

# DTU Workshop – Learning and Optimization for Decision-Making Under Uncertainty

## Introduction

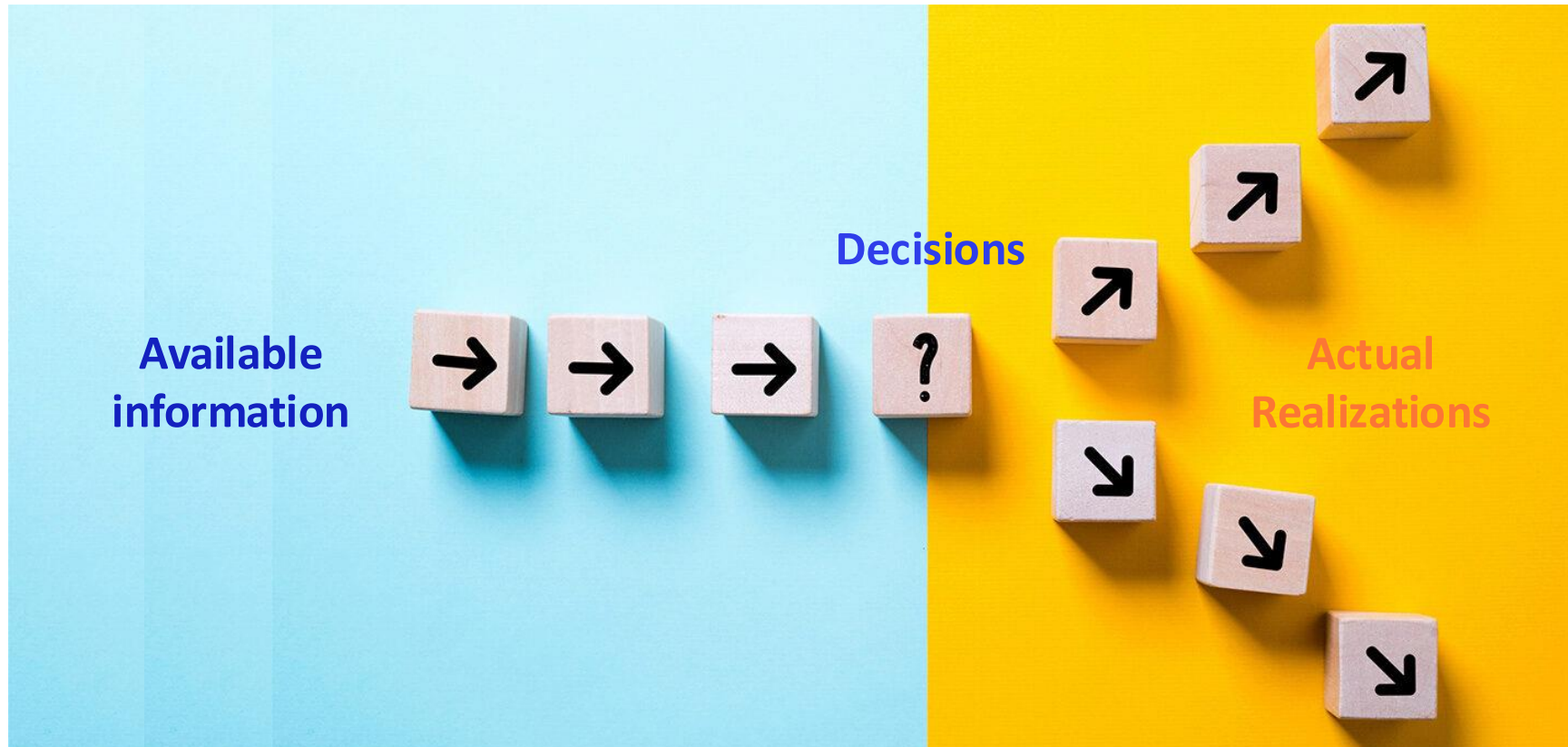
Lesia Mitridati

DTU PES Summer School 2025

May 22, 2025

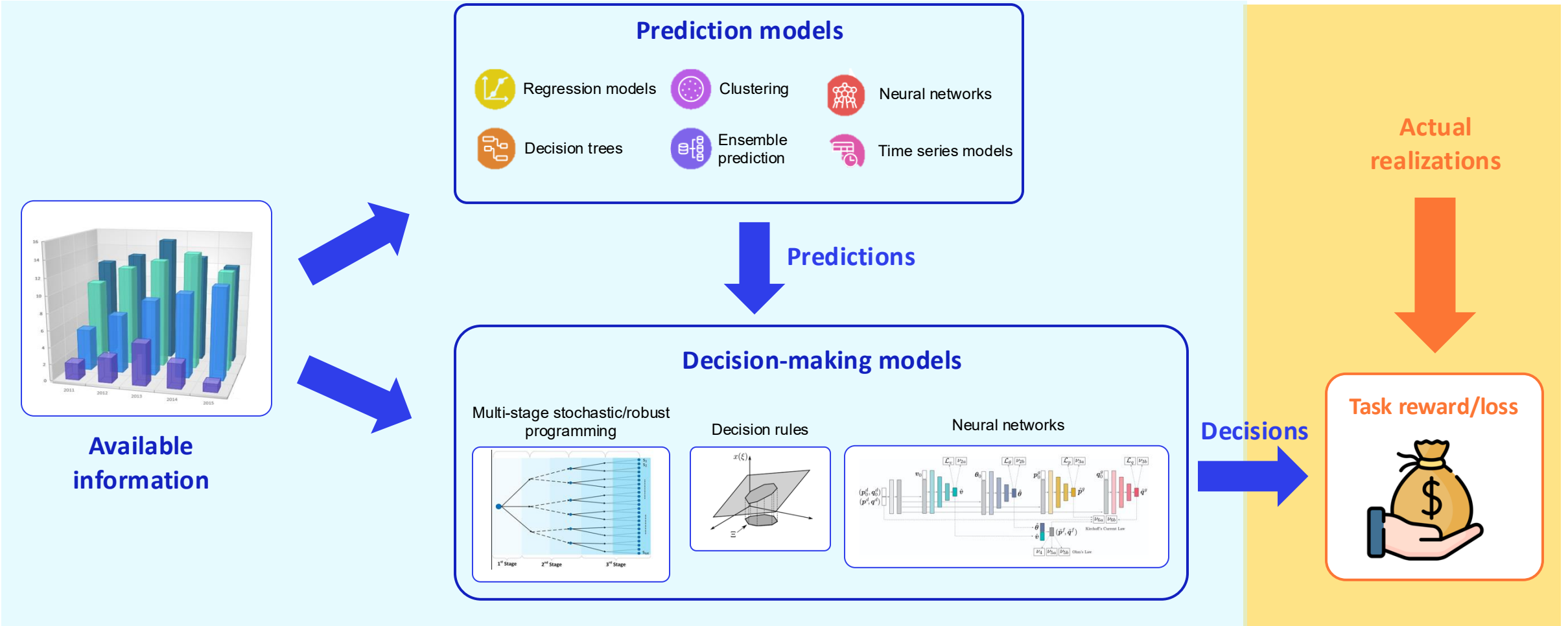
# Decision-making under uncertainty: Overview

**Goal: choosing an *optimal* action when the outcomes (rewards/losses) are not fully known or predictable**



# Decision-making under uncertainty: Overview

**Goal: Develop prediction/decision-making models that map available information to optimal decisions**

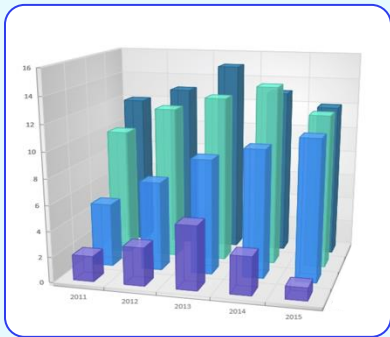


# Decision-making under uncertainty: Overview

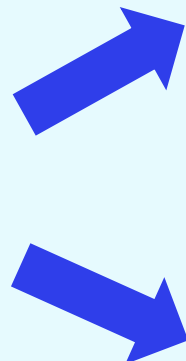
**Goal: Develop prediction/decision-making models that map available information to optimal decisions**

**Challenge 1: How to utilize all available information to make better-informed decisions?**

L. Mitridati, J. Kazempour



Available information

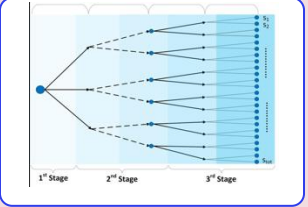
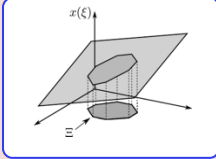
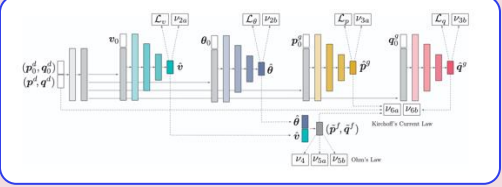


