Maritime Situational Awareness in the era of Large Language/Reasoning Models

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Topics not covered

- Formal models of CER
  - Other approaches on formal complex event recognition[*,†].

[*] Bucchi et al, CORE: a COmplex event Recognition Engine. VLDB, 2022. https://github.com/CORE-cer/CORE

[†] Alevizos et al, Complex Event Recognition with Symbolic Register Transducers. VLDB, 2024. https://github.com/ElAlev/Wayeb

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  - Comparison in terms of expressive power, complexity and performance[‡].

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- Formal models of CER
  - Other approaches on formal complex event recognition[*,†].
  - Comparison in terms of expressive power, complexity and performance[‡].
- Probabilistic CER[§]
  - Noisy input streams[¶].
  - Uncertainty in the complex event definitions[‖].

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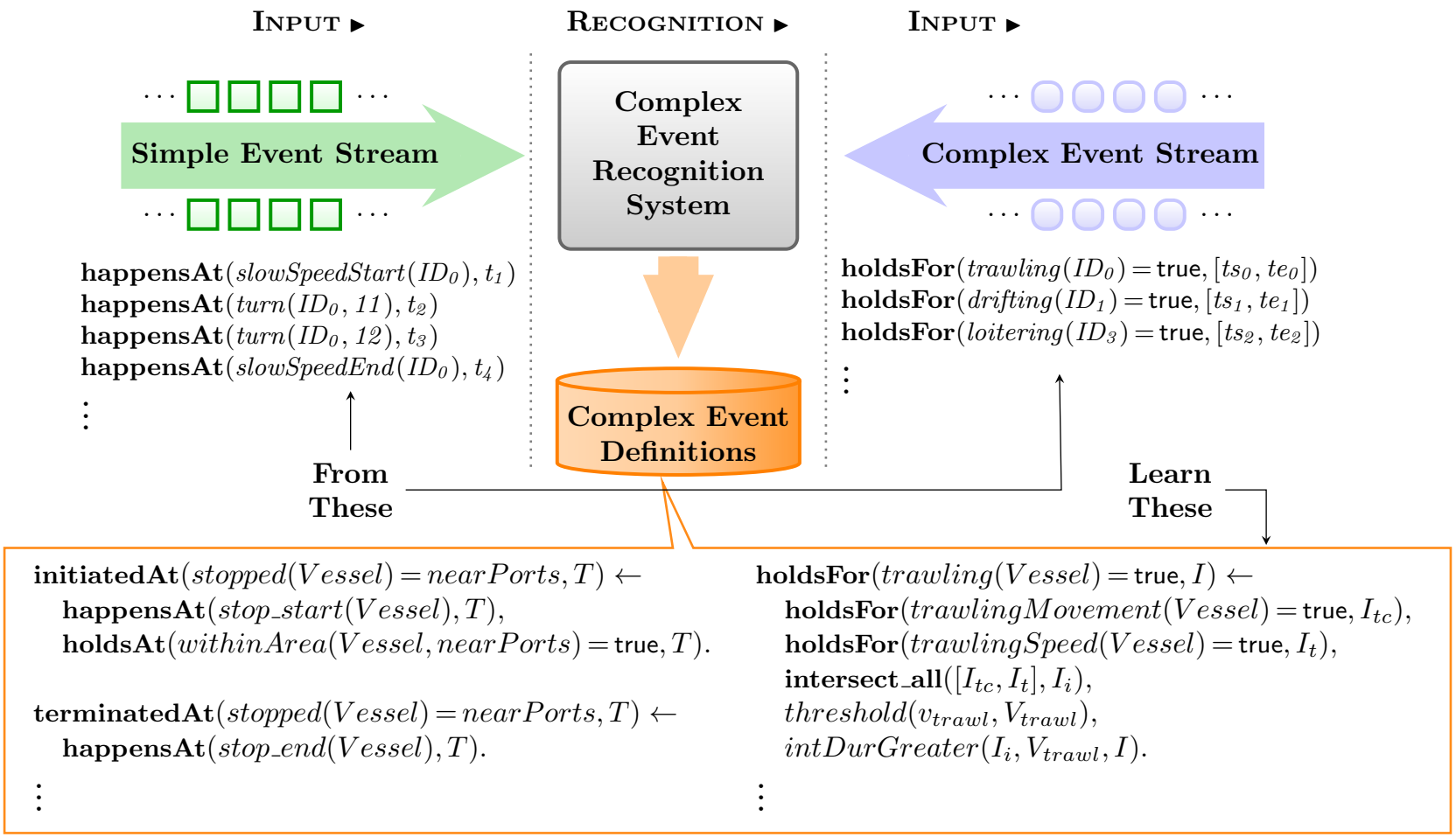
[‡] Grez et al, A Formal Framework for Complex Event Recognition. ACM TODS, 2021.

