iBehave:
Towards the Sequencing of Behaviour

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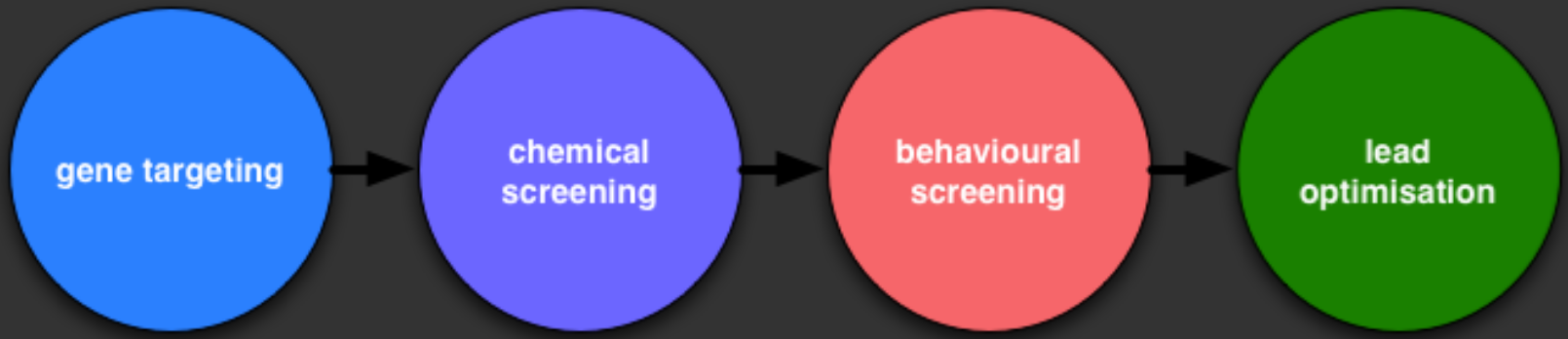
Structure

