

AI for environment at RISE

Olof Mogren, PhD



Research group

- Applied modelling:
 - Environment and climate
 - Health and precision medicine
 - Privacy-preserving machine learning
 - Efficient and distributed learning
- Language, vision, sound, sensor data, combinations
- Foundations of machine learning
- Collaborations



Olof Mogren, PhD

John Martinsson



Aleksis Pirinen, PhD



Edvin Listo Zec



Martin Willbo



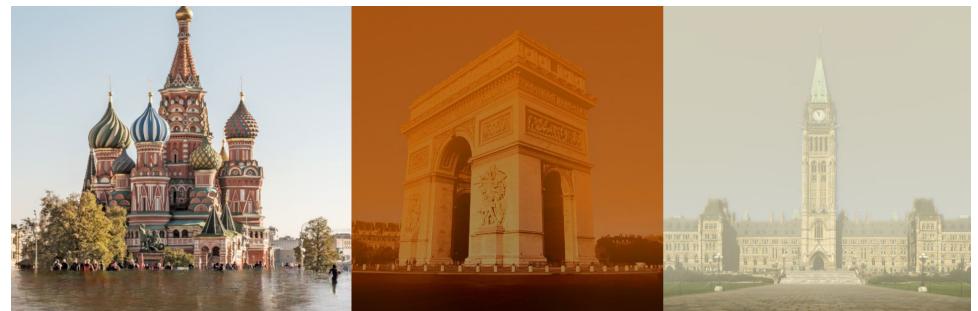
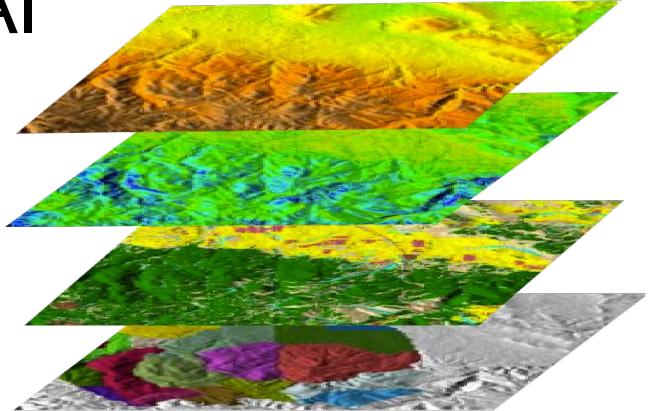
Ebba Ekblom



Altenburg, Germany, July 2021. India Times.

Climate change adaptation using AI

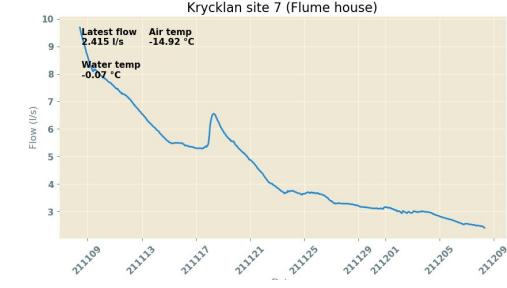
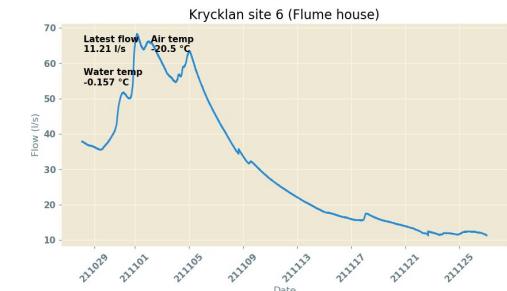
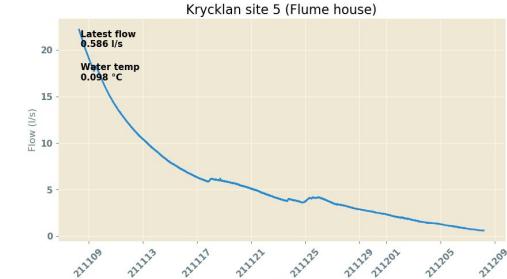
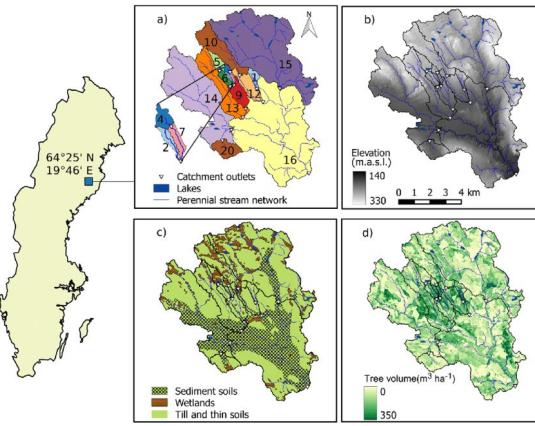
- Geographical analysis
 - Risk prediction: flooding, landslides, etc.
 - Capacity in wetlands and floodplain
 - Visualise and demonstrate scenarios
 - Where to do efforts?
- Biodiversity
 - Risk prediction
 - Track key species
- Disaster management
 - Wild fire tracking and prediction



