Dynamics in Two-Sided Attention Markets — An Optimization Perspective
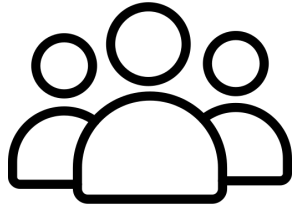
Haiqing Zhu

Panel: Prof. Lexing Xie, Dr. Yun Kuen Cheung, Dr. Thang Bui
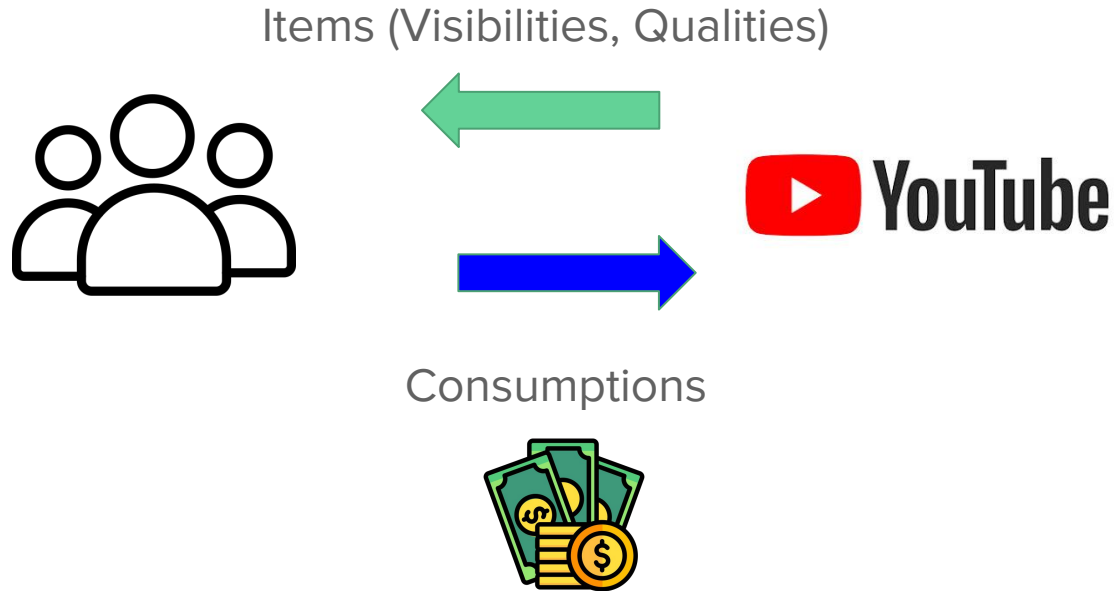
Start Date: August, 2023

Model - Two-sided Attention Market
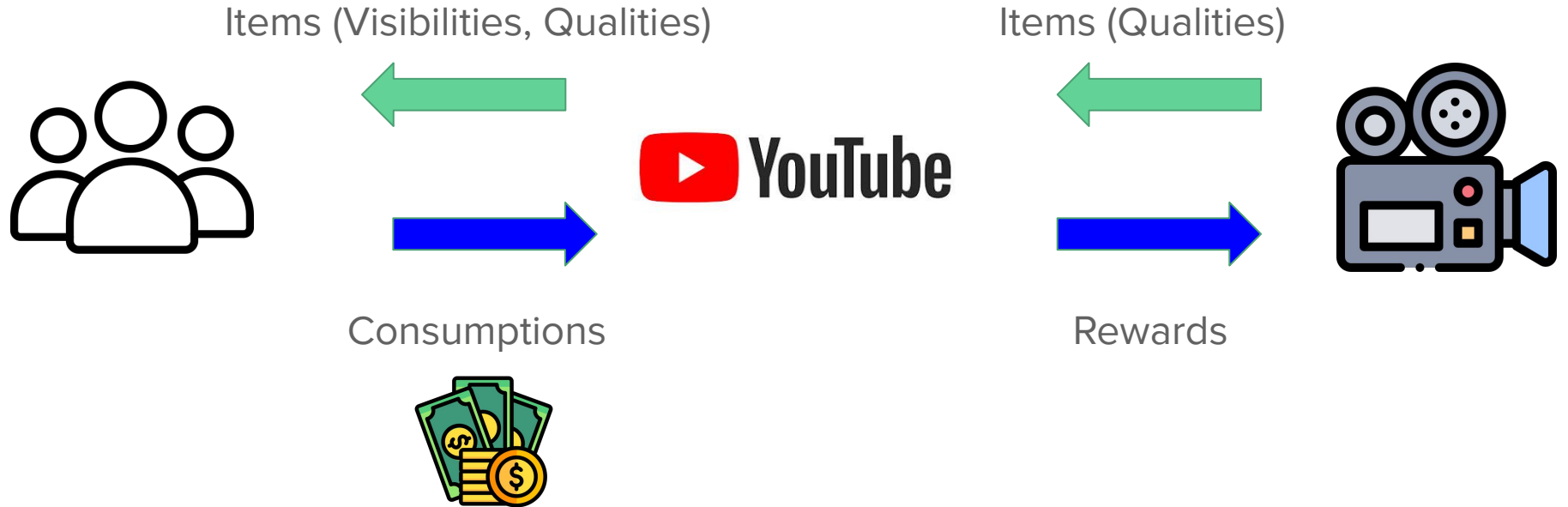
Items (Visibilities, Qualities)

