



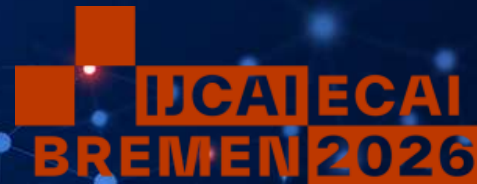
**Tsinghua
University**



**Beijing Institute of
Mathematical Sciences and
Applications (BIMSA)**



**University of
BRISTOL**



IJCAI-ECAI 2026 · Half-day Tutorial

Principles, Structures, and Adaptive Agents: Scaling AI under Limited Supervision

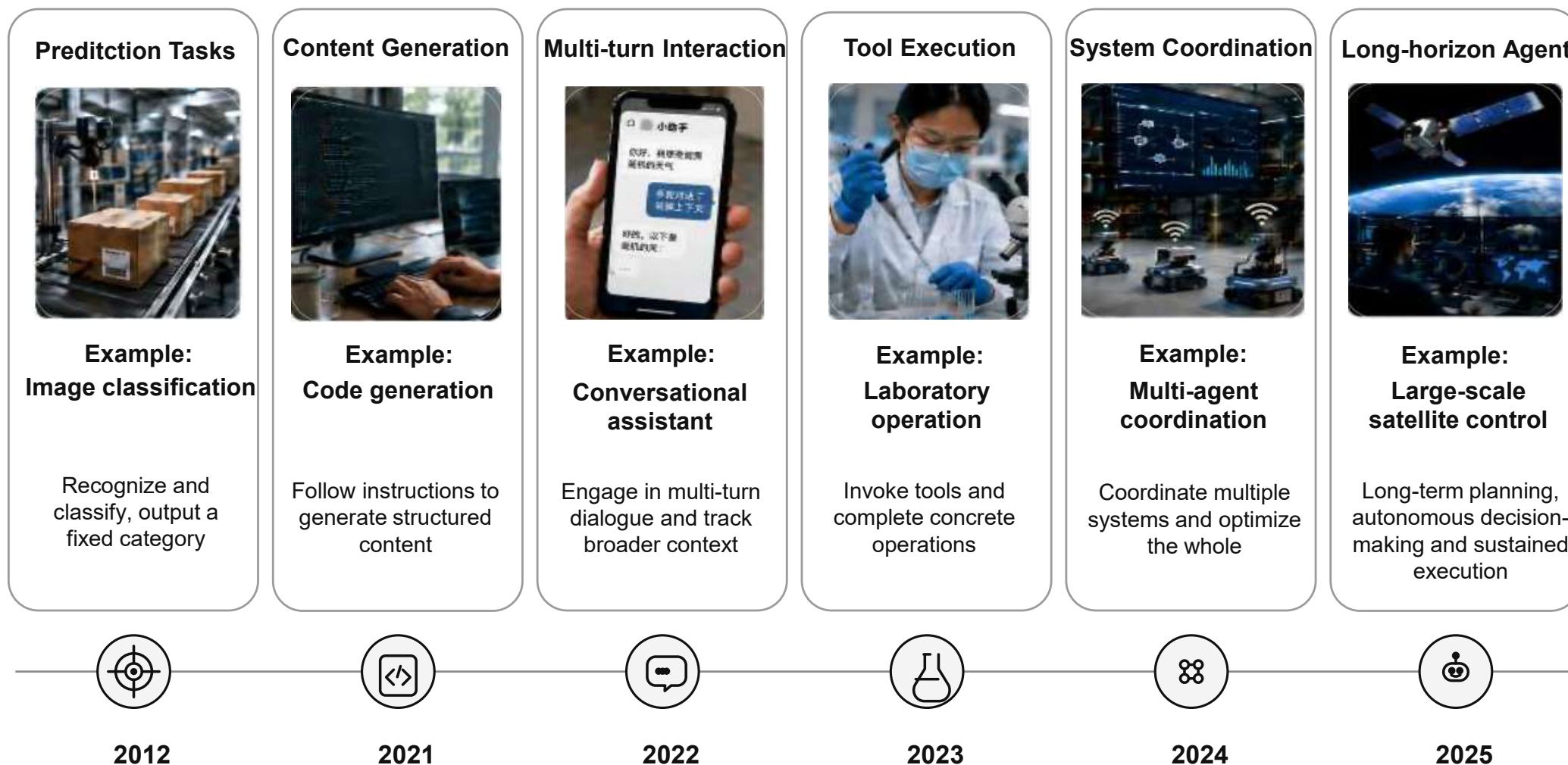
Presenters:

Zixing Song · Yaqing Wang · Quanming Yao



From Predicting Answers to Completing Tasks

Evolution of Task Forms



Adaptation must happen throughout interaction for agentic tasks.