- Motivation
- Automatic Annotation
- Sequencing Behaviour

iBehave: Motivation



solving the bottlenecks: $300 000 000

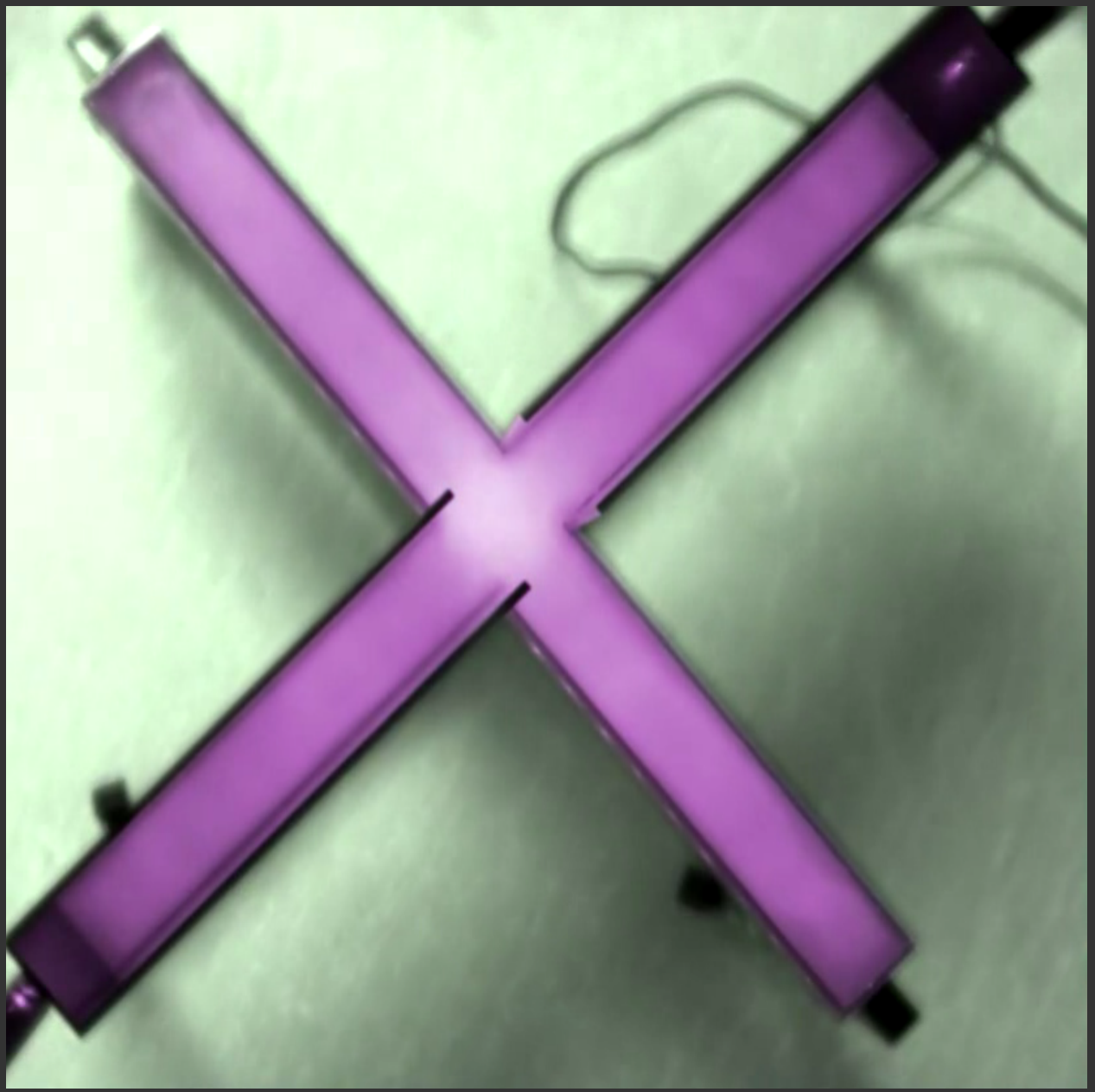


