PedAnalyze - Pedestrian Behavior Annotator and Ontology

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Introduction & Motivation

- Behavior diversity

- Existing datasets lack consistent annotations (Text-based explanations vary too much across annotators)

- Per-frame annotations cause redundancy & obscure temporal
- relationships

- Existing datasets don't contain rare, edge-case scenarios seen in social media dash-cam videos

- Pedestrian behavior-driven research (e.g., behavior prediction)

https://github.com/adhocmaster/ped-behavior-annotator

Main Contributions

Multi-frame Annotations: captures behaviors spanning a sequence of frames.

Structured Datasets:

- Tags prevent wording differences between human annotators

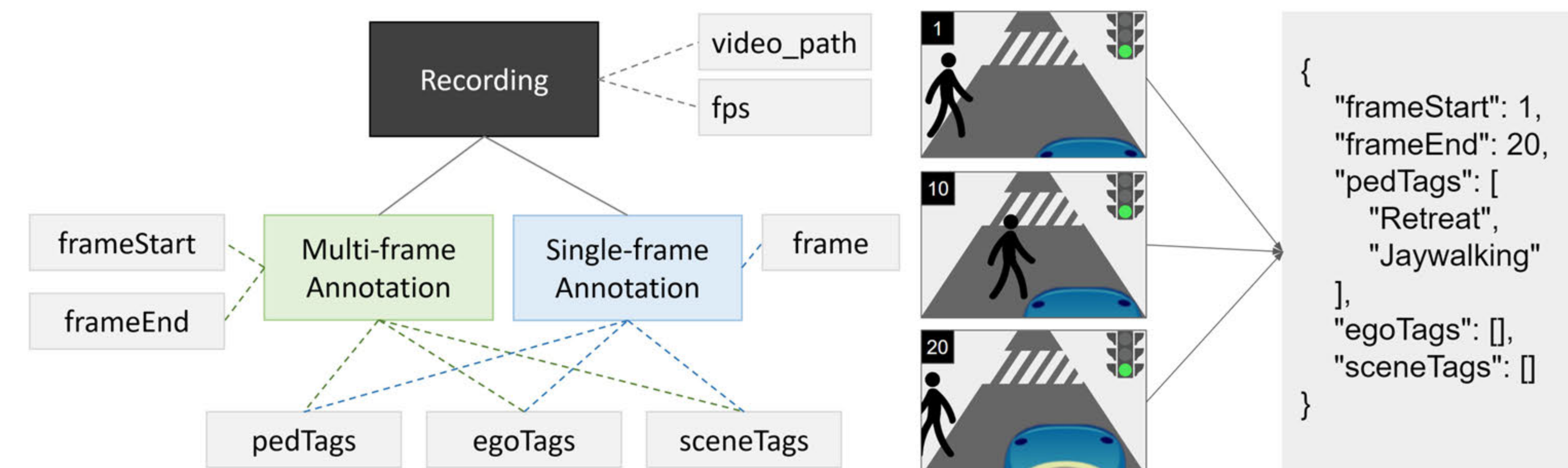- Controlled vocabulary with explicit definitions enables tag querying

Set of Pedestrian/Vehicle Behavior Tags: Standardizes a collection of possible behaviors that can be exhibited

**Annotation Tool** for Social Media Dash-cam Videos

Methodology & Results

Annotation Data Model

- Pedestrian Behaviors
- Vehicle Behaviors
- Environment Conditions
- Pedestrian Demographics
- Additional Information


```
{
  "frameStart": 1,
  "frameEnd": 20,
  "pedTags": [
    "Retreat",
    "Jaywalking"
  ],
  "egoTags": [],
  "sceneTags": []
}
```

Purpose

- Pedestrian and vehicle behavior tags emphasize interactions and maneuvers.

- Environment condition and pedestrian demographic tags expose context.

