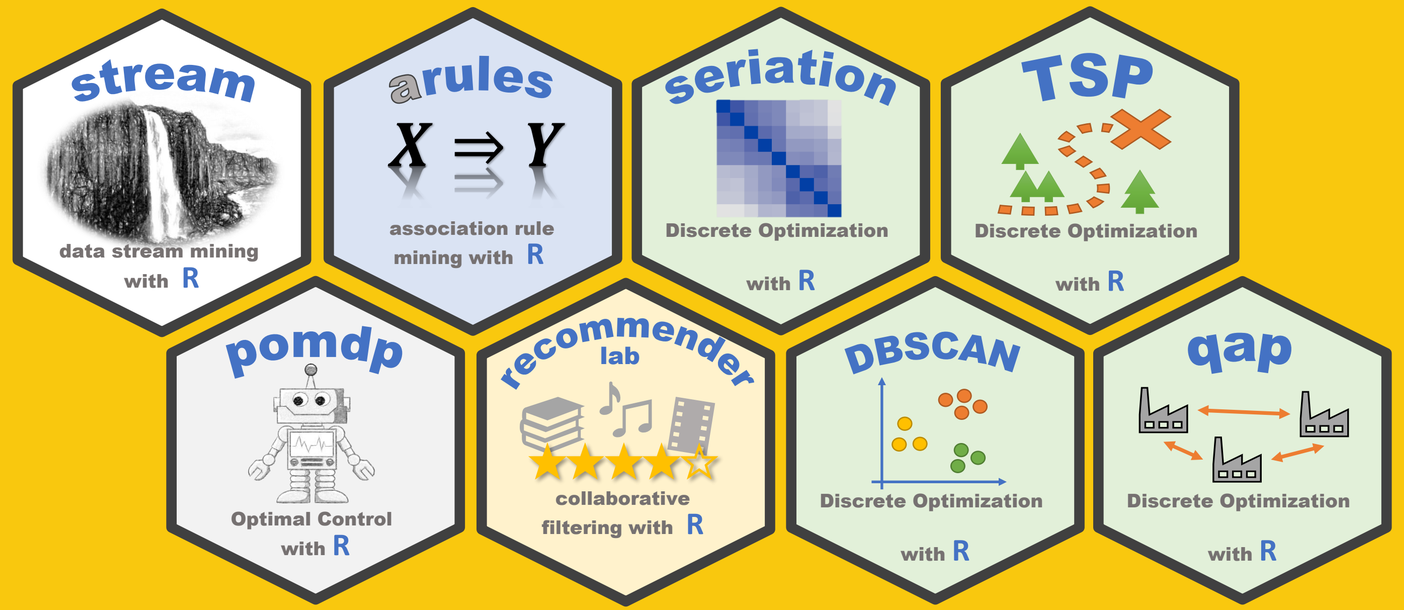
Reproducible research with 15+ widely used software packages for optimization, machine learning and artificial intelligence



M. Hahsler Research Overview

Michael Hahsler

Associate Professor in Computer Science

mhahsler@lyle.smu.edu
michael.hahsler.net

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Supported by

NIH · National Human Genome Research Institute · NSF · T-System · Southwestern Medical Center · Net-Centric I/UCRC

SMU Lyle School of Engineering

Michael Hahsler

Associate Professor in Computer Science
Lyle School of Engineering, SMU
mail: mhahsler@lyle.smu.edu
web: michael.hahsler.net