Figure: The elevated plus maze - a typical behavioural assay

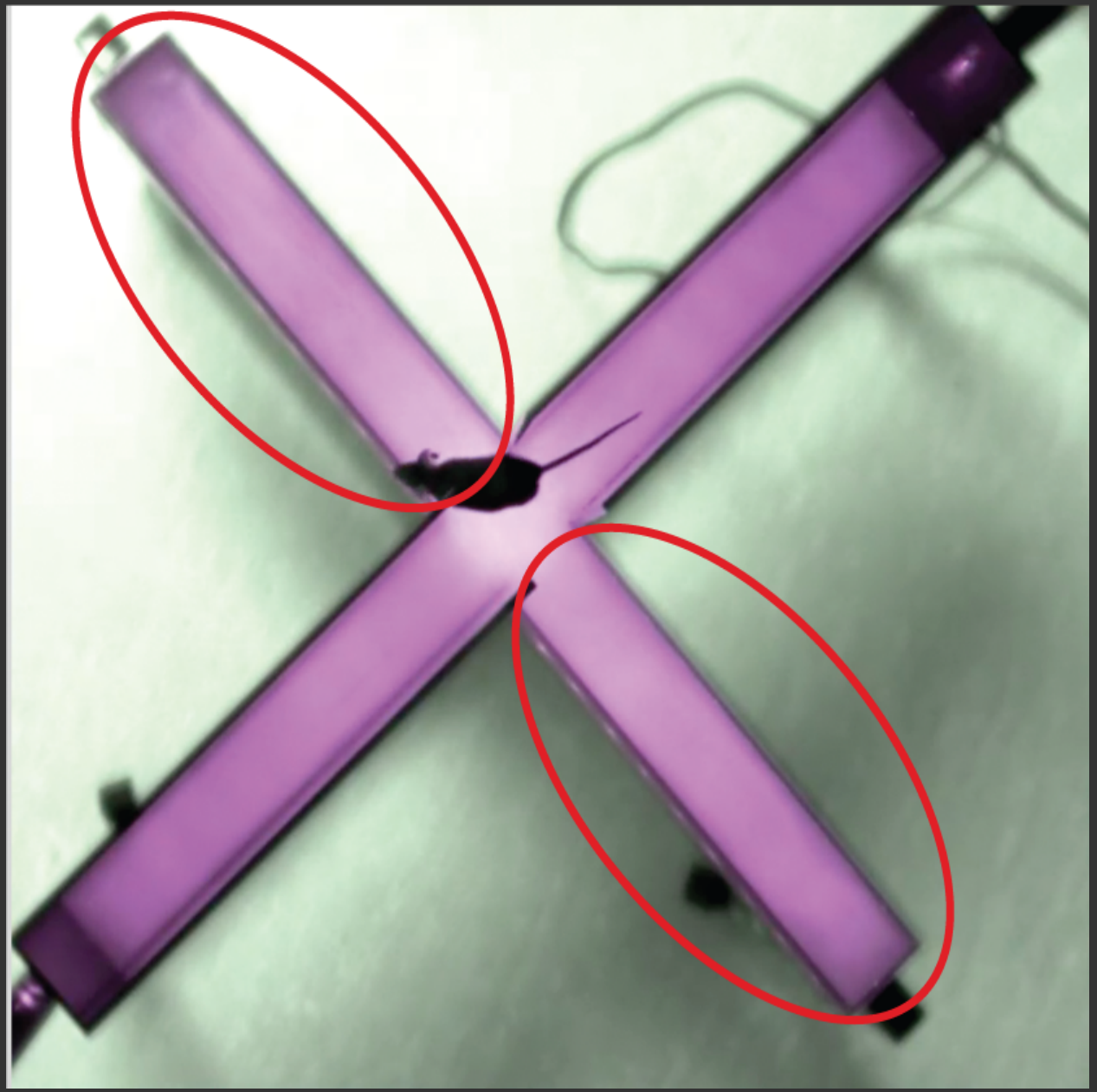


Figure: The captured dynamics are typically ignored in favour of crude aggregated behavioural indices