- Together, these tag categorizations jointly produce the desired description language.
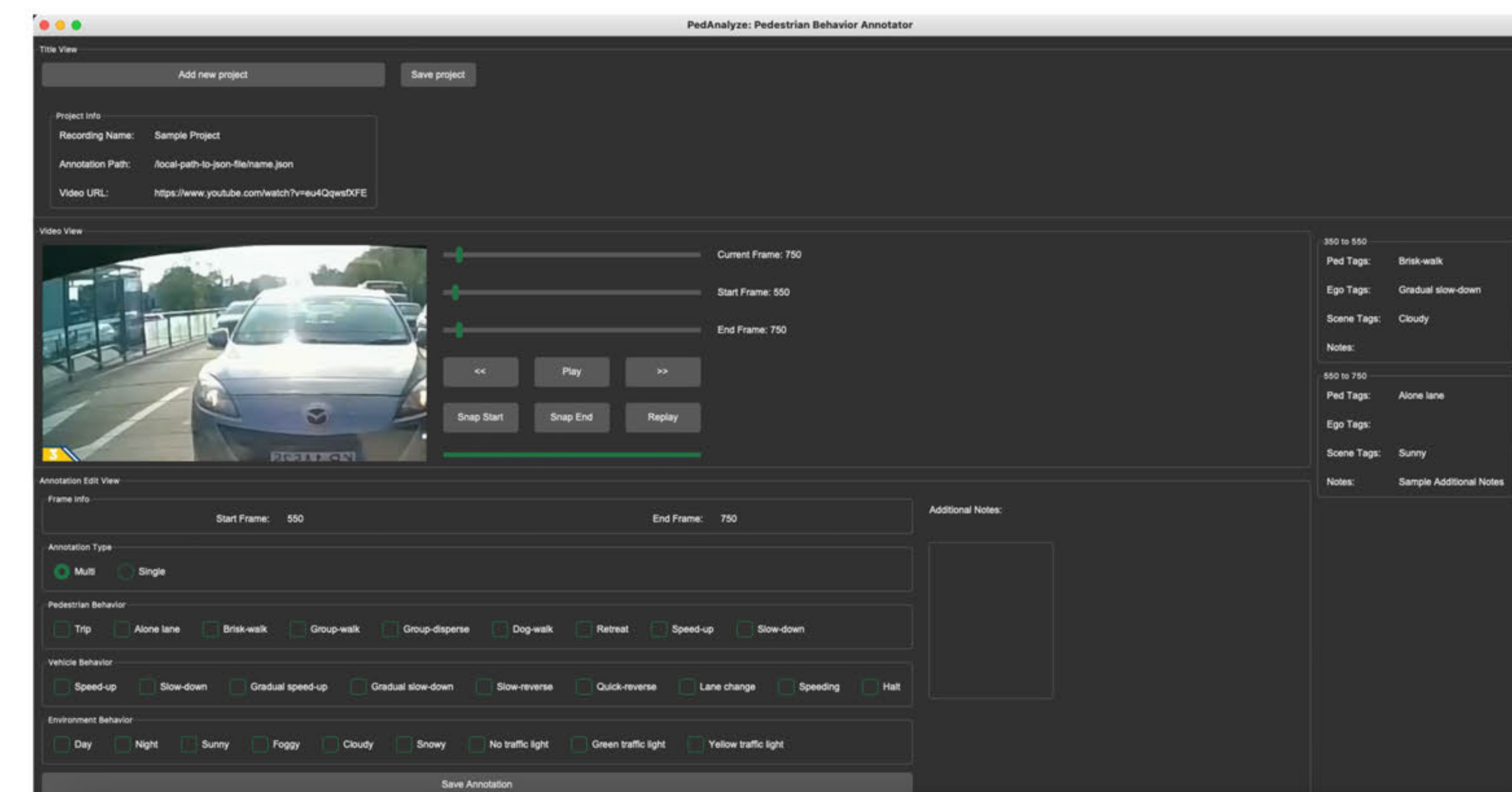
Tag Subsets

We characterized behaviors and conditions into subsets to make the tag searching process more intuitive and fast.

Subsets	Pedestrian Behavior Tags	Subsets	Vehicle Behavior Tags
Generic	Trip, Along lane, Brisk-walk, Group-walk, Group-disperse, Dog-walk, Retreat, Speed-up, Slow-down, Wander, Pause-start, Jaywalking, Cross-on-red	Generic	Aggressive acceleration, Aggressive brake, Gradual acceleration, Gradual brake, Slow-reverse, Quick-reverse, Lane change Speeding, Halt
Instant Reaction	Swerve, Break, Flinch out, Flinch in, Frozen	Collision	Induced collision, Run-stop, Swerve
Collision	Collision, Near-miss, Run into traffic, Thrown back	Interaction	Make go (allowing the pedestrian to go)
Interaction	Make stop, Make go, Aggression, Assault, Observing	Irregular	Sidewalk (drives onto sidewalk)
Mental State	Looking, Glancing, Not looking/glancing Distracted, Agitated, Cautious, Indecisive	Subsets	Environment Condition Tags
Intention	Cross, Not-cross, Not-sure-cross	Time & weather	day, night, sunny, foggy, cloudy, snowy
Subsets	Demographic Tags	Traffic lights	none, green, yellow, blinking yellow, red
Age	child, adult, elderly	Road signs	stop sign
Gender	man, woman	Location	crosswalk, no crosswalk
Culture	Swedish, Chinese, Indian, German, etc.	Traffic	light, moderate, heavy, one-way, two-way
		Visibility	occluded pedestrian, glare on windshield

Future Work and Conclusions

Improving Annotation Accuracy + Consistency

- Establishing a comprehensive set of ontology with more behavior coverage

- Option for users to configure and add their own tags as appropriate

Dataset Development

- Release initial datasets with dash-cam videos from YouTube and Instagram

- More advanced dataset: recent work has shown the benefit of a defined ego-vehicle relative coordinate system; supporting this in PedAnalyze removes the need for absolute positioning. When combined with behavior tags, this will allow for the

Collaboration + Integration

- Capability for team members to collaborate and merge annotations — beneficial for locating and resolving inter-rater disagreements

- Integration with Instagram, Facebook, and other platforms

UI Rearrangement (ongoing)