



**WALC 2024**  
**Applied AI**

# Motion Classification, Anomaly Detection & Hands-On

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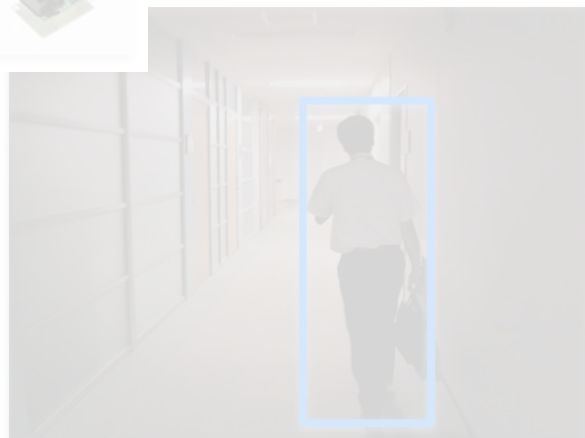
UNIFEI - Federal University of Itajuba, Brazil

TinyML4D Academic Network Co-Chair



**TINYML4D**

# Vision



# Sound



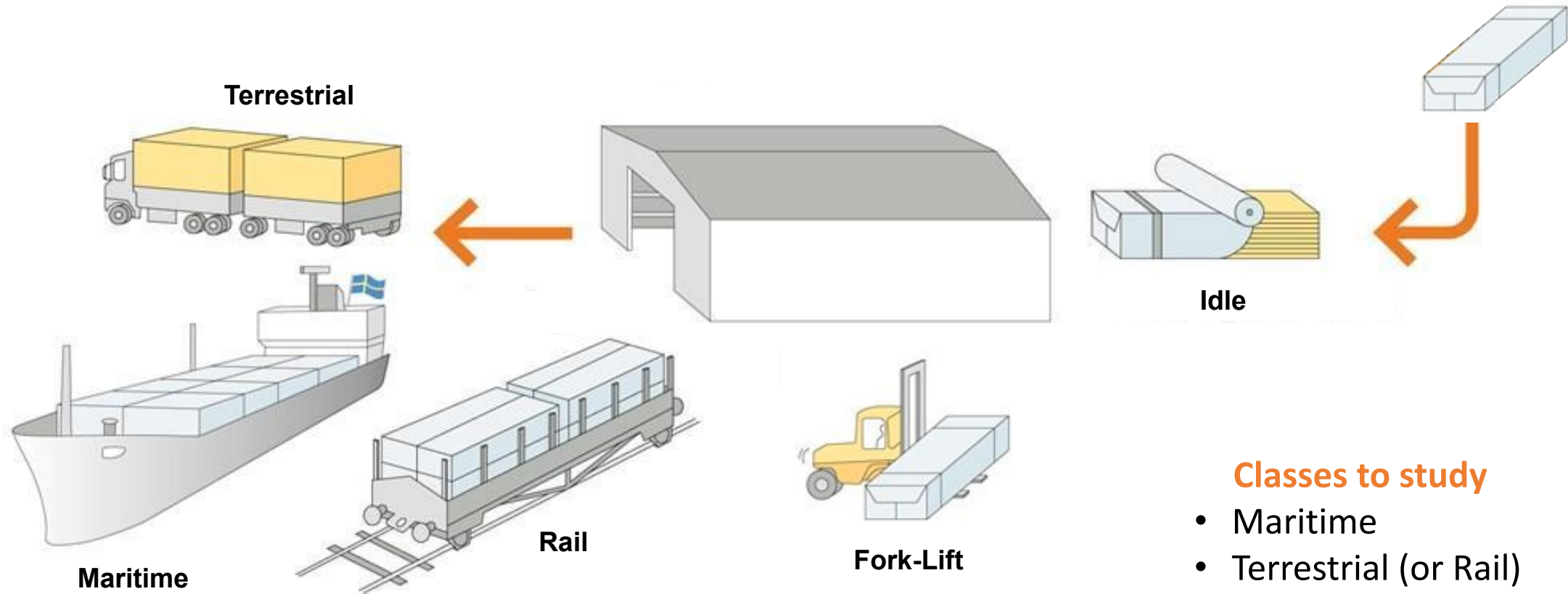
