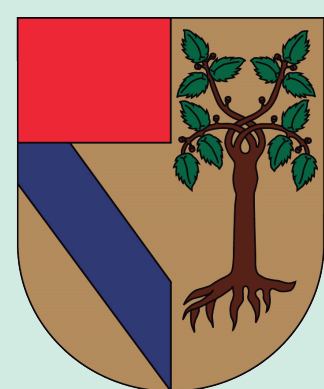


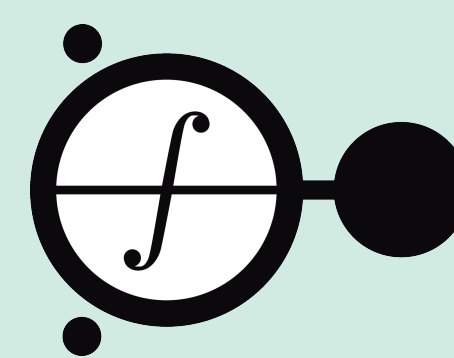
Challenges and Issues on Artificial Hydrocarbon Networks: The Chemical Nature of Data-Driven Approaches



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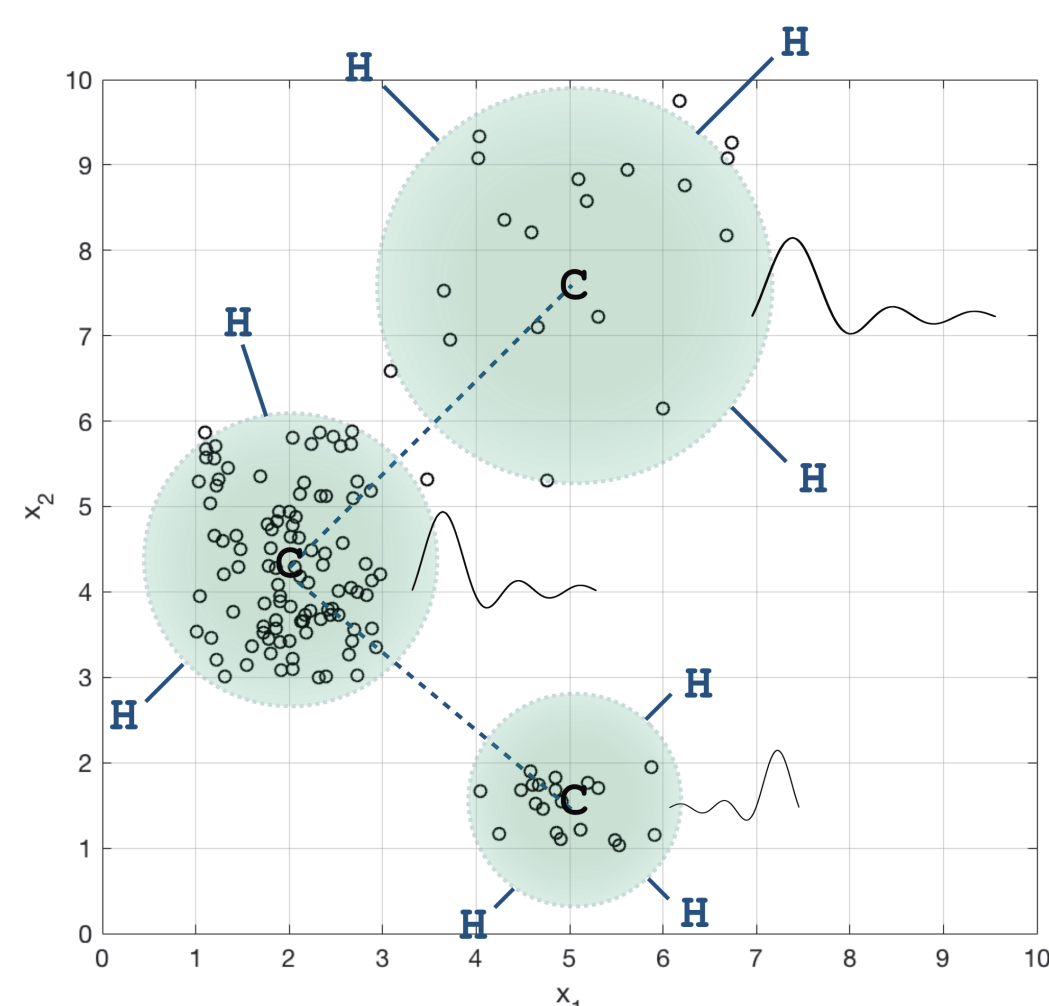
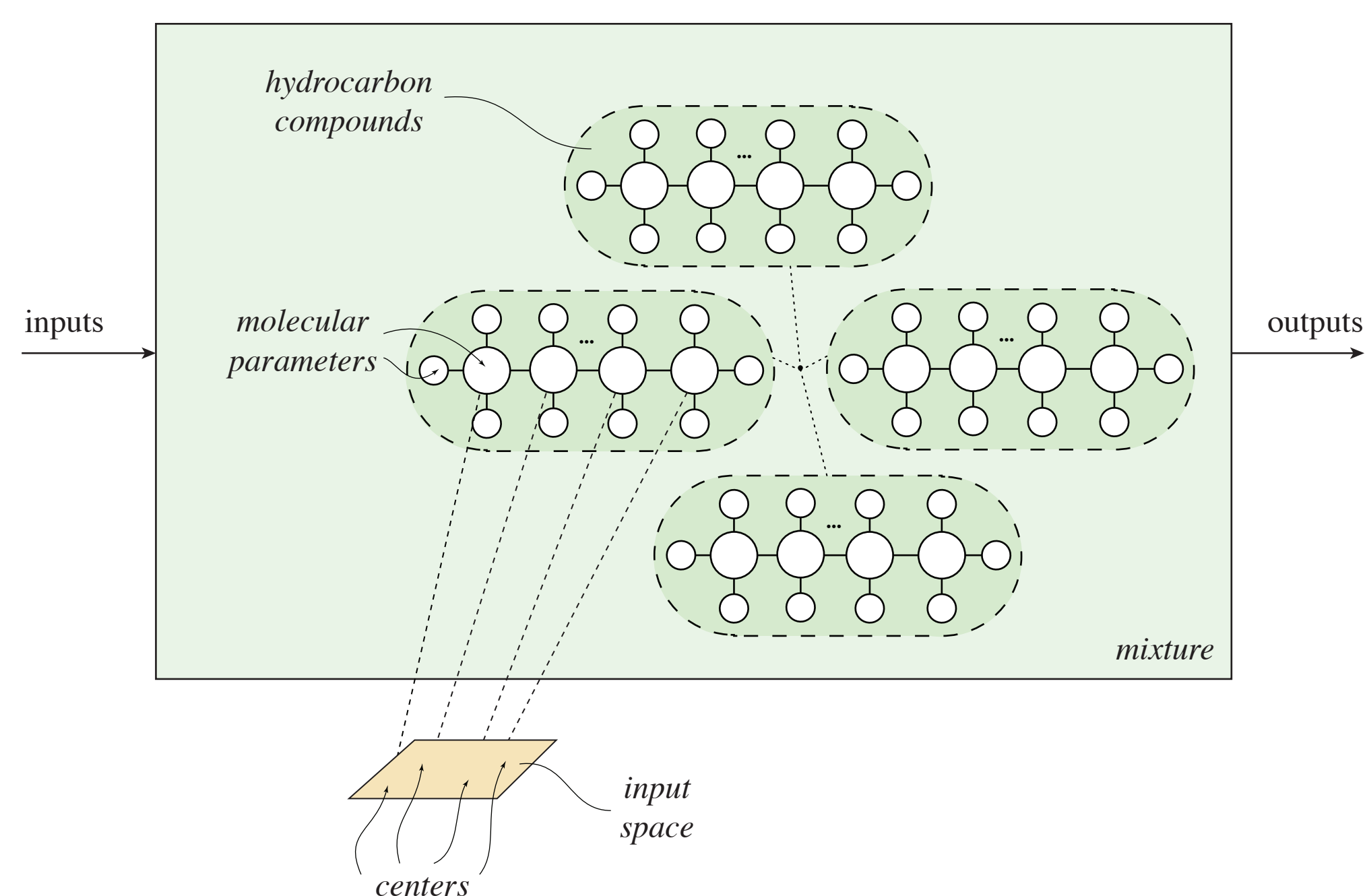
BACKGROUND AND SCOPE

Recently, artificial hydrocarbon networks (AHN), a supervised learning method inspired in the inner structures and mechanisms of chemical compounds, have been proposed as a data-driven approach. AHN have proved to be efficient in predictive power when modeling a data-based problem. However, it stills require more studies on its challenges, issues and applications.