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

[¶] Mantenoglou et al, Online Event Recognition over Noisy Data Streams. IJAR, 2023.

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

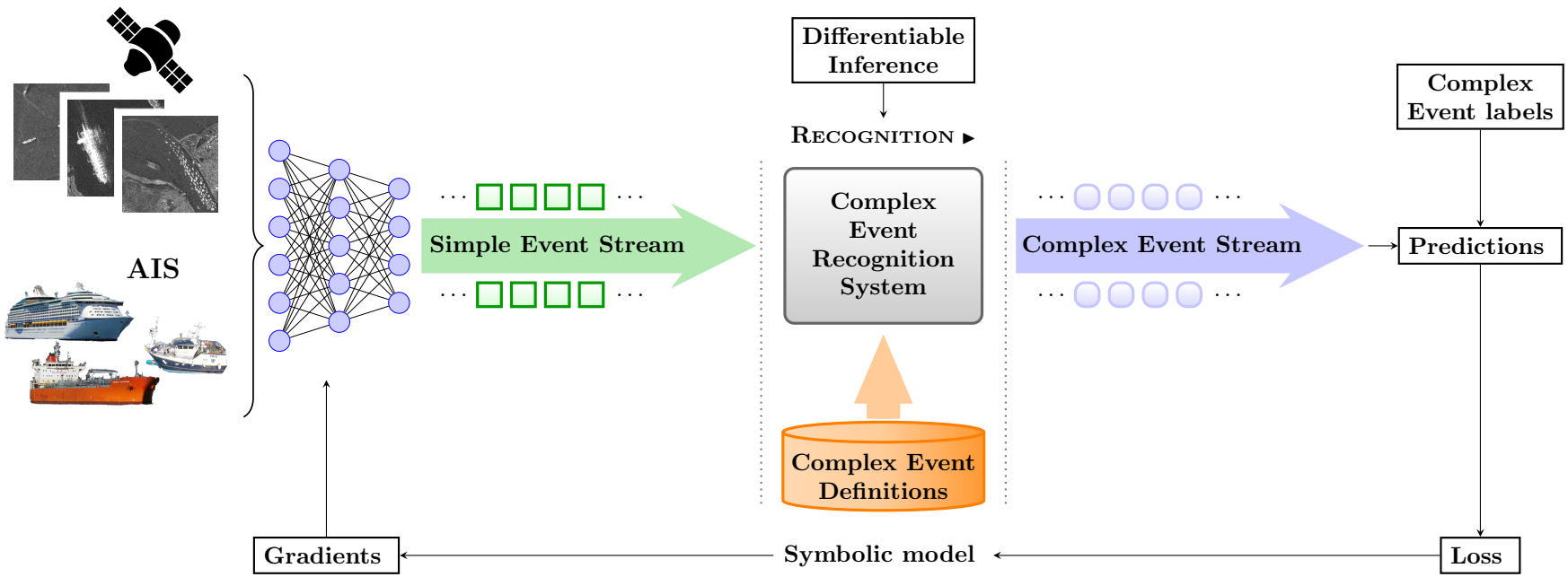
Machine Learning for Complex Event Recognition*,†