Model - Two-sided Attention Market

Items (Visibilities, Qualities)

Consumptions

Model - Two-sided Attention Market

Items (Visibilities, Qualities)

Items (Qualities)

YouTube

Consumptions

Rewards

Model - Two-sided Attention Market

Items (Visibilities, Qualities)

Items (Qualities)

Consumptions

Rewards
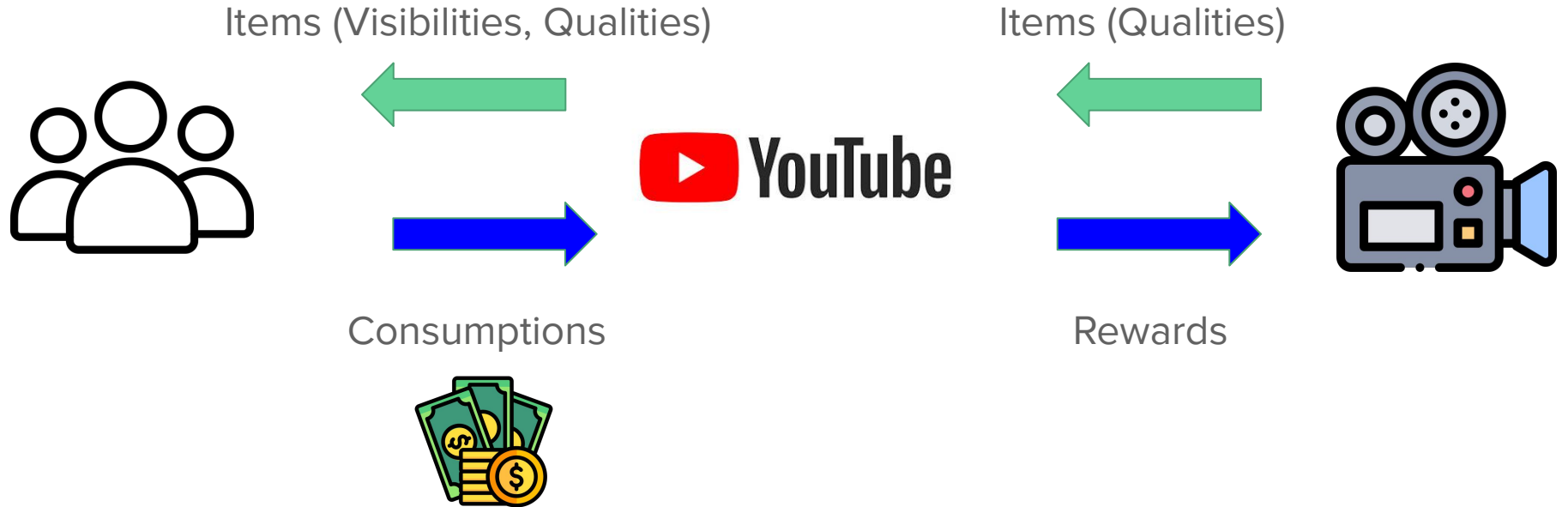
Model: Mathematical Abstraction
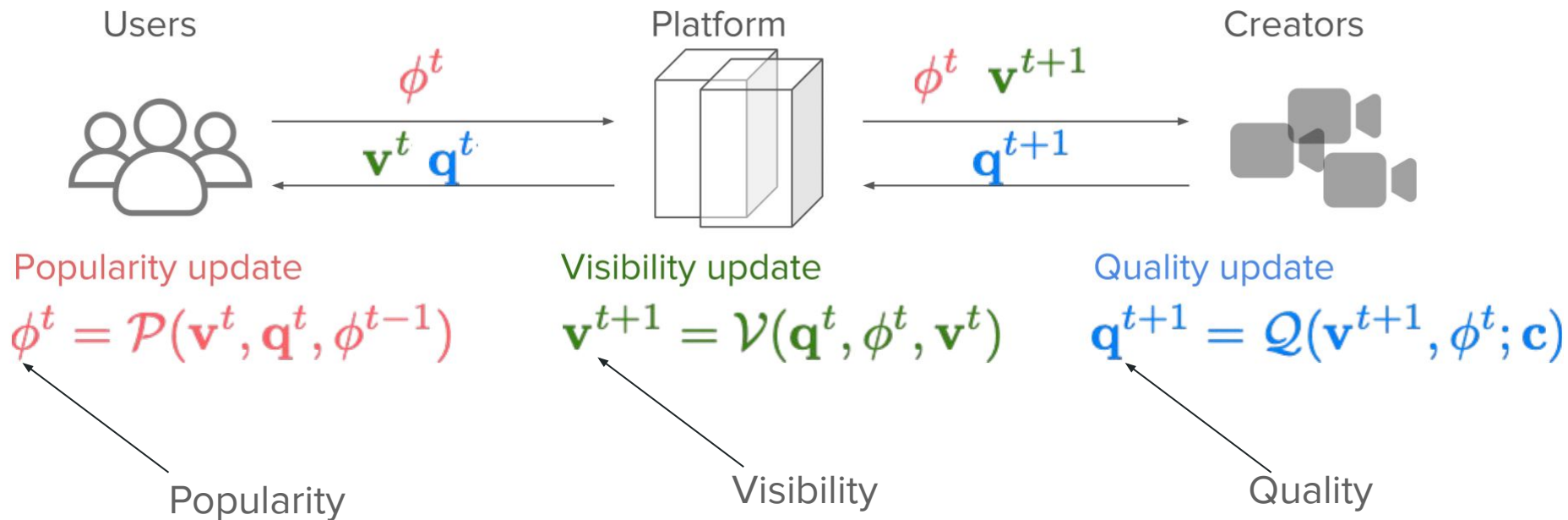
Users $\quad\quad$ Platform $\quad\quad$ Creators