### Prediction models

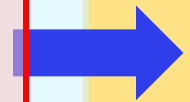
- Regression models
- Clustering
- Neural networks
- Decision trees
- Ensemble prediction
- Time series models



### Decision-making models

- Multi-stage stochastic/robust programming
 
- Decision rules
 
- Neural networks
 

Decisions



Actual realizations

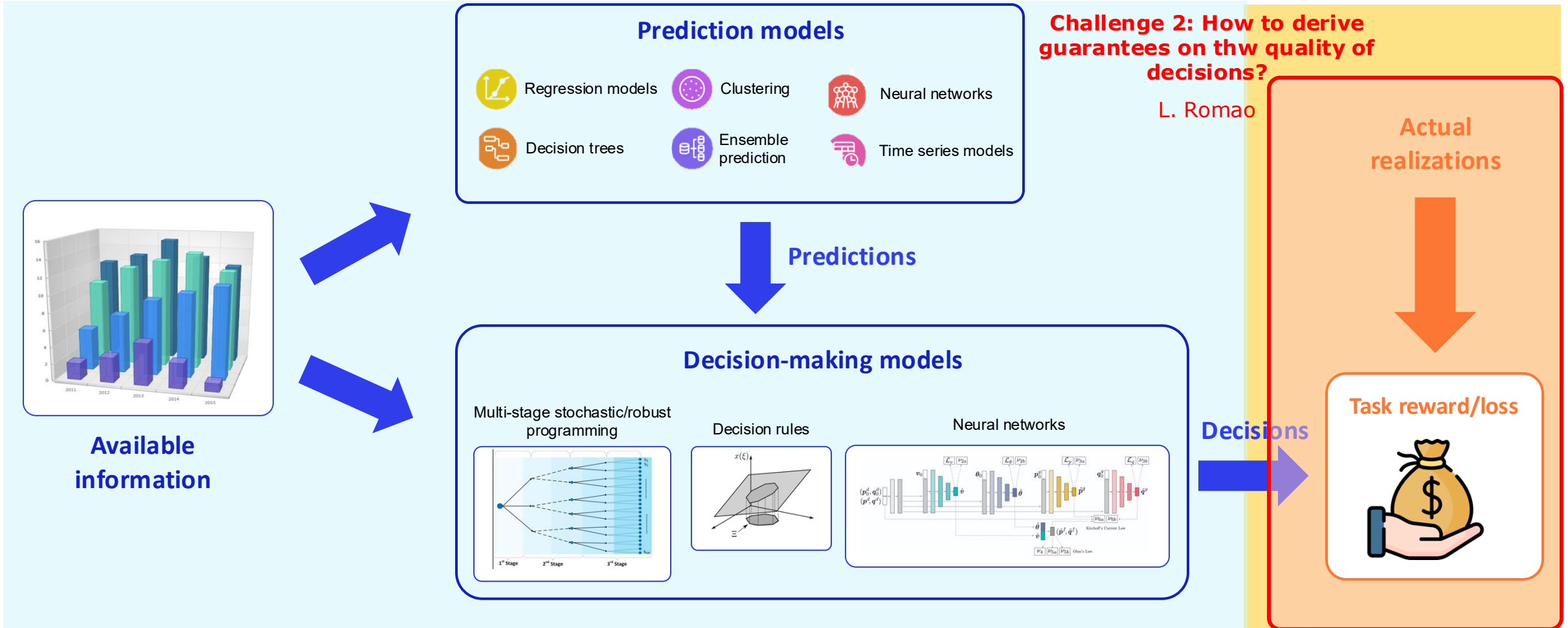


Task reward/loss



# Decision-making under uncertainty: Overview

**Goal: Develop prediction/decision-making models that map