# Vibration



# Motion Classification



# Case Study: Mechanical Stresses in Transport



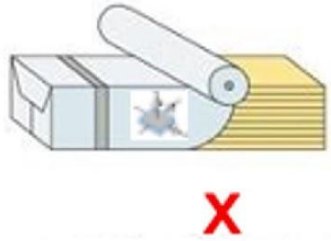
## Classes to study

- Maritime
- Terrestrial (or Rail)
- Lift
- Idle

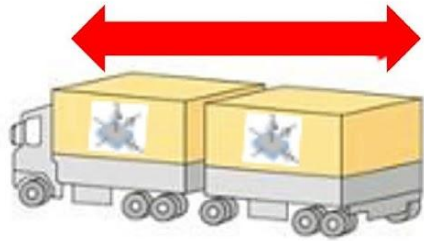
# Data Pre-Processing



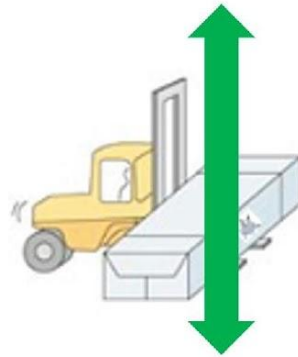
Collect  
Data



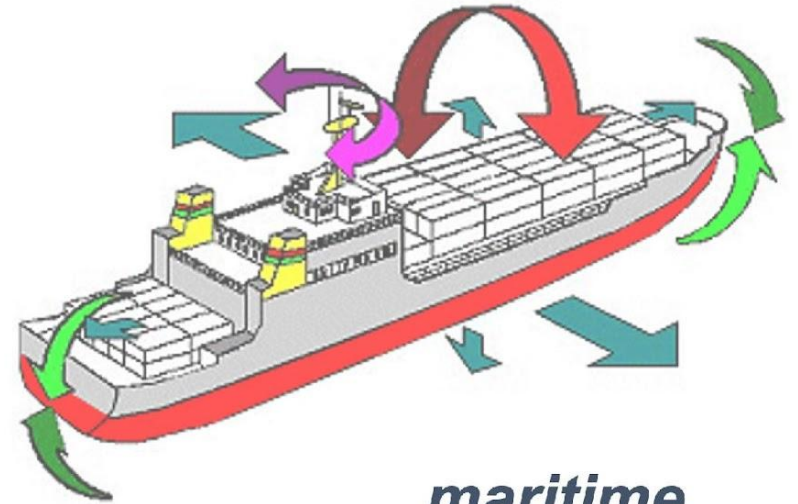
**Idle**



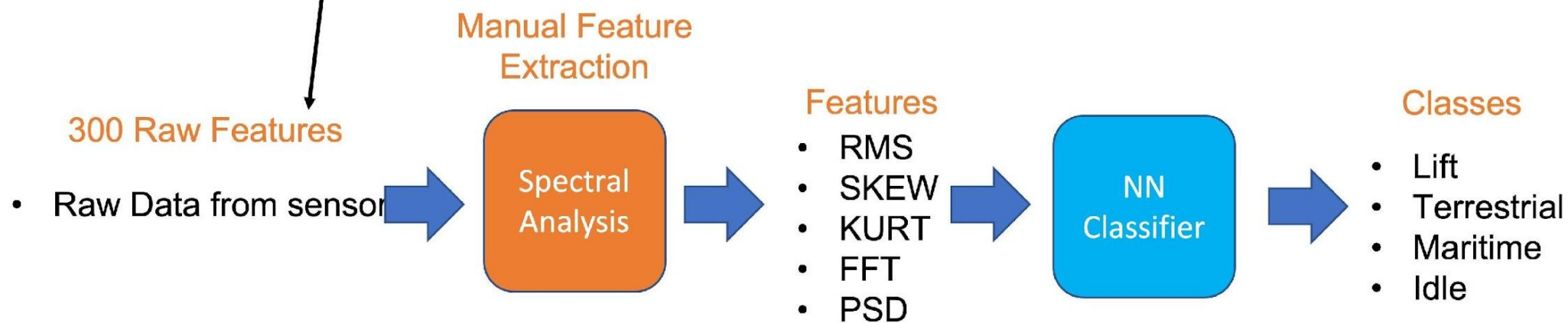
**terrestrial**  
(x-axis)



