

Interactive Multi-Label CNN Learning with Partial Labels

Dat Huynh and Ehsan Elhamifar

Khoury College of Computer Sciences
Northeastern University

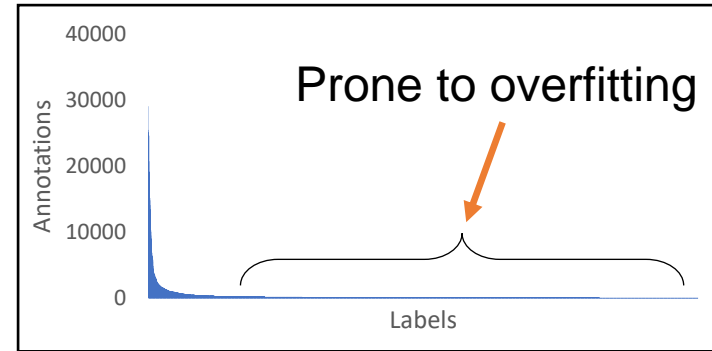


- **Multi-label Learning:**

- Recognize **all labels** in images \longrightarrow **Costly** to gather annotation for all labels
- Each image is often **partially labeled**



Annotated labels	Missing labels
Hiking	Jacket
Person	Clothing
Mountain	Recreation
	Adventure



- **Prior work on learning with partial labels:**

- Missing label as negatives \longrightarrow falsely label images
- Use model prediction to impute missing labels \longrightarrow error propagation

- **Contributions:**

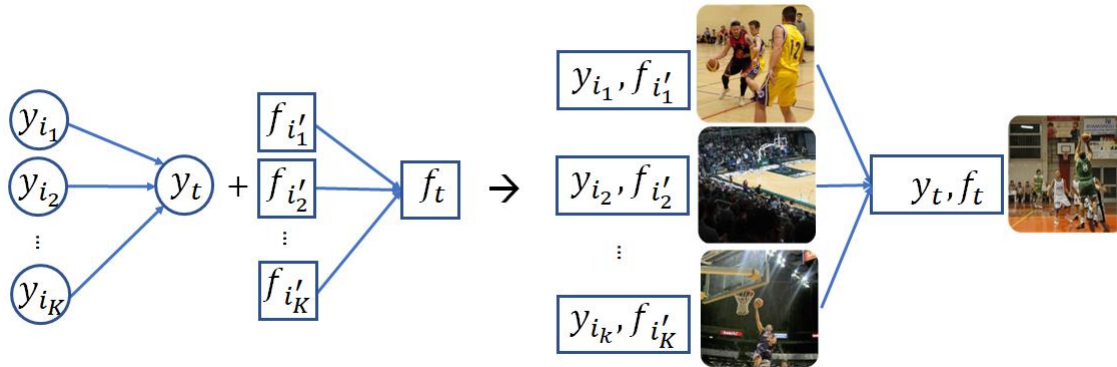
- **End-to-end CNN training** using **label and image dependencies**
- **Interactively learn** model parameters and dependencies



