

Luca von Mayer - 2427051

INTRO

- **Human demonstration** enables AI to replicate complex decisions.
- Models predict actions from **visual cues**; we add **reaction times** to improve predictions.
- Longer decisions **serve as a proxy for challenging states**, enhancing model focus.

METHODS

1. **Atari-HEAD dataset:** gaze points & reaction times.
2. **Temporal Gaze Network:**
 - Predicts human **gaze & state difficulty**,
 - **Inputs:** frames, motion & low-level visual saliency.
 - **Outputs:** gaze heatmaps, difficulty (easy/hard).
 - Handles rare hard states (0.1%) via **SMOTE** (synthetic hard samples) & **Focal Loss**,
3. **TAGIL (Action Prediction Network):**
 - Processes raw & gaze-masked frames + **difficulty input**.
 - **Difficulty-weighted loss** for challenging states.

RESULTS

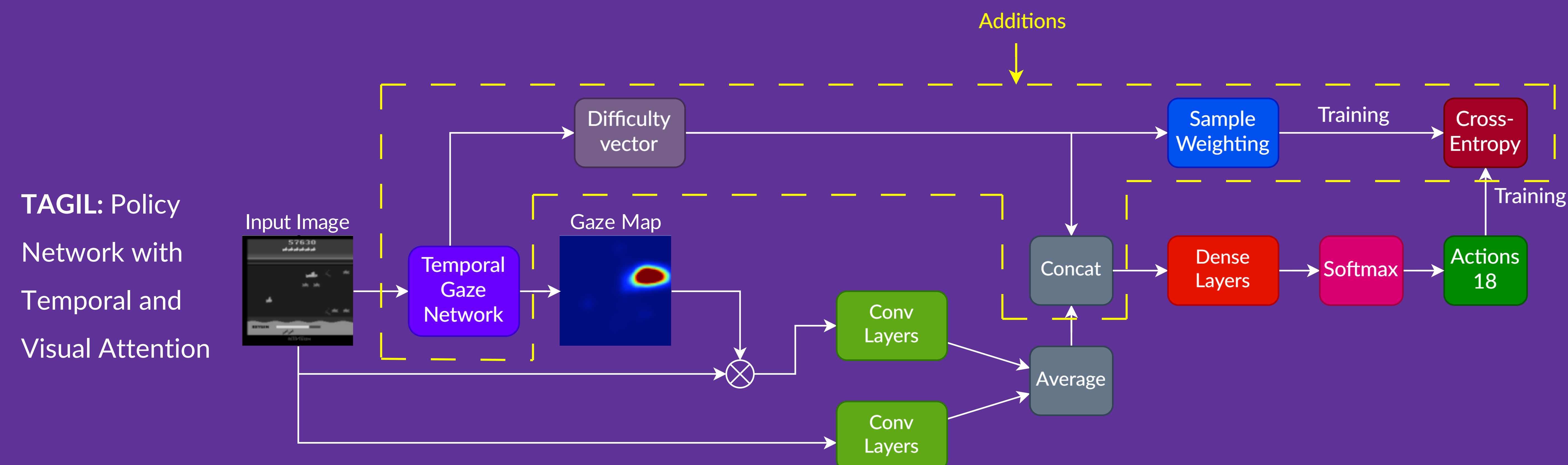
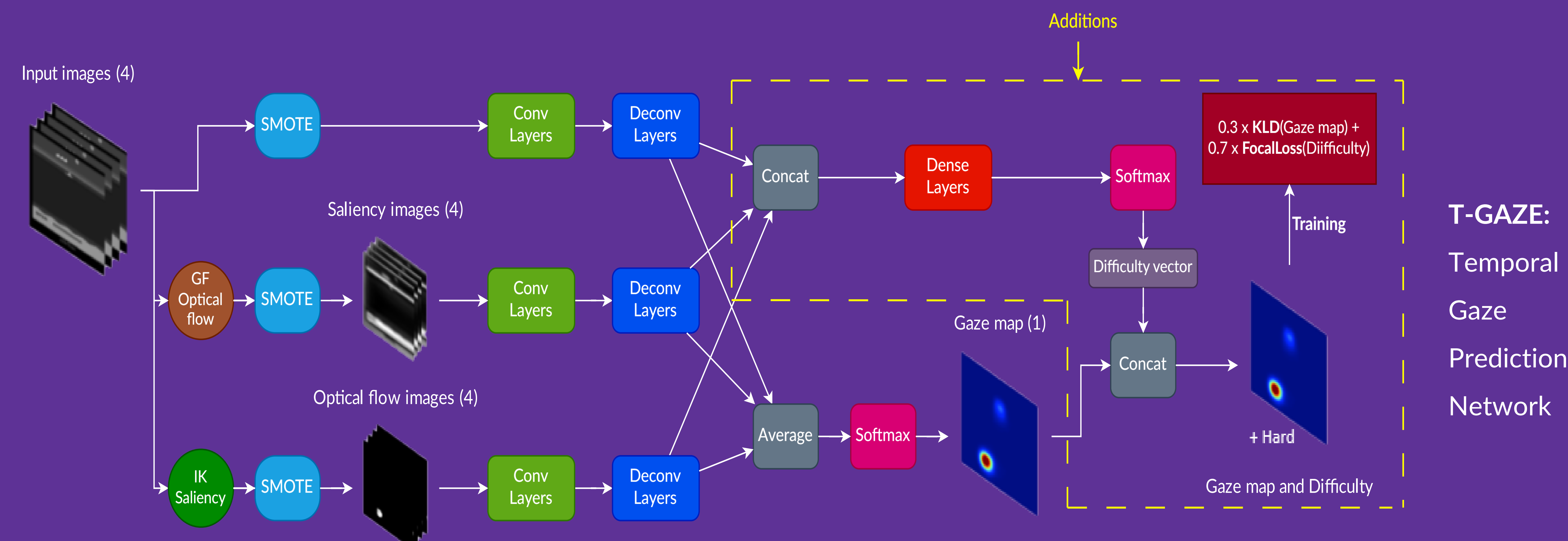
Game	AGIL	TAGIL
Ms. Pacman*	69.24 \pm 0.5	77.46 \pm 0.1
Breakout	83.79 \pm 0.3	84.45 \pm 0.3
Freeway	93.28 \pm 0.3	92.85 \pm 0.5
Bank Heist*	58.13 \pm 0.4	63.52 \pm 0.3
Montezuma's Revenge	88.96 \pm 0.2	87.90 \pm 0.5
Berzerk*	54.48 \pm 0.8	64.83 \pm 0.3