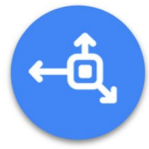
**lift**  
(z-axis)



**maritime**  
(x,y,z-axis)



# Model Design (NN Classifier)



Spectral  
Analysis

NN  
Classifier

Collect  
Data

Preprocess  
Data

Design a  
Model

Train a  
Model

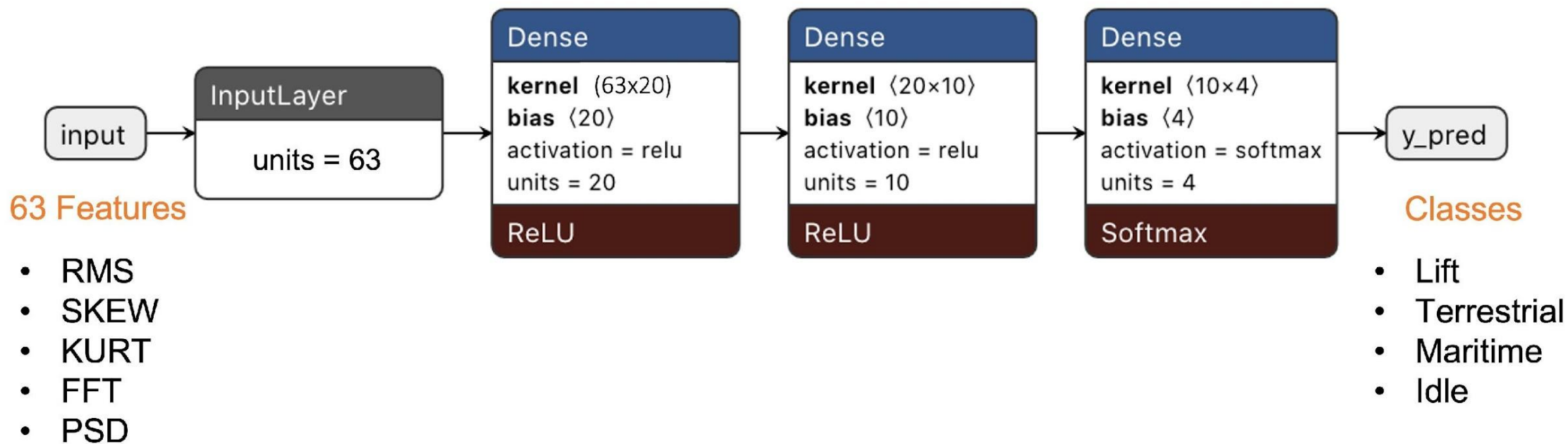
Evaluate  
Optimize

Convert  