available information to optimal decisions**

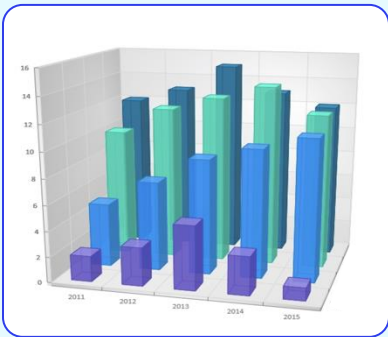


# Decision-making under uncertainty: Overview

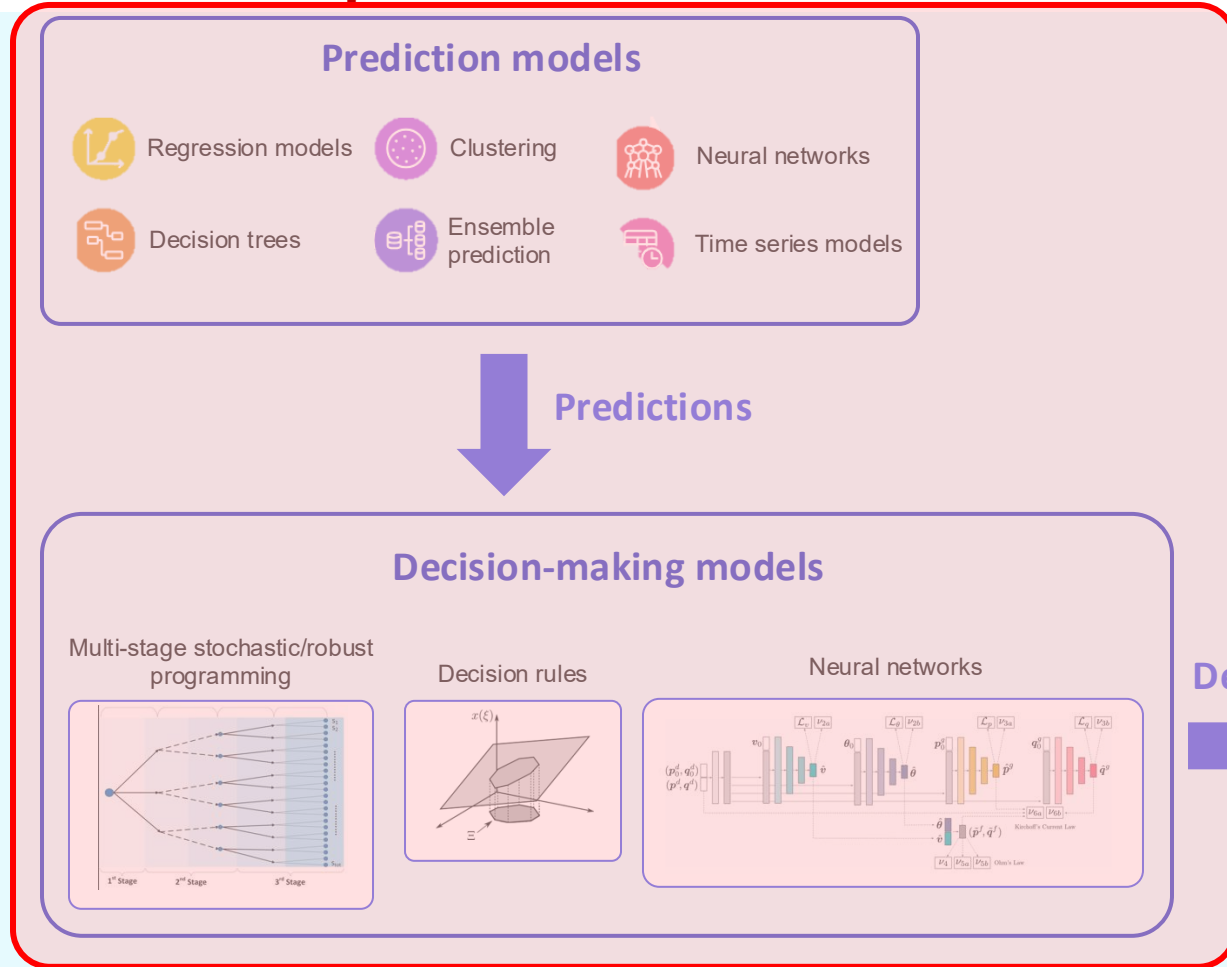
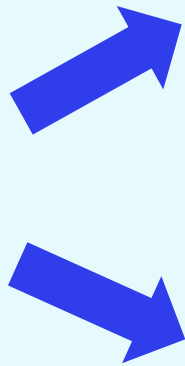
**Goal: Develop prediction/decision-making models that map available information to optimal decisions**

**Challenge 3: How to improve these decision-making models and solve them efficiently using advanced ML methods?**

S. Chatzivasileiadis



Available information



Decisions