This work aims to discuss challenges and trends of AHN as a data-driven method. It also lays the foundations on AHN for implementing new training algorithms and the way to reveal the chemical nature of data-driven problems.

KEY CONCEPTS OF AHN

The goal of the AHN method is to package information, from a set of instances, in basic units known as molecules. Then, create compounds (nonlinear) and mixtures (linear).



The inspiration in organic compounds to develop a ML method considers three facts observed from nature:

- Stability
- Organization
- Multi-functionality

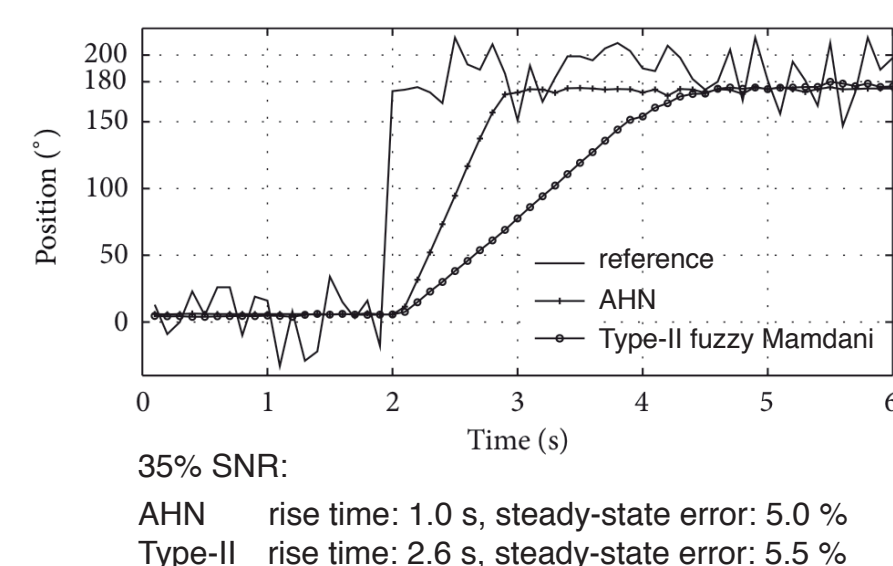
APPLICATIONS & HIGHLIGHTS OF AHN

– Key features in supervised ML.

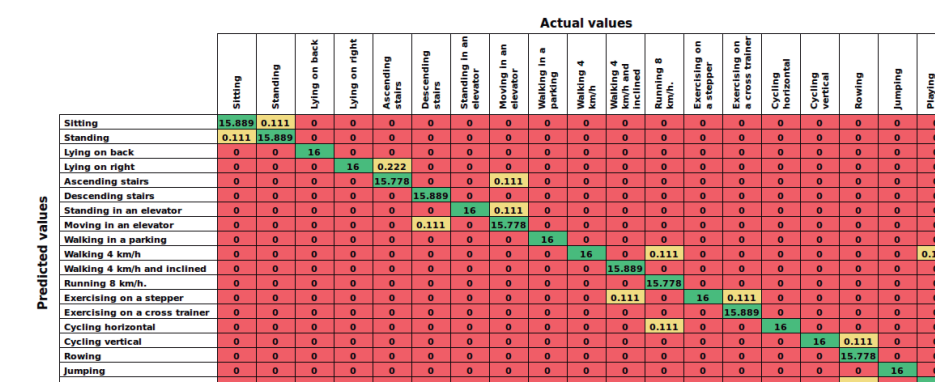
Features	AHN	DT	NN	NB	kNN	SVM
Accuracy	✓✓✓	✓✓	✓✓✓	✓	✓✓	✓✓✓
Tolerance (missing values)	✓	✓✓✓	✓	✓✓✓	✓	✓✓
Tolerance (noise)	✓✓✓	✓✓	✓✓	✓✓✓	✓	✓✓
Variety of attributes	✓✓	✓✓✓	✓✓	✓✓	✓✓	✓✓
Regression	✓✓✓	✓	✓✓	✓	✓✓	✓✓
Classification	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓	✓✓✓
Interpretability	✓✓	✓✓✓	✓	✓✓✓	✓✓	✓