ϕ^t

$\mathbf{v}^t \; \mathbf{q}^t$

$\phi^t \; \mathbf{v}^{t+1}$

$\mathbf{q}^{t+1}$

Popularity update

$$\phi^t = \mathcal{P}(\mathbf{v}^t, \mathbf{q}^t, \phi^{t-1})$$

Visibility update

$$\mathbf{v}^{t+1} = \mathcal{V}(\mathbf{q}^t, \phi^t, \mathbf{v}^t)$$

Quality update

$$\mathbf{q}^{t+1} = \mathcal{Q}(\mathbf{v}^{t+1}, \phi^t; \mathbf{c})$$

Popularity $\quad\quad\quad\quad$ Visibility $\quad\quad\quad\quad$ Quality
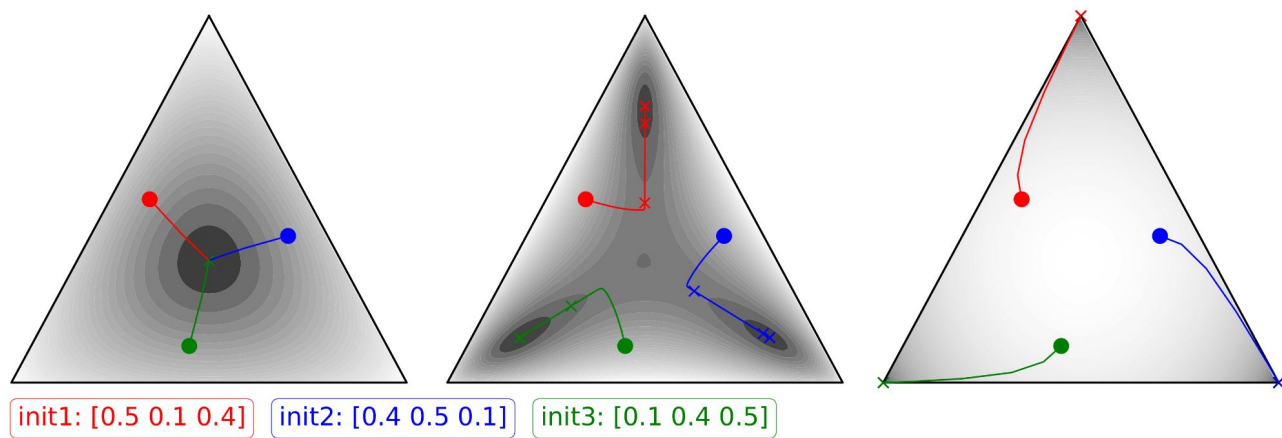
Results: Behaviour of Attention Dynamics