Zebra Fish

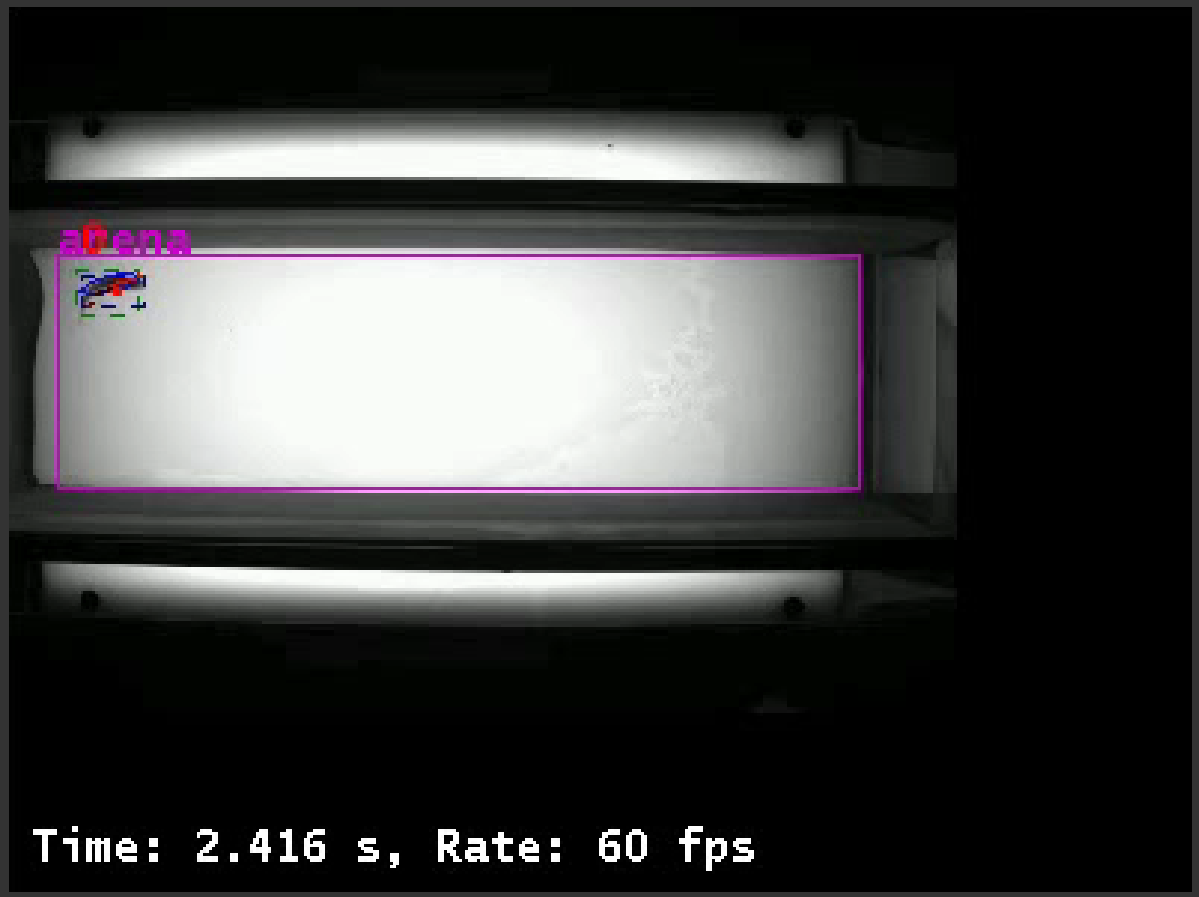


Figure: Zebra fish used in aggression assays

Chickens

Figure: Chickens studied in a welfare monitoring context

Low Hanging Fruit: Automatic Annotation

Automatic Annotation: Aims

- To automatically infer aggregated behavioural indices.
- To mimic expert annotation - to allow individual labs to define behaviour.
- To work at (faster than) real time.
- To be consistent within and across labs.