Model

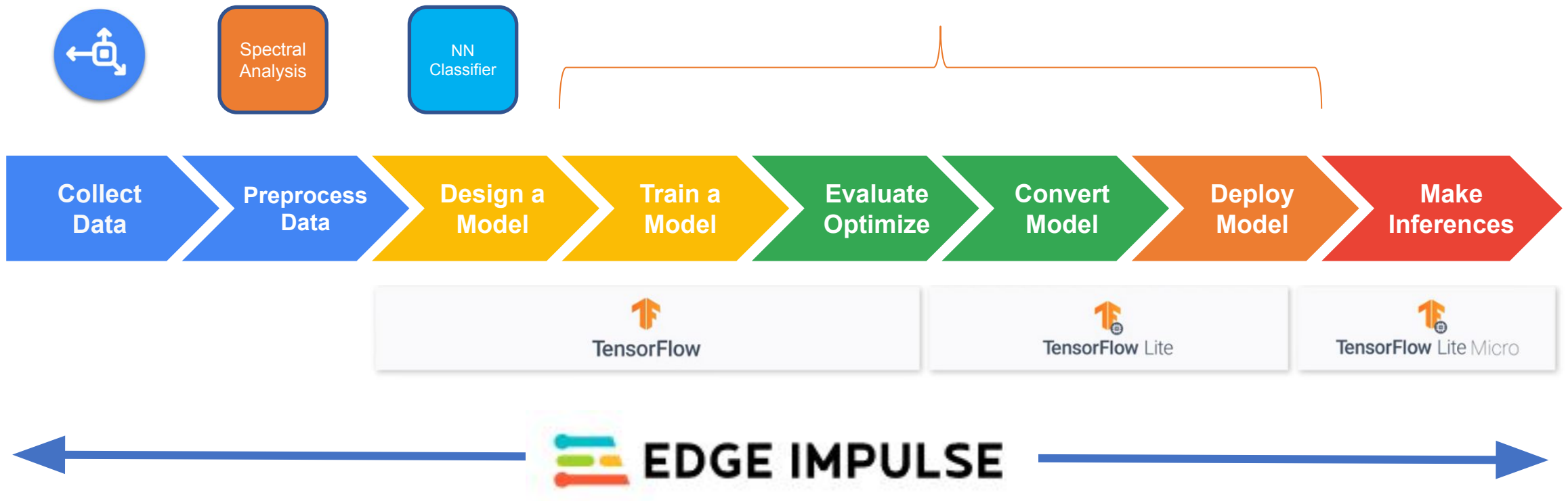
Deploy  
Model

Make  
Inferences





# Train, Evaluate, Convert, Deploy the Model



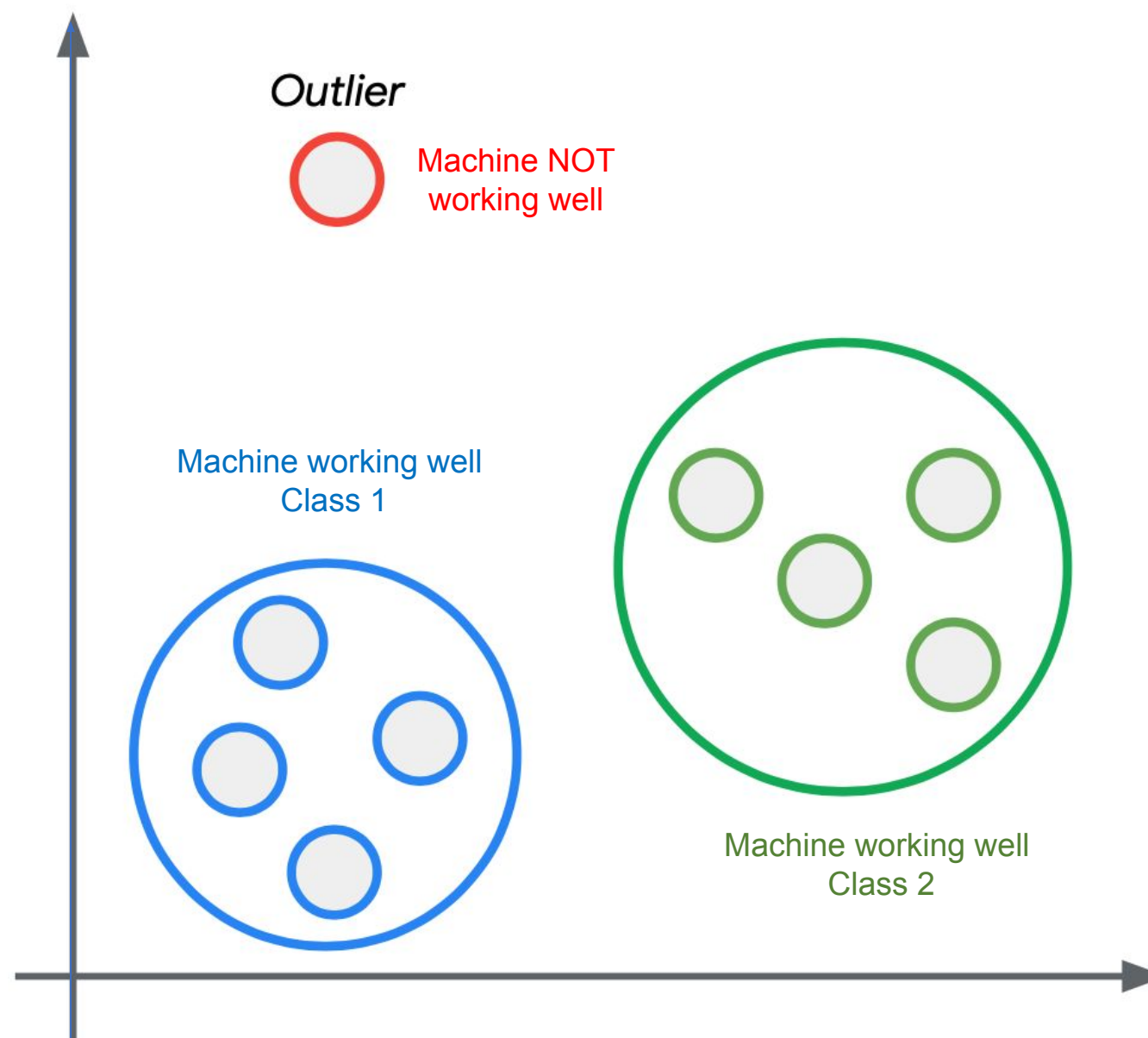