thisclimatedoesnotexist.com

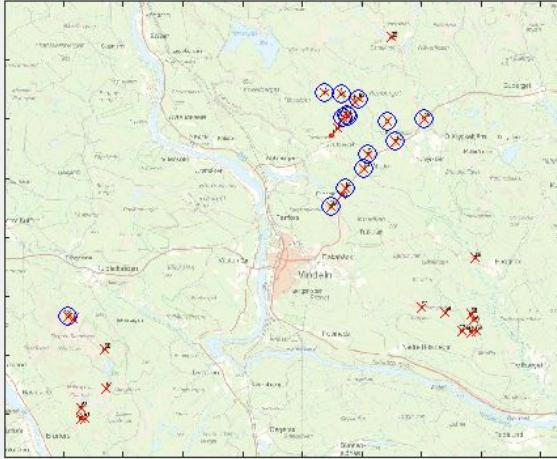
Krycklan catchment area

- Vindelälven
- 6780 hectare watershed catchment
- Over 30 years
- hydrology, climate, water, and soil water chemistry

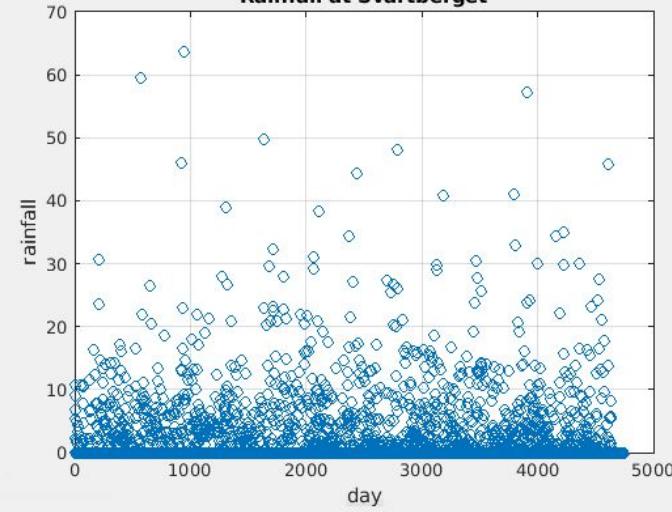