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

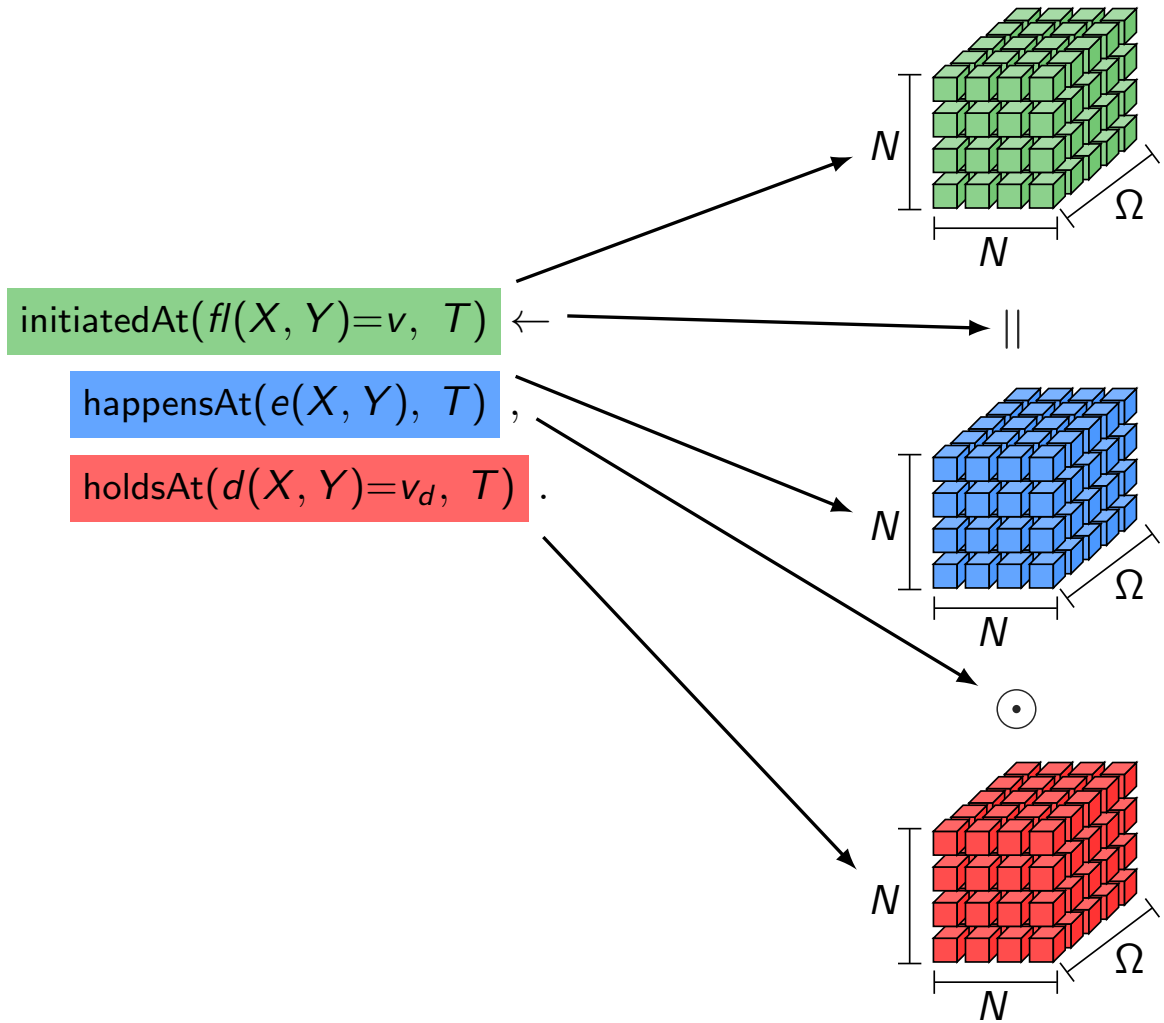
†Michelioudakis et al, Online semi-supervised learning of composite event rules by combining structure and mass-based predicate similarity. Machine Learning, 2024.

Neuro-Symbolic Complex Event Recognition*



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

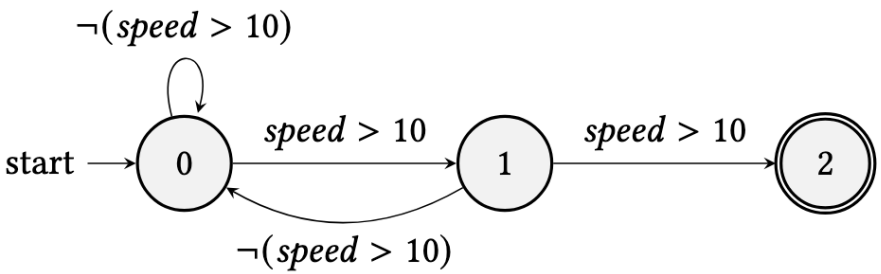
Tensor-Based Complex Event Recognition*



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

Complex Event Forecasting*

- Forecast the occurrence of a complex event.
- Symbolic automata for complex event patterns
  - Closure properties.
  - Formal compositional semantics.



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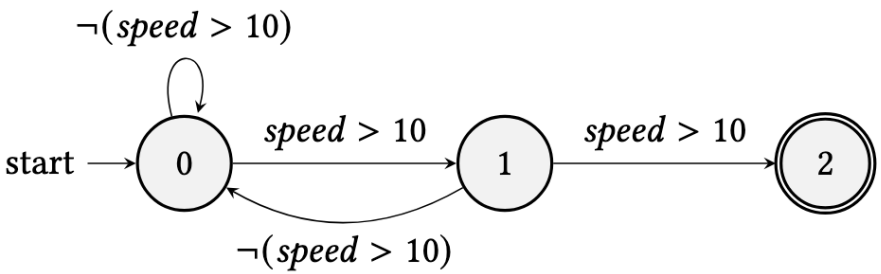

- Prediction suffix trees for long-term dependencies
  - Higher accuracy.
  - Comparable training time and acceptable throughput.

https://cer.iit.demokritos.gr (forecasting)

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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