Fruit Flies

Figure: Fruit flies in a courtship assay

Rats

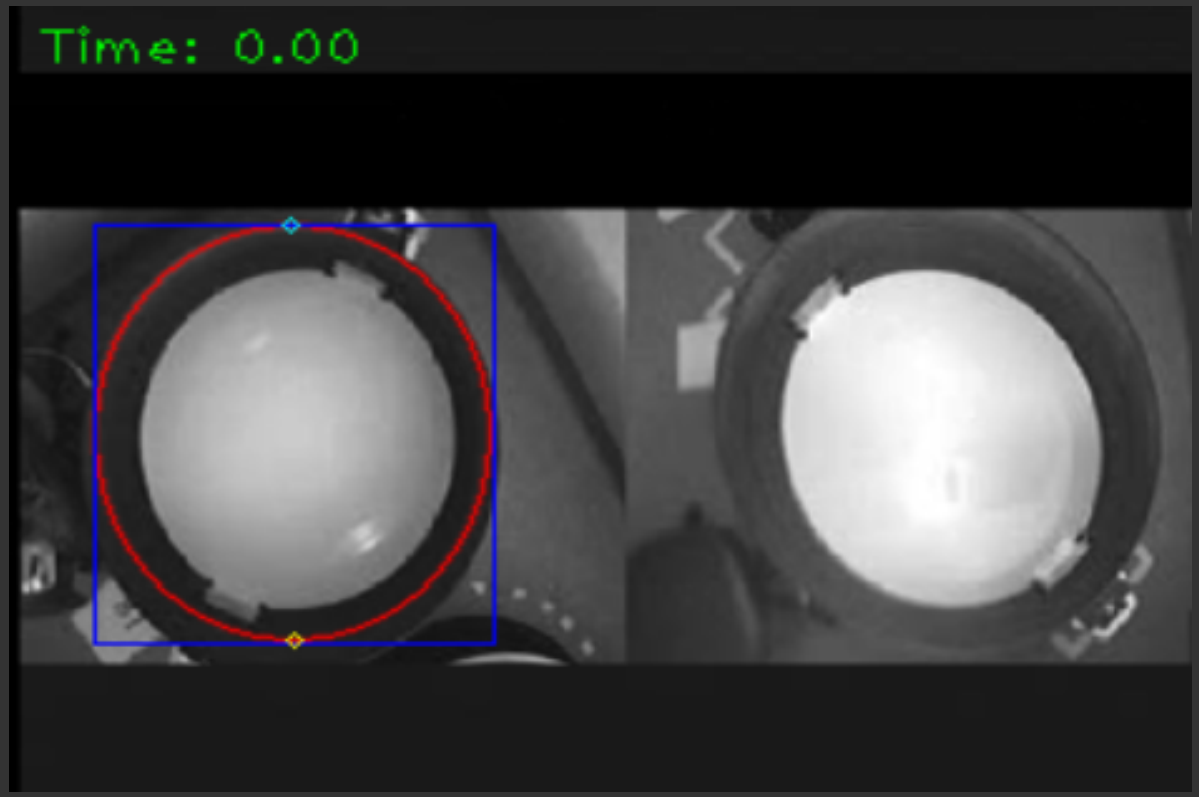


Figure: Rats in a libido study

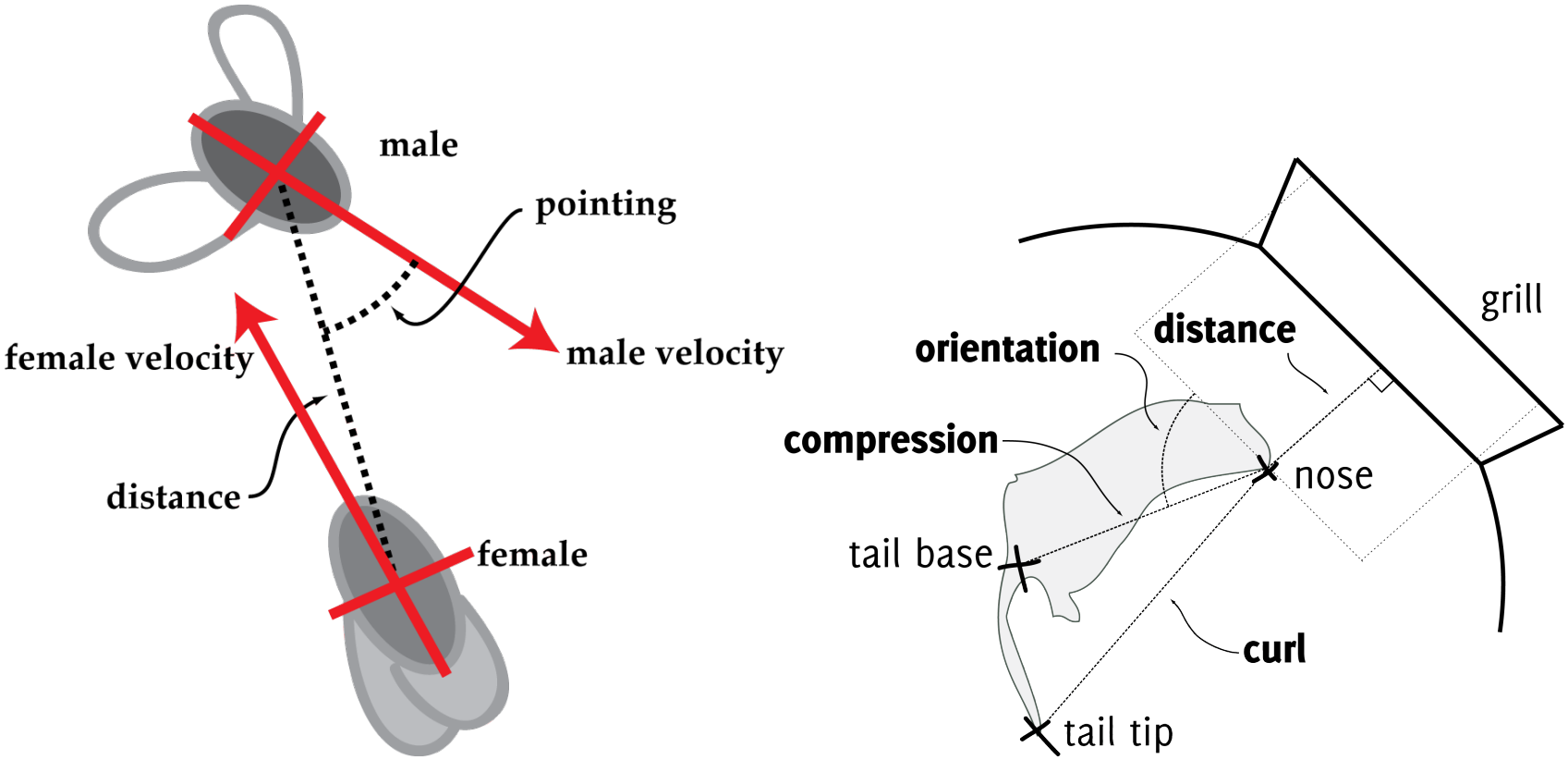


Figure: Fly and rodent features used in the static machine learning