# Motion Classification Hands-On

<https://studio.edgeimpulse.com/public/302078/latest>



# Anomaly Detection Hands-On





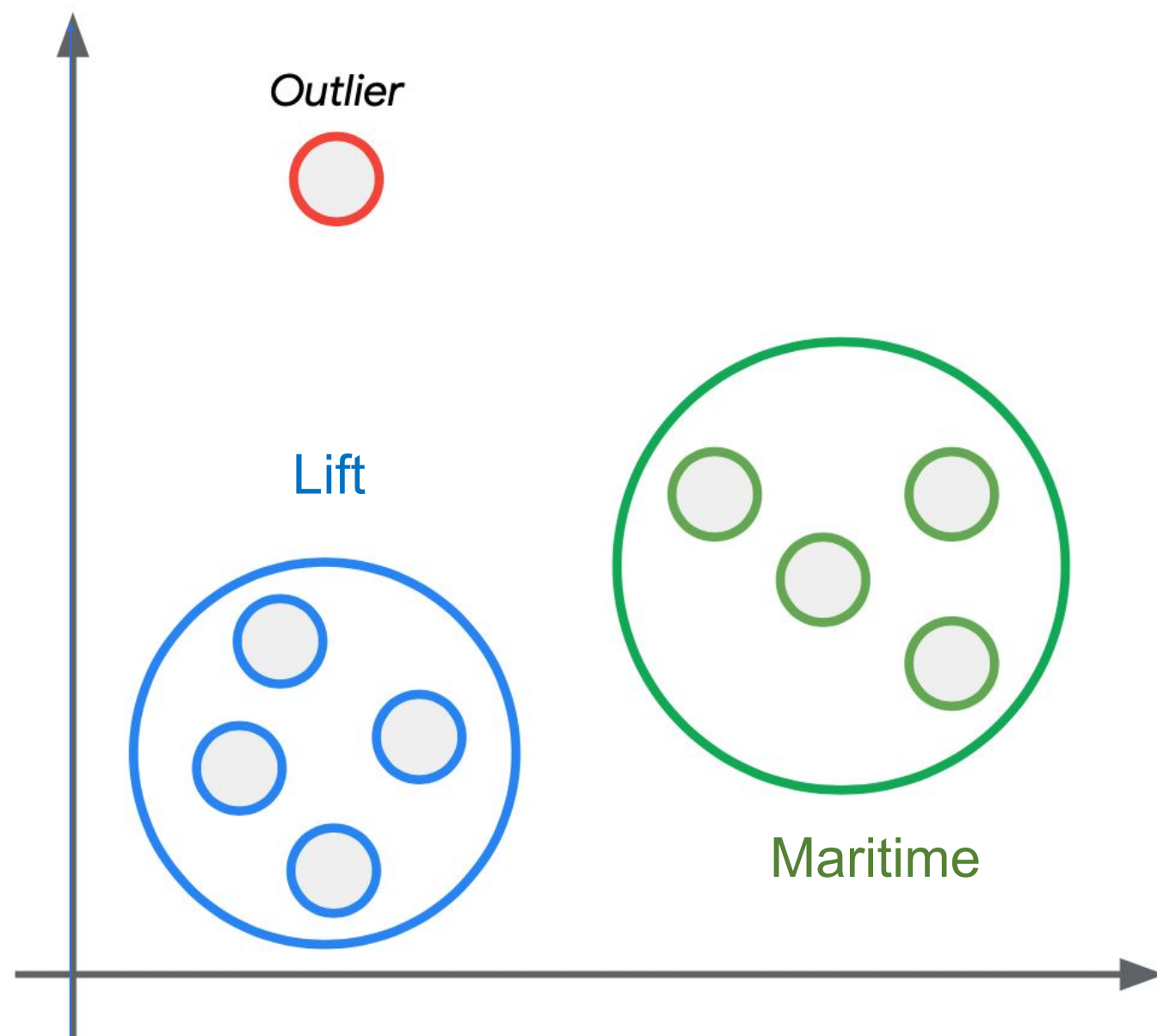
*Outlier*



Machine NOT  
working well

Machine working well  
Class 1

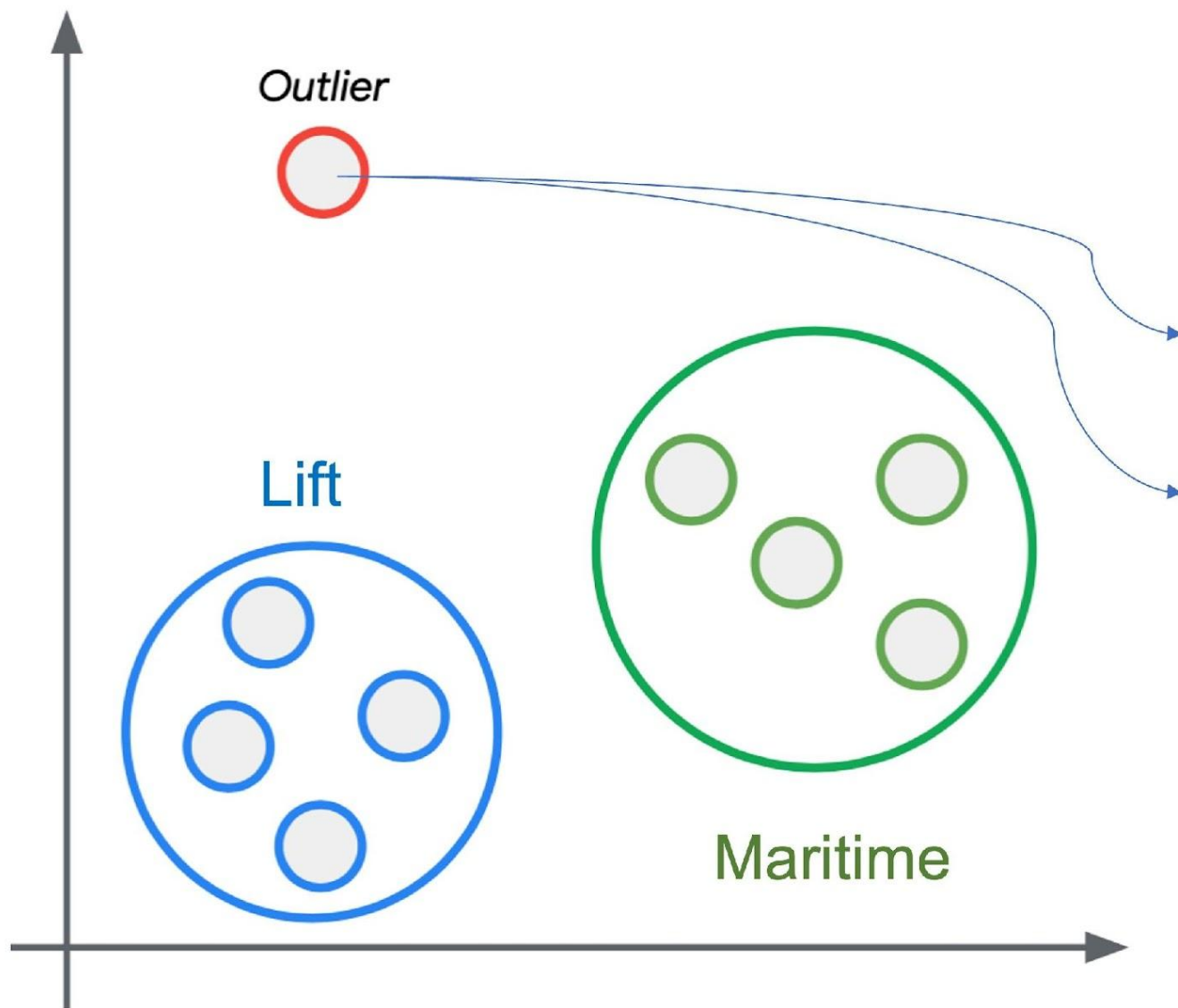