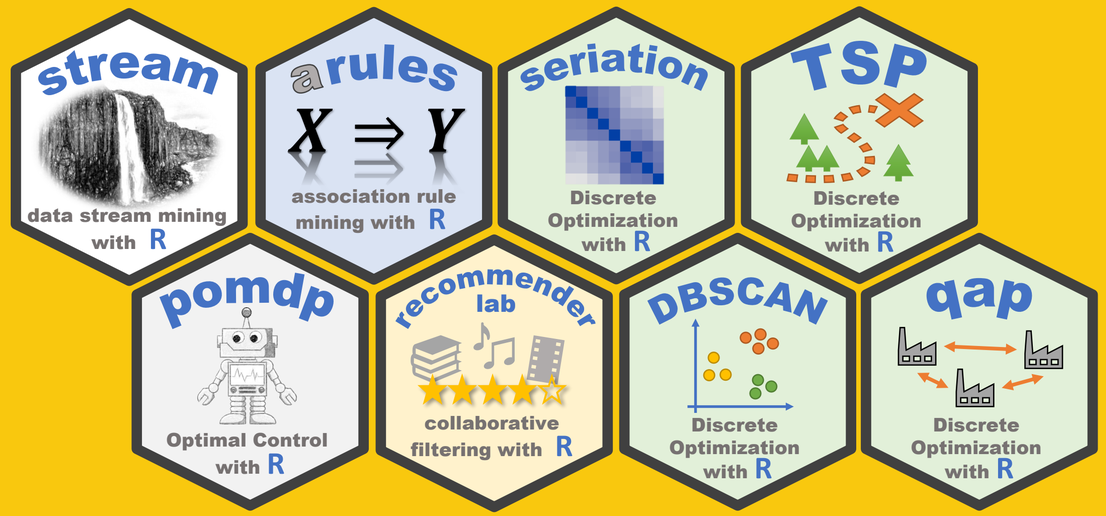
» My research interests lie in the intersection of **machine learning**, **statistical methods**, and **combinatorial optimization** with applications in artificial intelligence, data mining, and data science.

» My team works on open-source reference implementations of state-of-the-art algorithms and prototypes for new research ideas as packages for the R and Python environments.

» Application examples:

- Visualization: optimal order of objects
- Earth Sciences: Hurricane prediction, earthquake preparedness
- Healthcare: Learning policies for diabetes screening
- Cybersecurity: Malicious code detection

Reproducible research with 15+ packages for the R Environment



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SMU Lyle School of Engineering

Research Areas: Michael Hahsler

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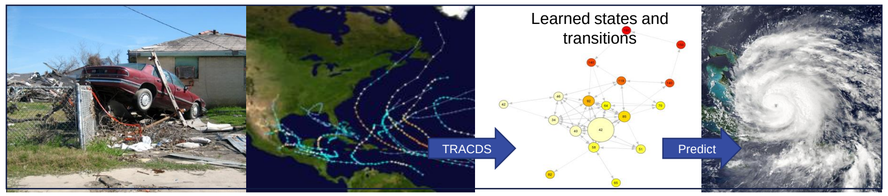
Machine Learning

» **Example project:** TRACDS: Temporal Relationships Among Clusters in Data Streams

» **Funding**: National Science Foundation, 3 years $210k

» **Collaborators**: Margaret Dunham (PI)

» **Overview**: Extend state-of-the-art data stream clustering to model temporal/order aspects of stream data to better predict hurricane intensity to improve safety and reduce damage.

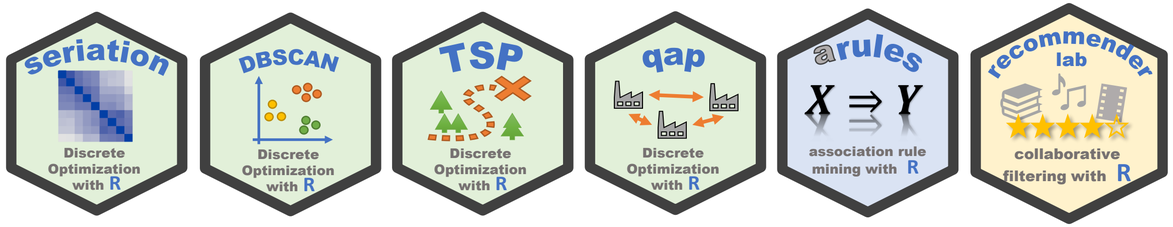


Open-Source Reference Implementations

» **Goal:** Create and maintain open-source reference implementations of state-of-the-art algorithms and prototypes for new research ideas as packages for the R and Python environments

» **Collaborators**: several worldwide.

» **Outcome**: 15+ R and Python packages implementing machine learning, statistical methods, and combinatorial optimization techniques with applications in artificial intelligence, data mining, and data science.