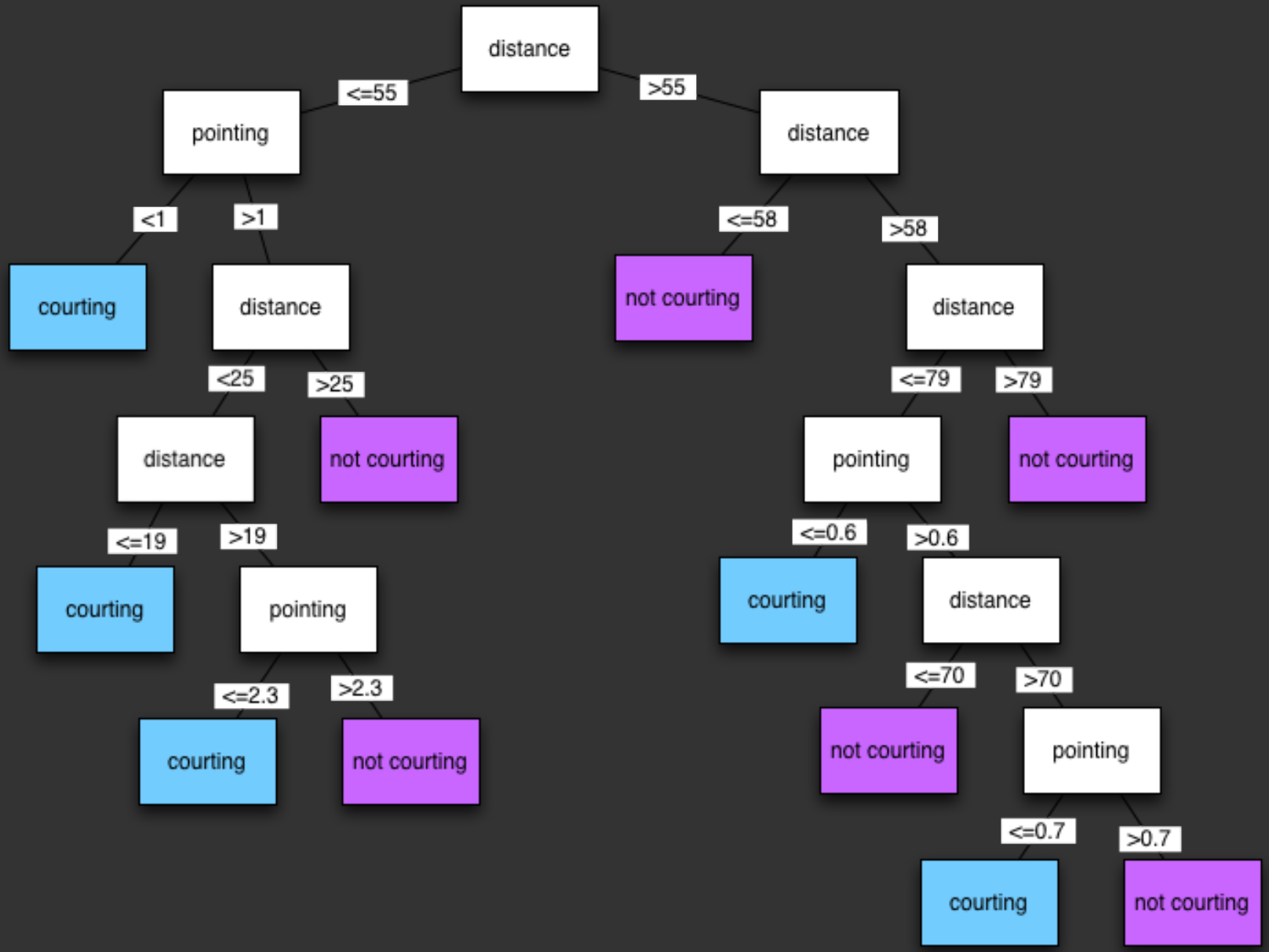


Figure: Extracted decision tree for the flies

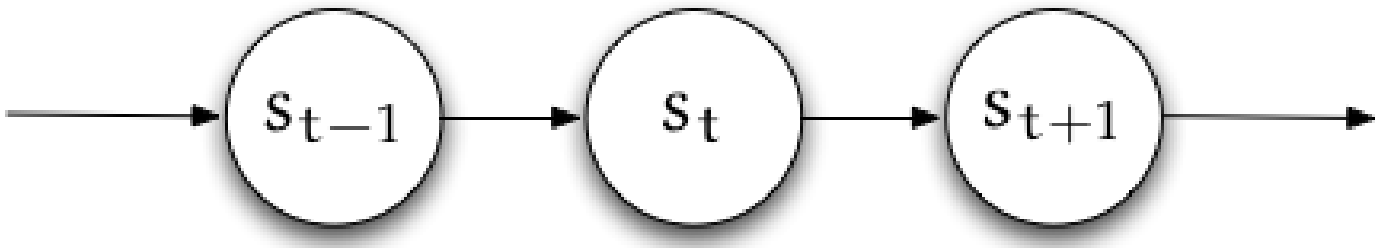
Figure: Results of the classification exercise in flies