Percentage validation accuracy (mean \pm std dev) of AGIL vs TAGIL across 6 Atari games. The * indicates significant (t-test).

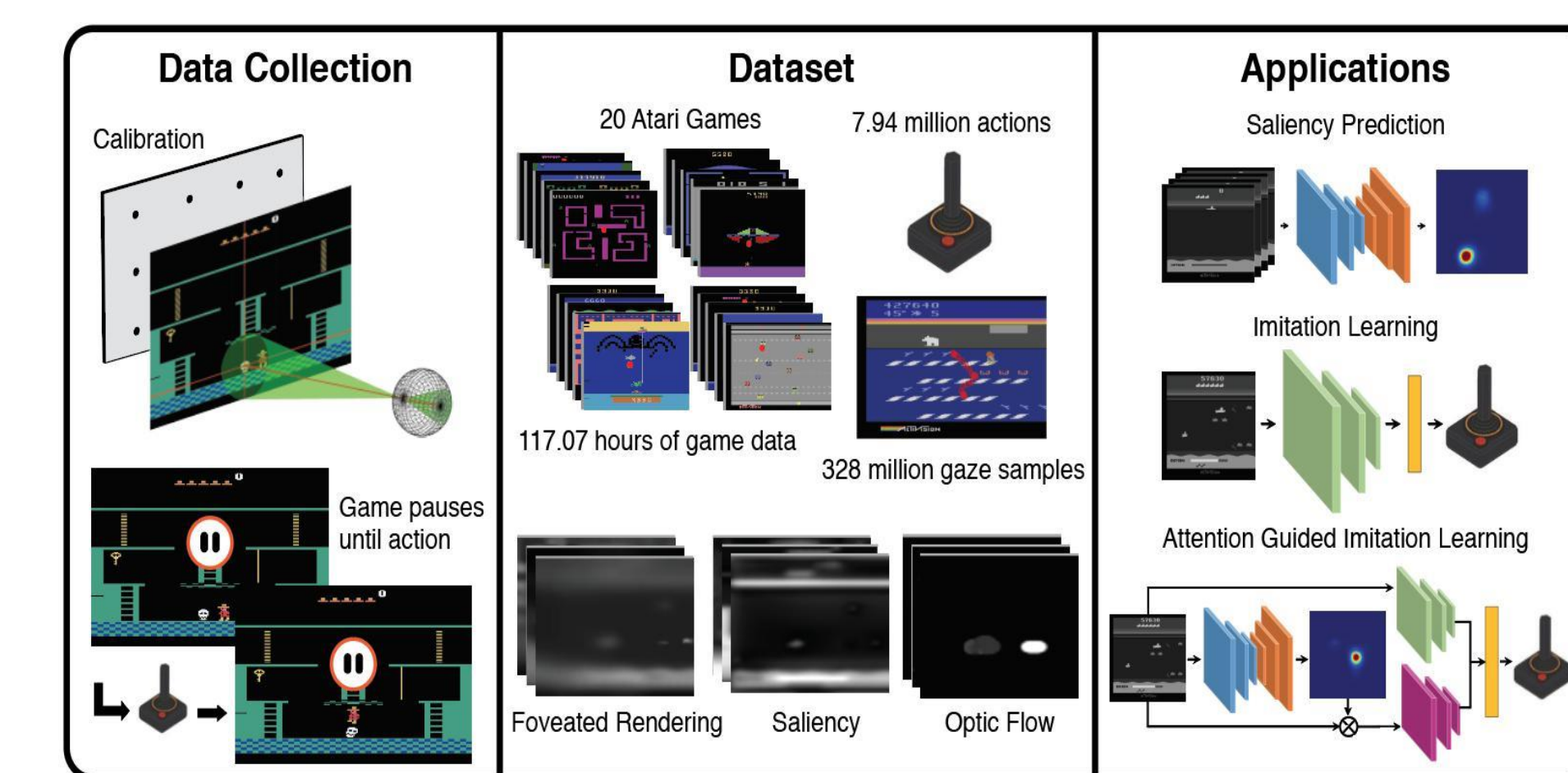
DISCUSSION

- **T-GAZE** matches baseline gaze prediction (minor trade-off from synthetic data).
- **TAGIL** achieves up to **10% improvement** in games with **maze-like environments** and multiple threats, maintains performance in simple pattern-based games.

