did we learn this week?

- Understand the rationale for our course's structure, the why of our module
- Recall the components of the course and their weightages and general deadlines
- Execute a basic machine learning workflow in Google Colab
- Conceptualize the division of labor in a typical machine learning project

Outlook for next week

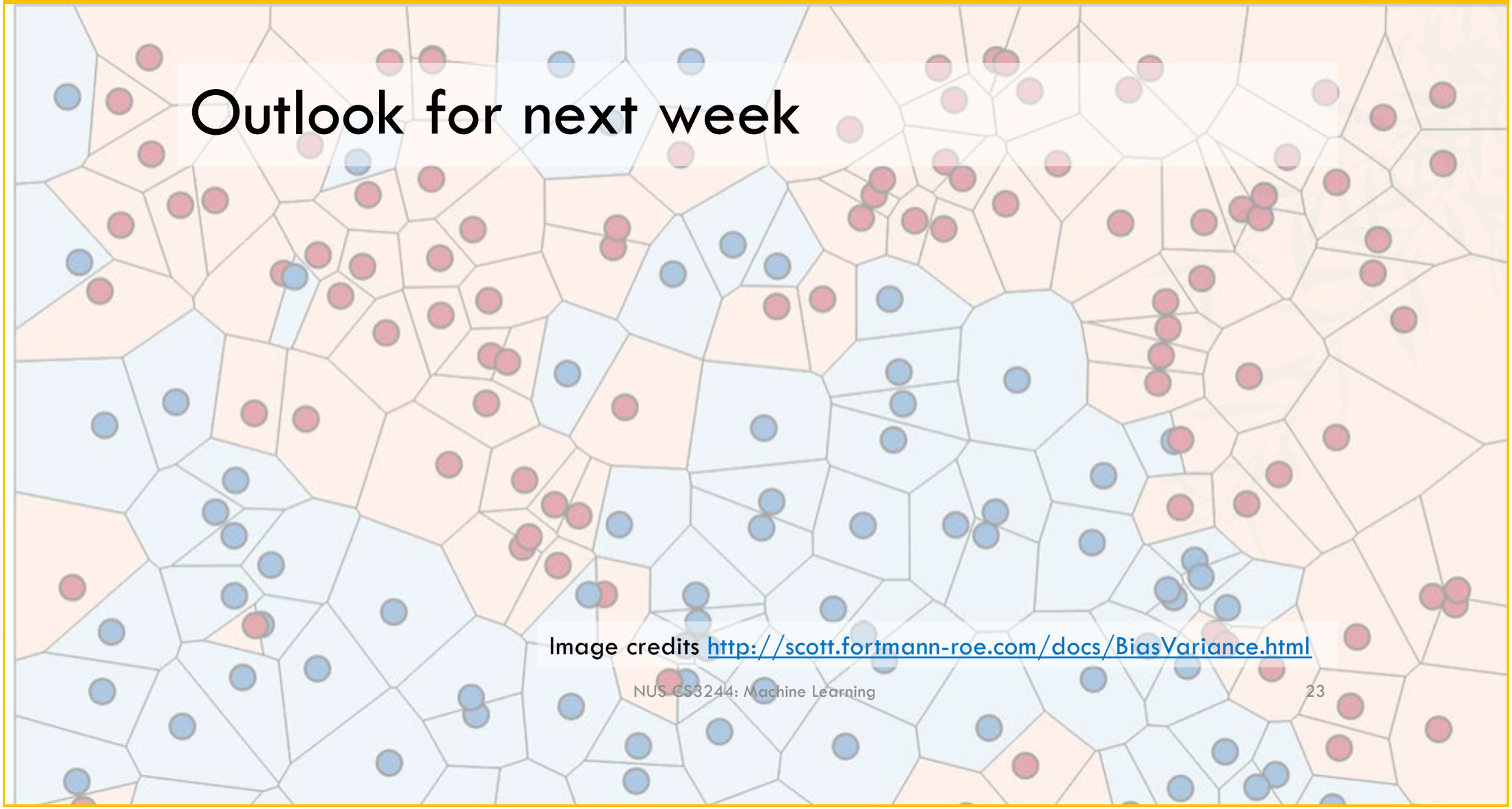

Image credits http://scott.fortmann-roe.com/docs/BiasVariance.html

Assigned Readings (due before next Mon)

First, let's do some reading to set the stage:

- Paradigms of ML: https://medium.datadriveninvestor.com/learning-paradigms-in-machine-learning-146ebf8b5943 (5 minutes)

- 5 Tribes of ML: https://medium.com/dummykoders/5-tribes-of-ai-the-perspective-6b9e0334638c (10 minutes)

Assigned Task (due before next Mon)

Let's intersect the two readings together!

Post a 1-2 sentence (not long!) answer to the below question in your Slack tutorial group #tg-xx or #tg-na (if you don't have a tutorial group yet).

Give an example of an ML application (a URL to it is good).
Describe which paradigm and tribe you think it belongs to.

[Don't worry if you're not sure, we'll cover this again in Week 02.]