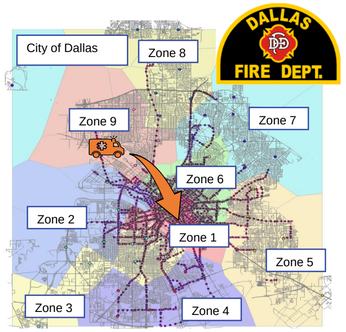
Artificial Intelligence

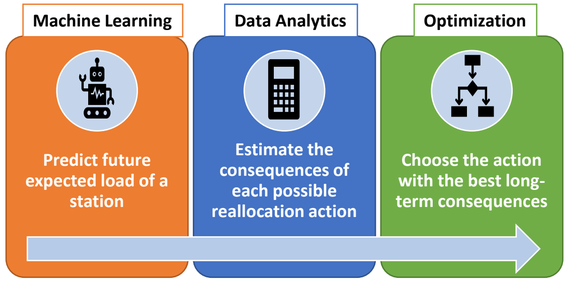
» **Example project:** SAFE-NET: An Integrated Connected Vehicle and Computing Platform for Public Safety Applications

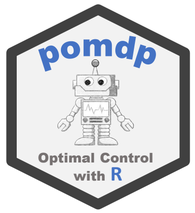
» **Funding**: National Institute of Standards and Technology, 5 years $1.3M

» **Collaborators**: Khaled Abdelghany (PI) and Barbara Minsker (Civil Engr.),

» **Overview**: Development of artificial intelligence methodologies to enhance the dispatching operations of emergency vehicles in urban areas.







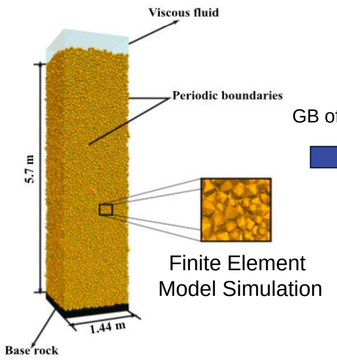
Data Science Applications

» **Example project:** Evaluation of Liquefaction Potential of Saturated Granular Soils under Partial Drainage Conditions

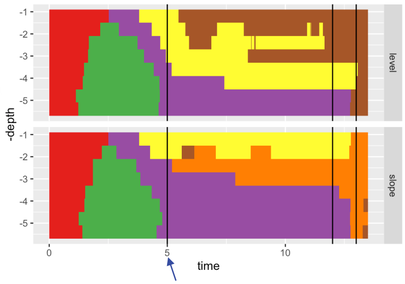
» **Funding**: Data Science Supplement, National Science Foundation, 2 years $45k

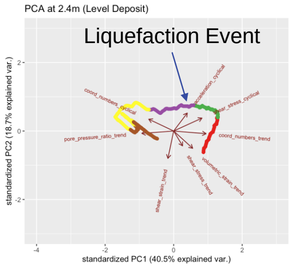
» **Collaborators**: Usama El Shamy (PI of existing grant, Civil Engr.)

» **Overview**: Apply data science and unsupervised learning to large-scale simulation data to improve the researchers' understanding of simulation results and improve earthquake



GB of Data





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Example Projects

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Scan for more information

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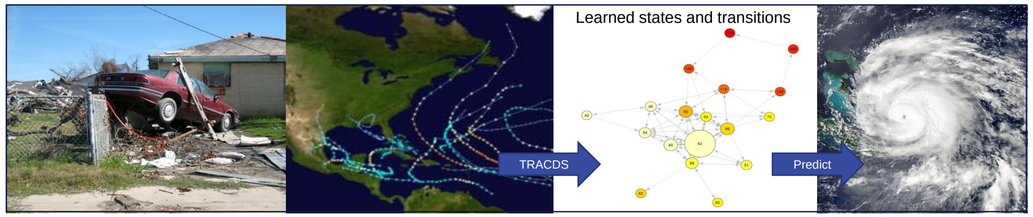
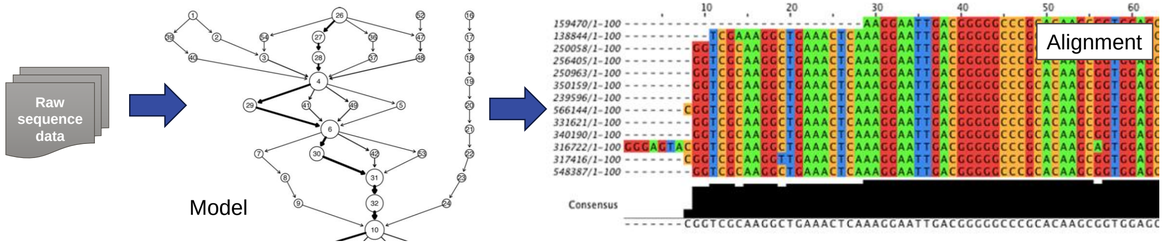