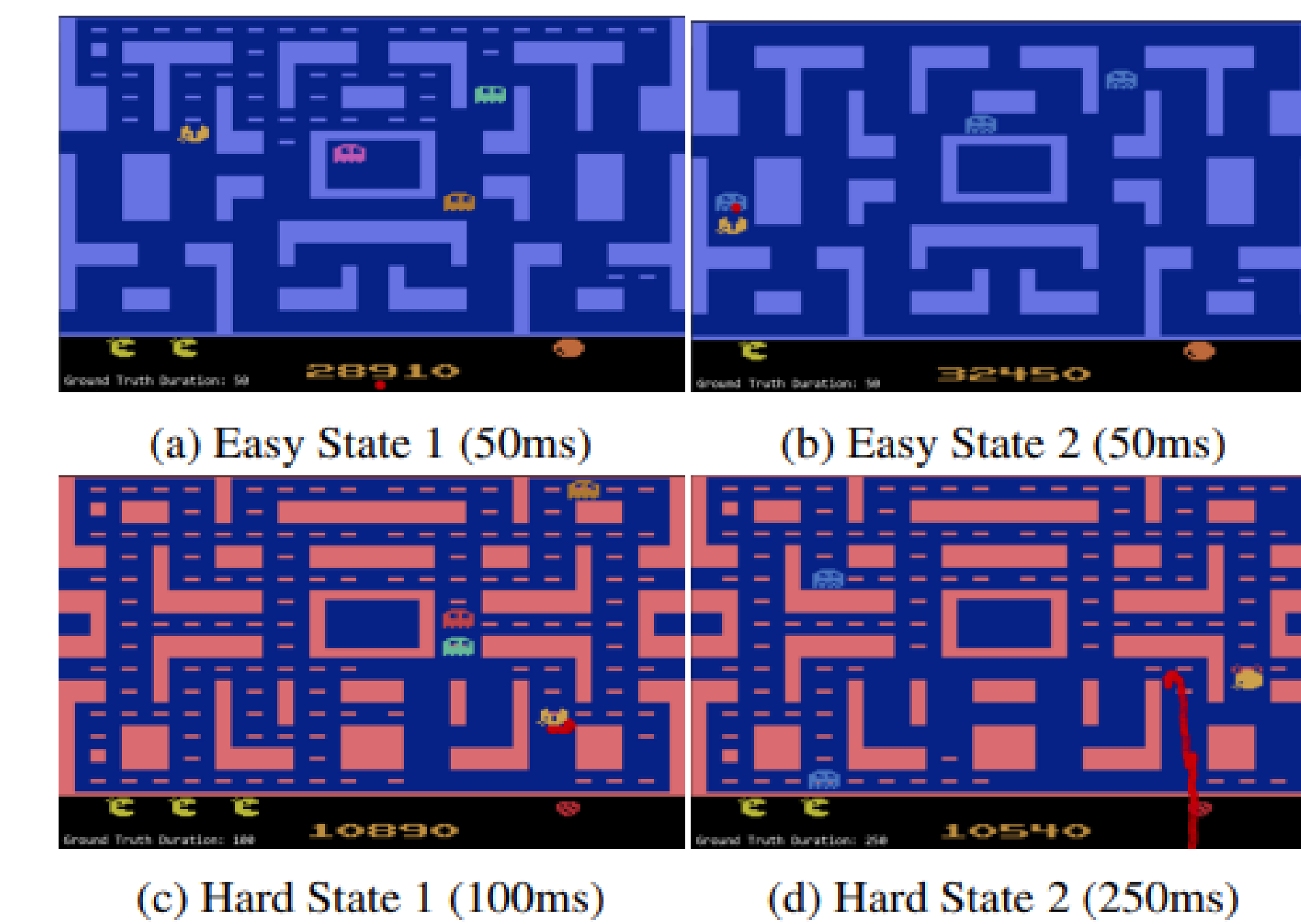
Knowing how long humans take to make decisions improves behaviour cloning.