Symbols: low (✓), medium (✓✓) and high (✓✓✓) satisfaction

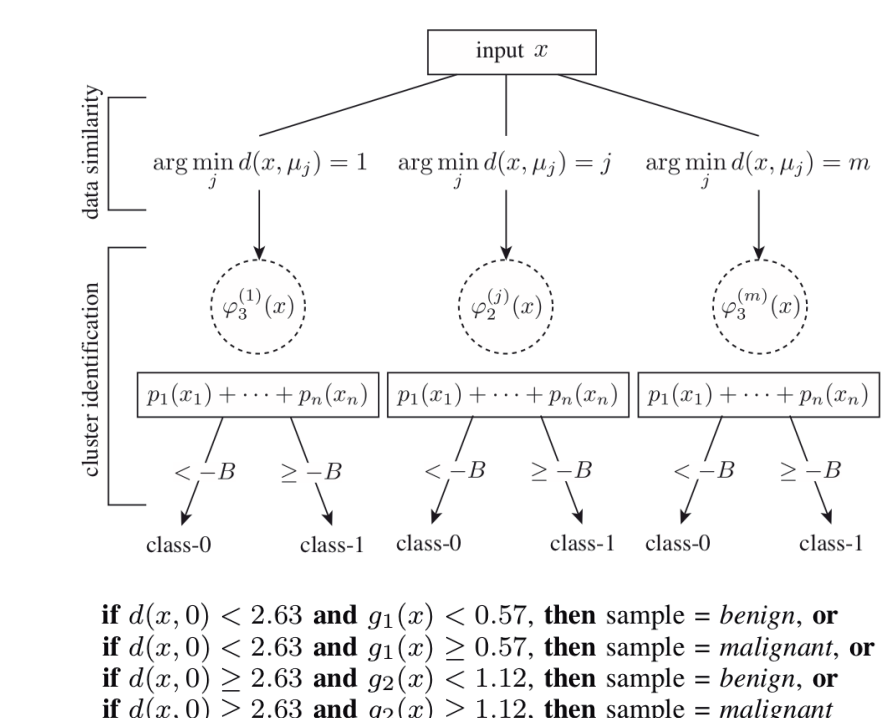
– Some applications and case studies.



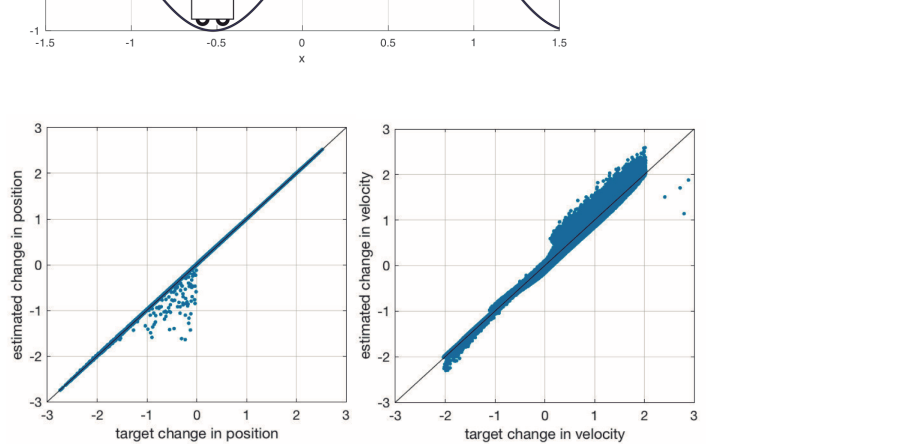
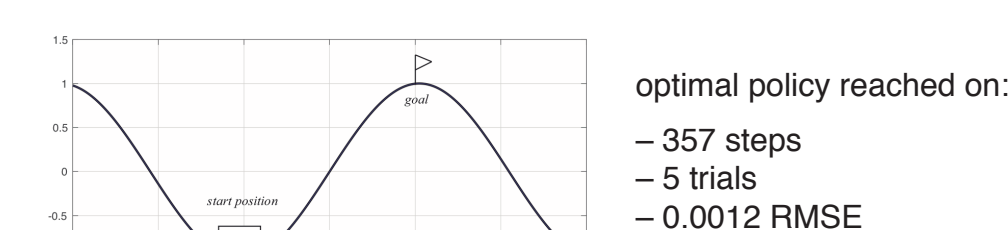
Position Control systems in DC motors



Human activity recognition



Interpretability of AHN-based classifier



Reinforcement learning from scratch

TRENDS AND ISSUES OF AHN

- New training algorithms
- Big data processing
- Kernels and relations in molecules
- Hybrid approaches with AHN
- Transfer learning

