SmartAnnotator Help

- How the behaviors are classified
- How does the model identify a behavior?

How the behaviors are classified

Behavior annotation in SmartAnnotator consists of the following steps:

1. The top view videos are preliminary annotated with the Rat Behavior Recognition Module or Mouse Behavior Recognition Module of Ethovision XT version ***
   See the section *Behavior Recognition Requirements* in the EthoVision XT Help for the best practices for camera setup, arena setup and detection settings.
2. SmartAnnotator makes fragments, each with a separate event, based on the automatic behavior classification in EthoVision XT.
3. Video fragments are shown to the user, for manual annotation.
4. The AI model is updated with these manual annotations.
5. Steps 3 and 4 are repeated until the classifier reaches an accuracy threshold.
6. The resulting classifier is applied to all events that are not yet annotated, giving these an automatic annotation if the model is certain enough.
7. Events that are most informative for the classifier, are shown to the user, for manual annotation.
8. Steps 3-7 are repeated, until all events are annotated.

How does the model identify a behavior?

Preliminary analysis by EthoVision XT

The preliminary analysis of the mouse or rat behavior by EthoVision XT makes use of the following information:

- Location
- Body shape
- Movement
- Environment proximity information based on the location of the animal
- Multi-scale temporal window features. See, for example,

  https://en.wikipedia.org/wiki/Multiscale_modeling and https://medium.com/@data-overload/sliding-window-technique-reduce-the-complexity-of-your-algorithm-5badb2cf432f

  for explanations of those concepts.

More information on the Mouse behavior recognition and Rat behavior recognition modules in EthoVision XT is found in the following paper:

https://www.frontiersin.org/journals/neuroscience/articles/10.3389/fnins.2023.1198209/full

SmartAnnotator

More information on the AI model in Smart Annotator is found in the paper *Fast Annotation of Rodent Behaviors with AI Assistance: Human Observer and SmartAnnotator Collaborate through Active Learning*, page 230-235.

https://www.measuringbehavior.org/wp-content/uploads/2024/06/Measuring-Behavior-2024-Final-web.pdf