

Can Computers Understand what is Happening?

Open Issues & Further Research

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- ▶ Formal models of CER
 - ▶ Other approaches on formal complex event recognition*.
 - ▶ Comparison in terms of expressive power, complexity and performance[†].

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- ▶ Formal models of CER
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- ▶ Probabilistic CER

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[‡] Skarlatidis et al, Probabilistic Event Calculus for Event Recognition. ACM TOCL, 2015.

[§] Alevizos et al, Probabilistic Complex Event Recognition: A Survey. ACM Computing Surveys, 2017.

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- ▶ Complex Event Forecasting
 - ▶ Symbolic *Register Automata*:
 - ▶ Symbolic automata with 'memory'.
 - ▶ Express n -ary relations between events.

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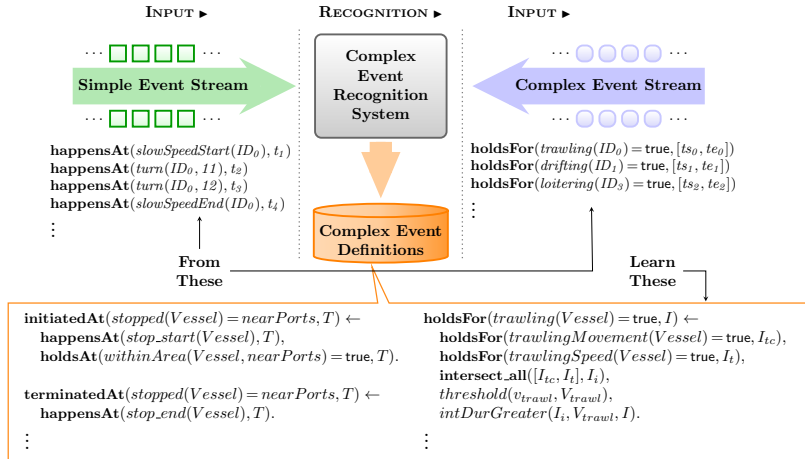
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Topics not covered

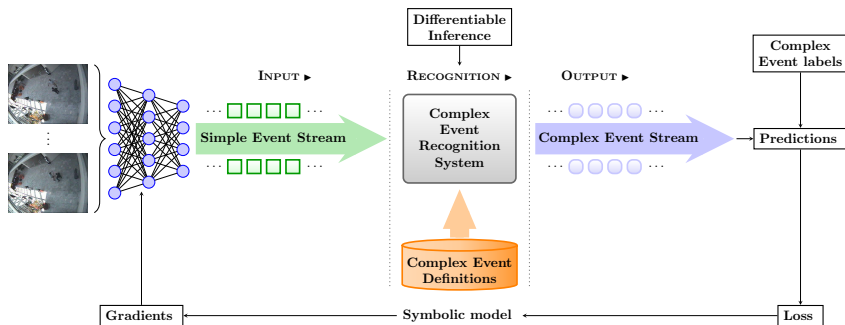
Machine Learning for Complex Event Recognition^{*,†}



^{*} Katzouris et al, Online Learning Probabilistic Event Calculus Theories in Answer Set Programming. Theory and Practice of Logic Programming, 2023.

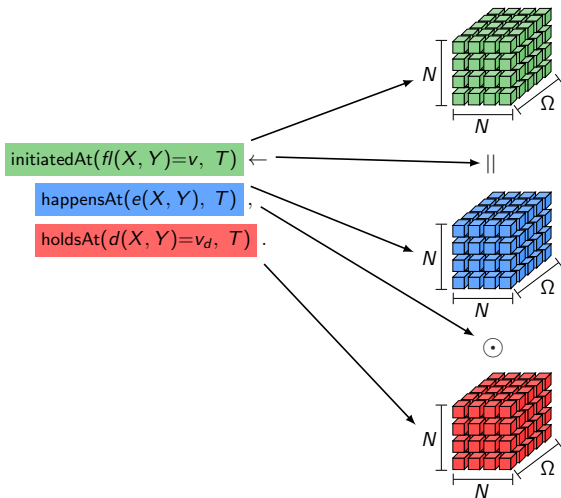
[†] Michelioudakis et al, Online semi-supervised learning of composite event rules by combining structure and mass-based predicate similarity. Machine Learning, 2024.

Neuro-Symbolic Complex Event Recognition*



* Marra et al, From statistical relational to neurosymbolic artificial intelligence: A survey. Artificial Intelligence, 2024.

Tensor-Based Complex Event Recognition*



*Tsilionis et al, A Tensor-Based Formalization of the Event Calculus. IJCAI, 2024.

Tutorial Resources

Resources: <http://cer.iit.demokritos.gr>

- ▶ Slides: <http://cer.iit.demokritos.gr/talks>
- ▶ Code: <http://cer.iit.demokritos.gr/software>
- ▶ Data: <http://cer.iit.demokritos.gr/datasets>
- ▶ Opportunities for (funded) collaboration: [job openings](#) and [topics for BSc/MSc theses and internships](#)