QuasiAlign: Position Sensitive P-Mer Frequency Clustering with Application to Classification and Differentiation

» **Funding**: National Institutes of Health, 4 years $385k

» **Collaborators**: Margaret Dunham (Co-PI), Monnie McGee (Dedman)

» **Overview**: Massive-scale sequence modeling for metagenomic sequence classification and characterization to support personalized medicine.



SAFE-NET: An Integrated Connected Vehicle and Computing Platform for Public Safety Applications

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» **Collaborators**: Khaled Abdelghany (PI) and Barbara Minsker (Civil Engr.),

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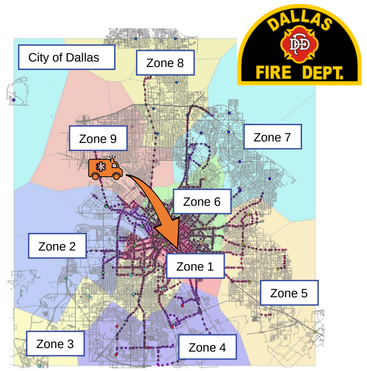

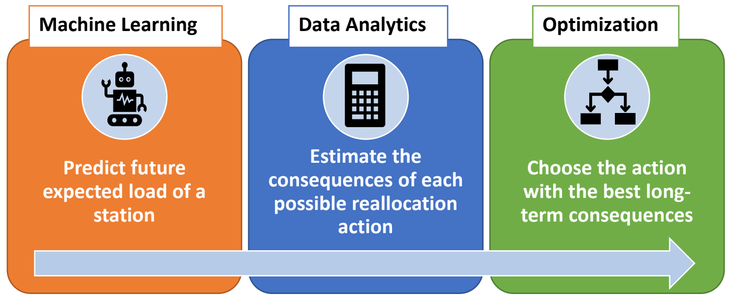

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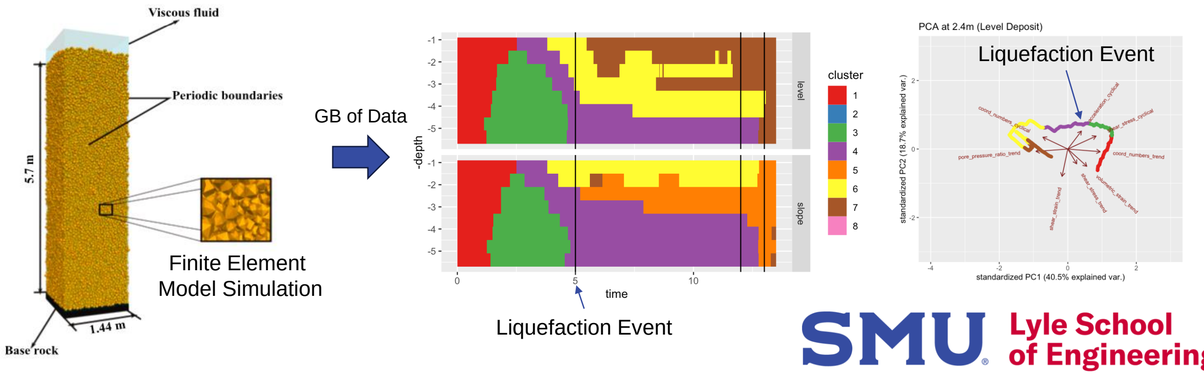

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