Limited Supervision Does Not Mean Limited Information

Labels: only the tip of the iceberg

Labels
Explicit supervision

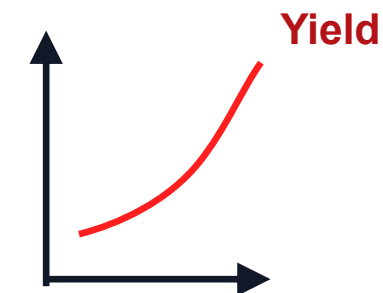
Information beyond labels



Example: an agent optimizing chemical reaction conditions



Experimental
Record



Rich Information Beyond Labels

Temperature, concentration, pH, reagent relations, experimental process, and safety constraints

Limited Explicit Supervision

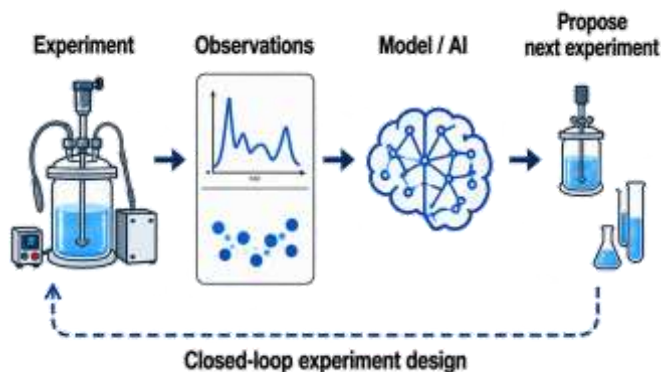
Final yield, success/failure outcomes, and a small number of historical experiments

The real challenge is not a lack of information, but that dispersed information has not been effectively organized, learned, and utilized.

Application Domain & How the Tutorial Unfolds

Applications: limited supervision is a shared bottleneck across domains

AI for Science



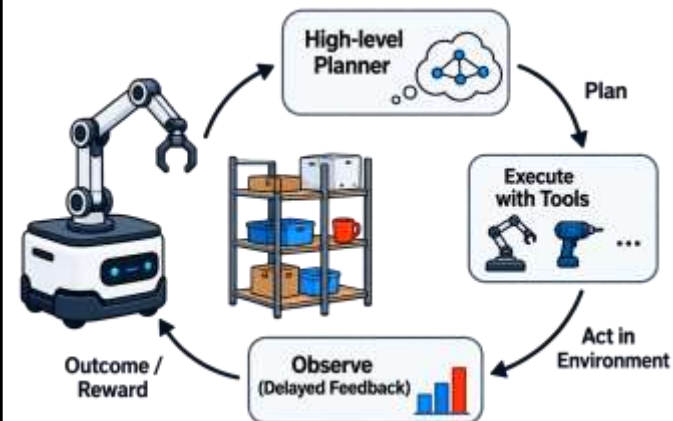
Expensive experiments; sparse outcomes; rich process information

GUI Agent



Annotation cost; UI drift across apps/devices; multi-step interaction

Agentic AI & Robotics



Delayed feedback; long-horizon interaction and tools; Costly interaction

Directions: From Priors, to Structure, to Interaction



01 Yaqing Wang

BIMSA

Principles

Learning with Limited Labels

Few-shot · Meta-learning · ICL



02 Zixing Song

University of Bristol

Structures

Graph Implicit Supervision

Experience · Decision · Learning graphs



03 Quanming Yao

Tsinghua University

Interaction

Adaptive Agents

Feedback · Coordination · Self-evolution

Tutorial Schedule

Half-day tutorial · 09:00–12:30

Time	Session	Presenter(s)
09:00–09:05	Opening & Framing	All (Lead: Quanming Yao)
09:05–09:55	Module A: Principles — Learning with Limited Labels	Yaqing Wang
09:55–10:45	Module B: Structures — Relational & Graph Implicit Supervision	Zixing Song
10:45–11:10	Break & Networking	—
11:10–11:55	Module C: Adaptive Agents under Limited/Delayed Feedback	Quanming Yao
11:55–12:30	Synthesis, Discussion & Q&A	All

IEEE Task Force on Data-Efficient Agentic Learning (TF-DEAL)

Mission

Build an international community for studying how agents learn under limited supervision, interaction, verification, and computation budgets.

Research Scope

- Experience Augmentation
- Agent Design
- Learning Paradigms
- Application Areas
- Cost-Aware Evaluation

2026 Community Activities

- 2026 IJCAI Tutorial
- ADMA Special Session
- AFAC Competition
- ICML Workshop

Connect with TF-DEAL



TF-DEAL Website

<https://cis.taskforce.ieee.org/deal/>



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DEAL community

Thanks!