- **Equivalence to Optimisation Dynamics:** It is proven that, the two sided market dynamics (under various recommendation policies) are equivalent to mirror descent w.r.t. some potential functions (not necessarily convex)
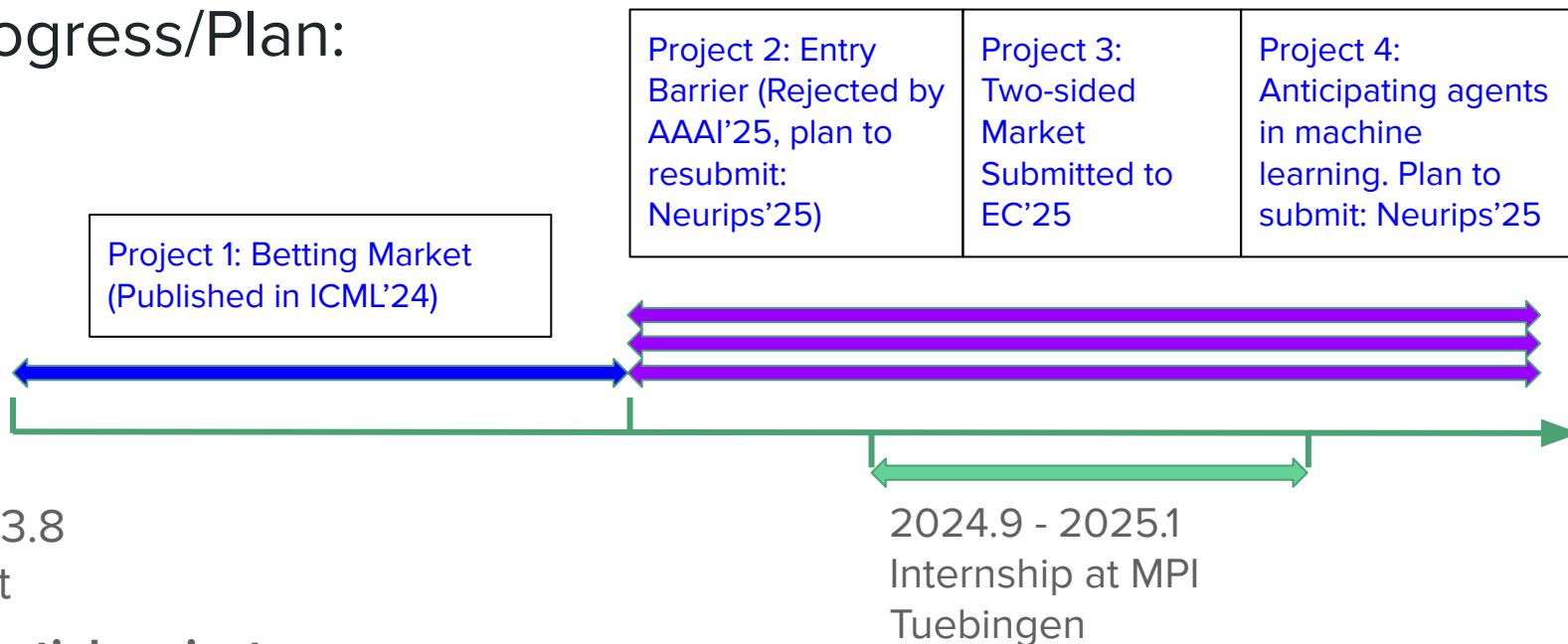
Results: Behaviour of Attention Dynamics

- **Equivalence to Optimisation Dynamics:** It is proven that, the two sided market dynamics (under various recommendation policies) are equivalent to mirror descent w.r.t. some potential functions (not necessarily convex)
- **Convergence Behaviours:**

init1: [0.5 0.1 0.4]   init2: [0.4 0.5 0.1]   init3: [0.1 0.4 0.5]

Progress/Plan:

Project 2: Entry Barrier (Rejected by AAAI'25, plan to resubmit: Neurips'25)

Project 3: Two-sided Market Submitted to EC'25

Project 4: Anticipating agents in machine learning. Plan to submit: Neurips'25

Project 1: Betting Market (Published in ICML'24)

2023.8
Start

2024.9 - 2025.1
Internship at MPI
Tuebingen

Potential projects:
1. Multi-dimentional Betting Markets
2. Explore - Exploit dynamics in Attention Markets
3. Dynamics in Academic Markets