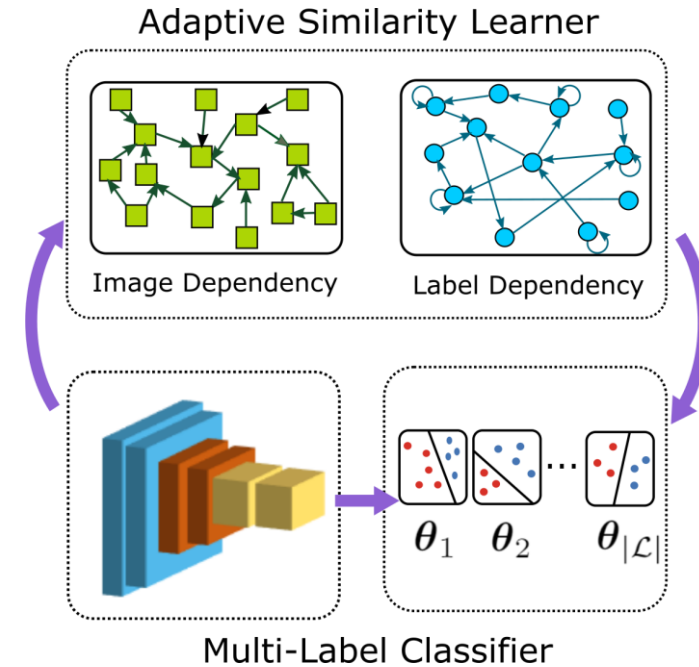
Proposed Architecture

- Interactive CNN Learning:**

- Label dependency:** determine image labels from **co-occurring labels**
- Image dependency:** similar images must have similar **visual features**
- Prediction smoothness:** via Label + Image dependencies

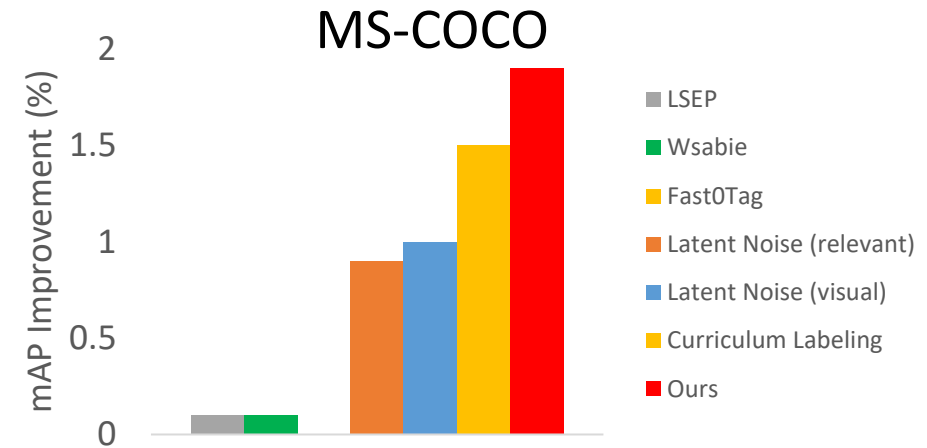
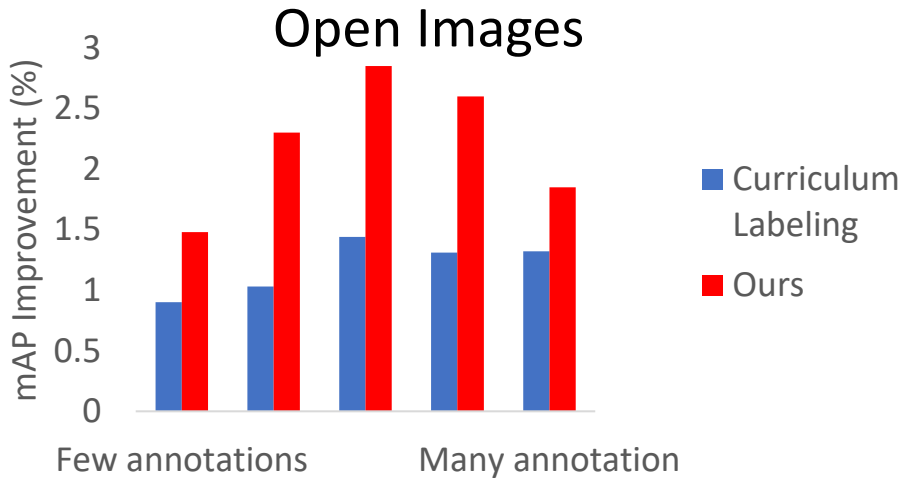


- Alternate** between **CNN learning** and **dependency estimation**



Experiments

- Performance improves for both **small and large # annotations**



- **Qualitative Results:** can capture most labels in images