Figure: Results of the classification exercise in rats

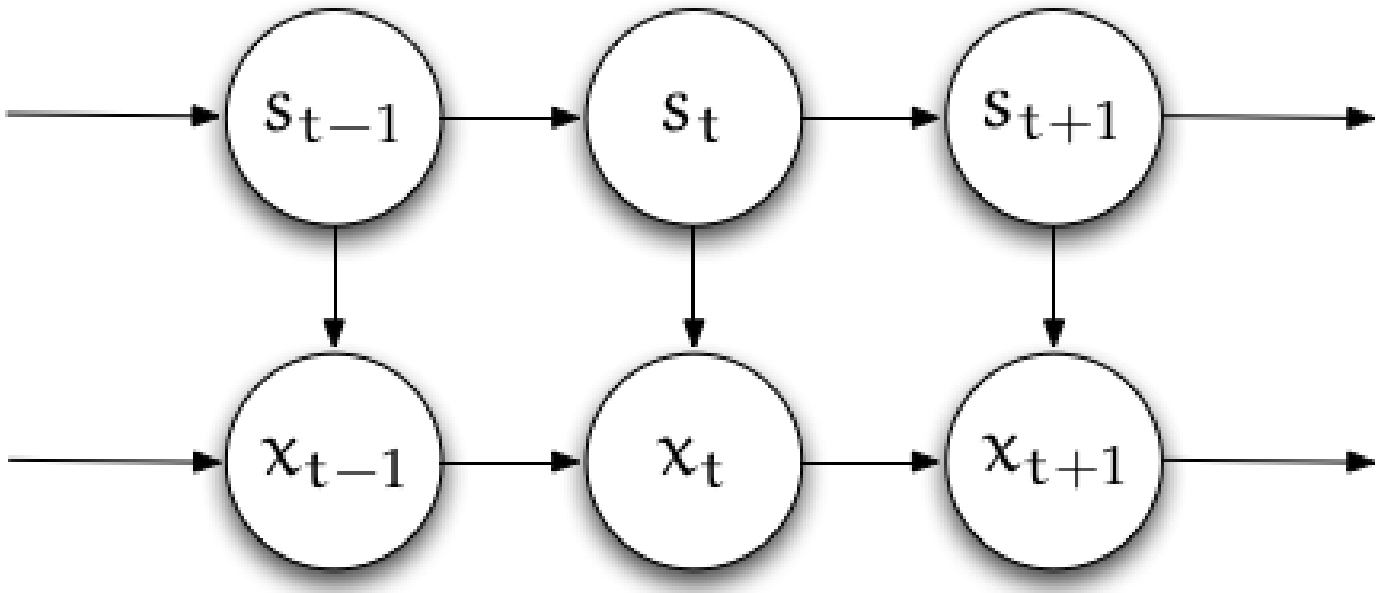
Future Work: Sequencing Behaviour

Sequencing Behaviour: Aims

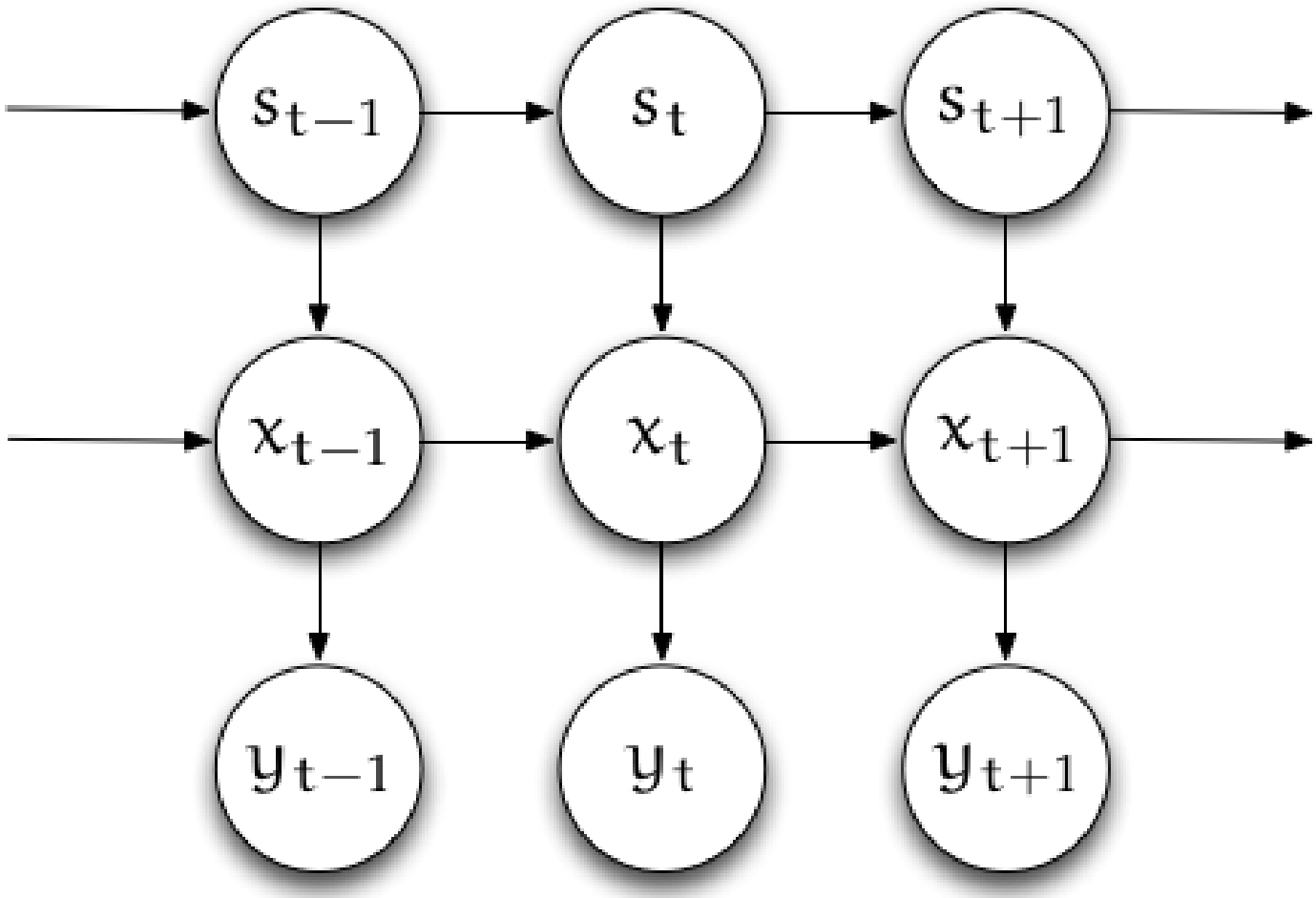
- Extract sequences of behaviour in an unsupervised way
- Allow individual labs assign meaning
- Automatically generate ethograms/Markov Chains