Machine working well  
Class 2

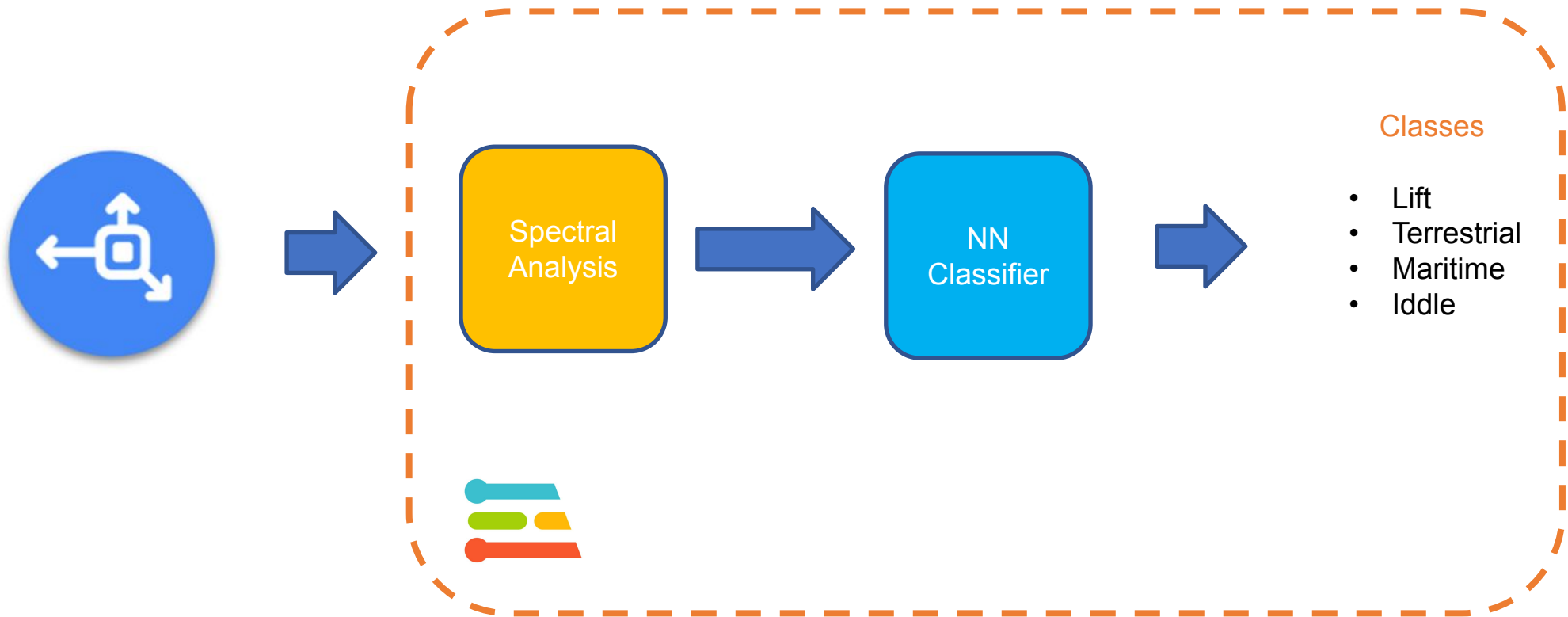


*Outlier*

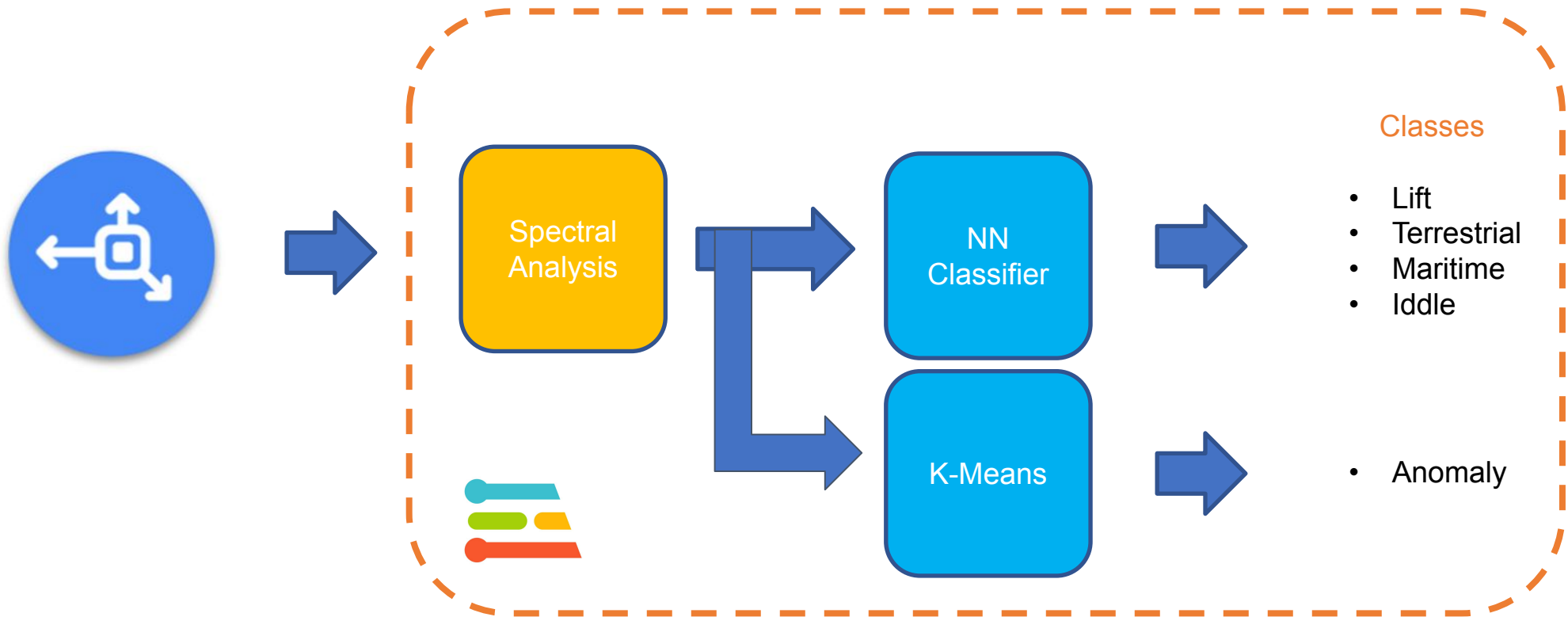
Lift

Maritime









# Questions?