Take a picture to access the full paper, poster and code



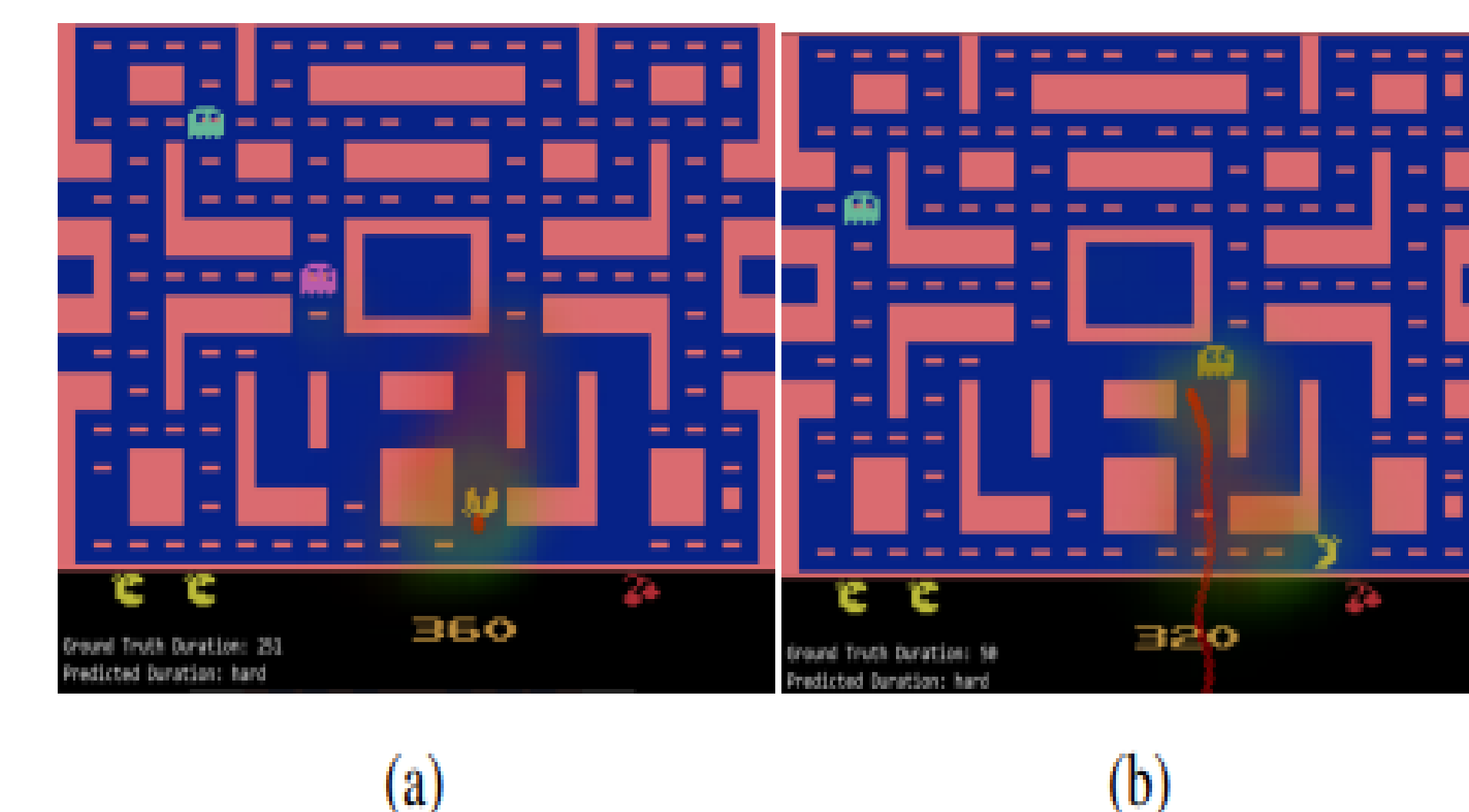
Overview of the Atari-HEAD dataset: data collection process, key data fields (e.g., image frames, actions, gaze points, reaction times), and research applications.



Examples of Ms. Pac-Man states classified as easy and hard. Red dots indicate ground truth gaze predictions. Reaction times (ms), a proxy for difficulty, align with the intuitive difficulty of these states.

Game	GAZE	T-GAZE
Ms. Pacman	0.2494 \pm 0.003	0.2483 \pm 0.003
Breakout	0.3220 \pm 0.014	0.3337 \pm 0.002
Freeway	0.3939 \pm 0.004	0.3833 \pm 0.002
Bank Heist	0.3376 \pm 0.005	0.3354 \pm 0.007
Montezuma's Revenge	0.4012 \pm 0.006	0.3807 \pm 0.003
Berzerk	0.2845 \pm 0.007	0.2717 \pm 0.001

Validation IOU (mean \pm standard deviation) between Gaze and T-Gaze models across 6 Atari games.



Comparison between Gaze maps: showing baseline and T-Gaze heatmaps in green and red, respectively, with ground-truth gaze points as red dots, while the lowerleft displays the difficulty predictions.