s_t: behavioural state



x_t: dynamic model state



y_t: observed feature vector

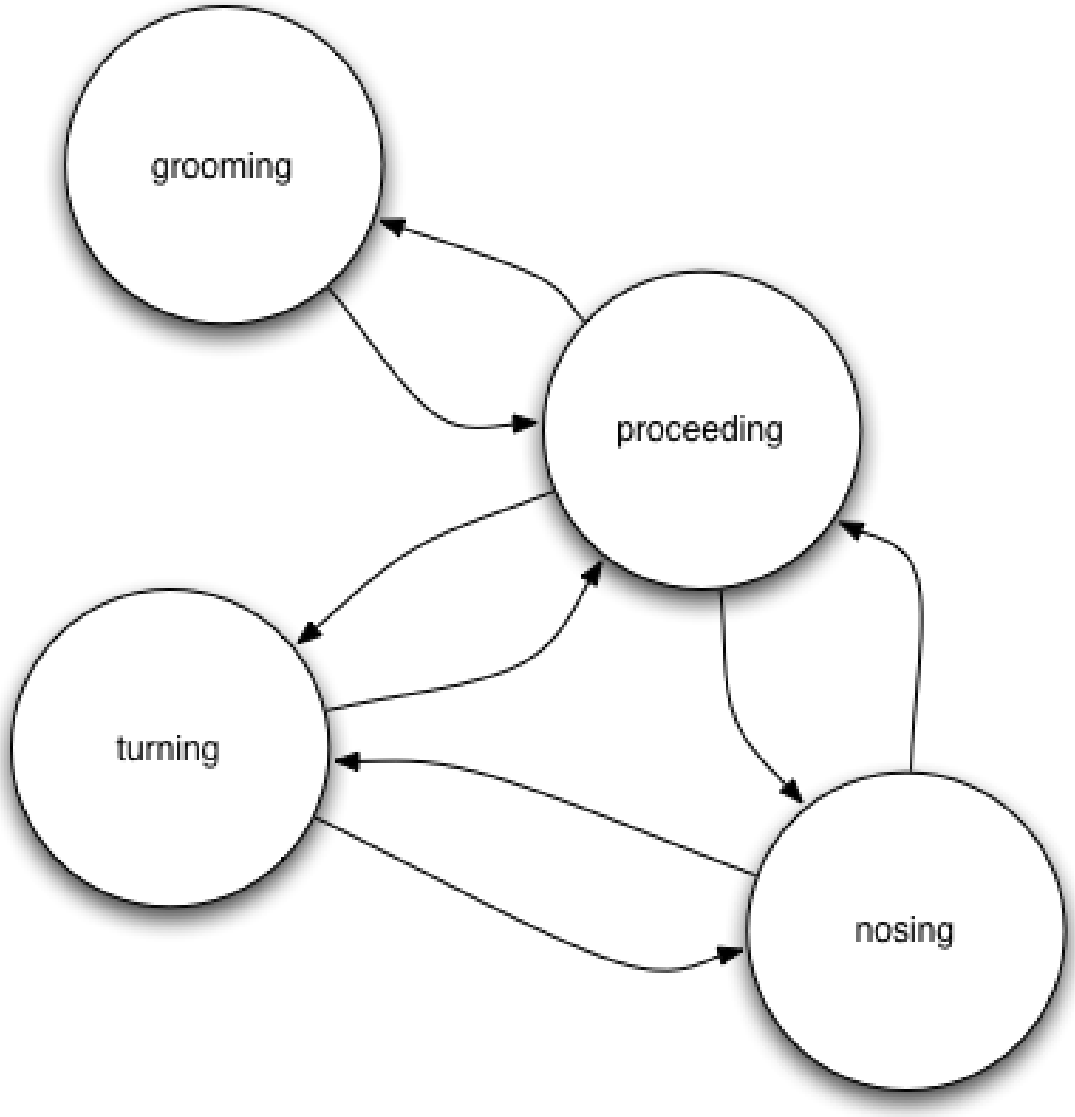


Figure: An extracted model of normal behaviour

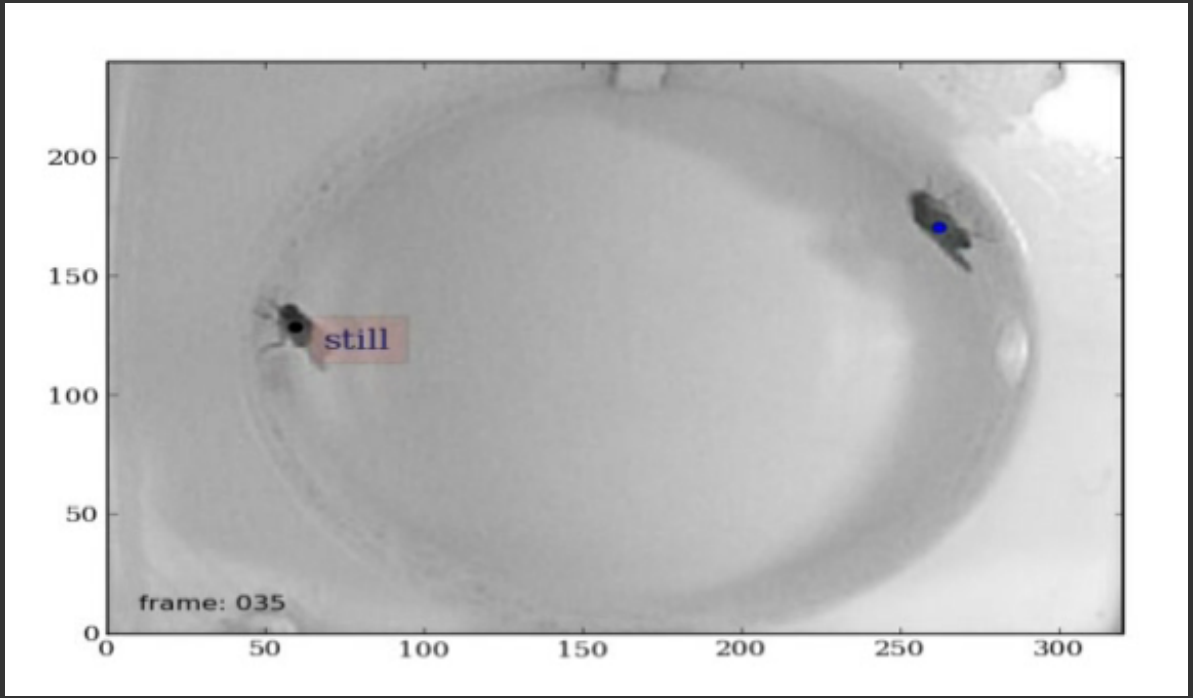


Figure: Results of the sequencing behaviour experiment

Summary

- Drug discovery's bottle neck: behavioural phenotyping.
- Supervised learning: quick and profitable.
- Unsupervised modelling: promising yet challening.

Acknowledgments

- iBehave is Douglas Armstrong, James Heward, Tim Lukins and Mike Dewar
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