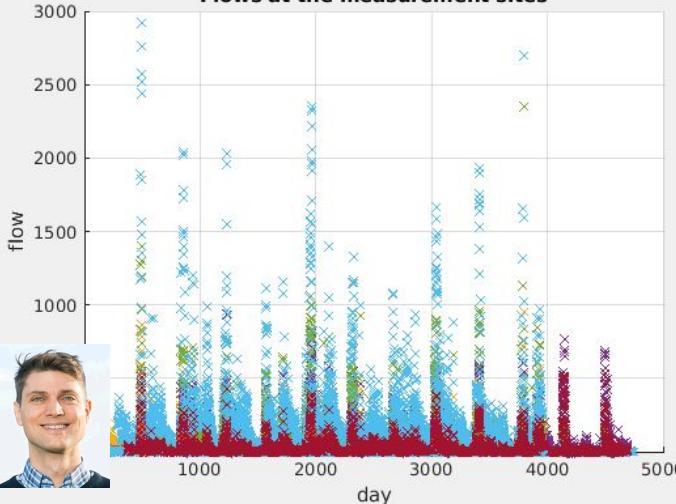
Measurement map with ids



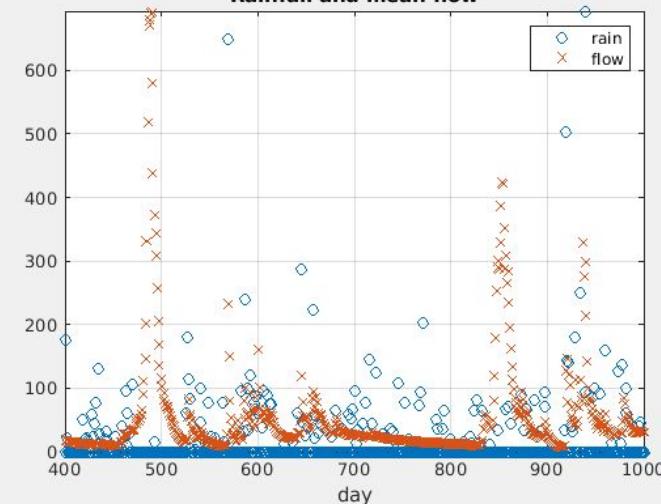
Rainfall at Svarberget



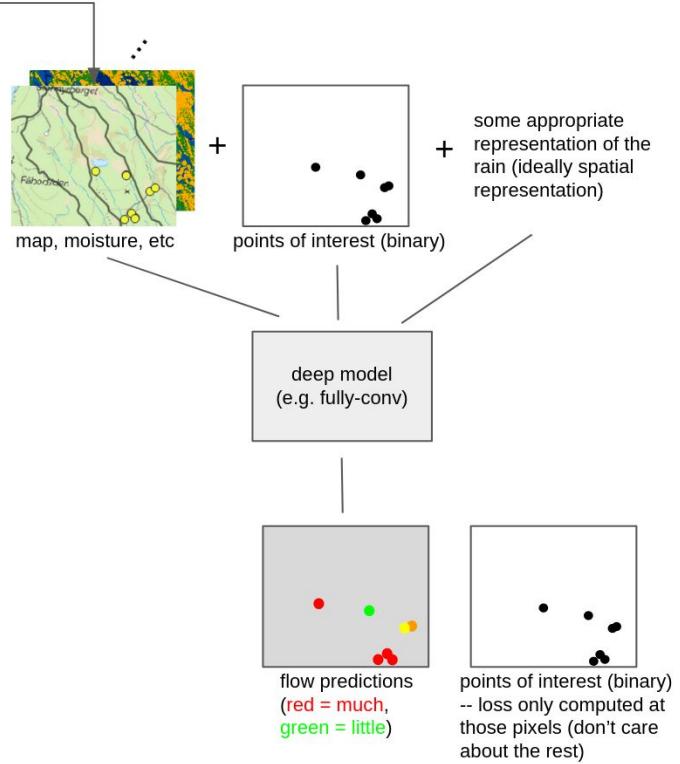
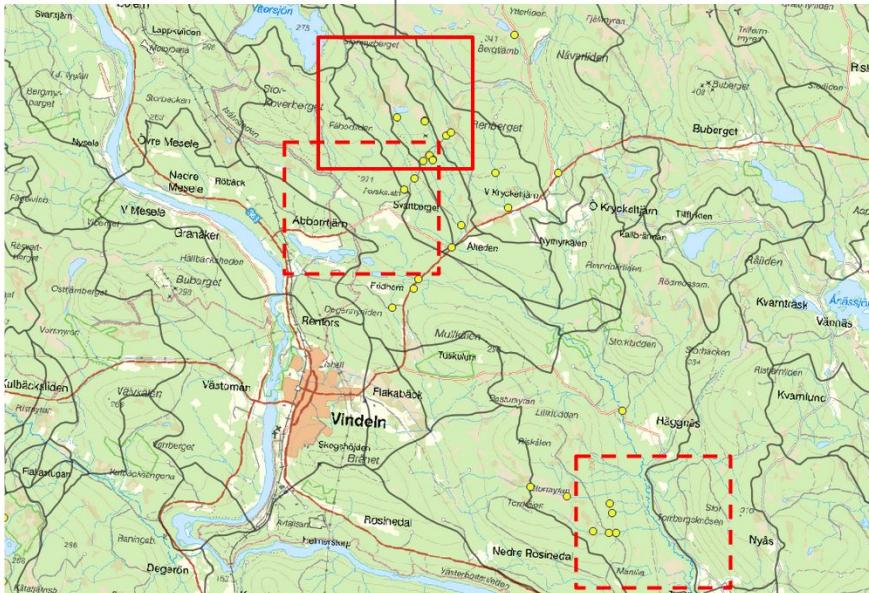
Flows at the measurement sites



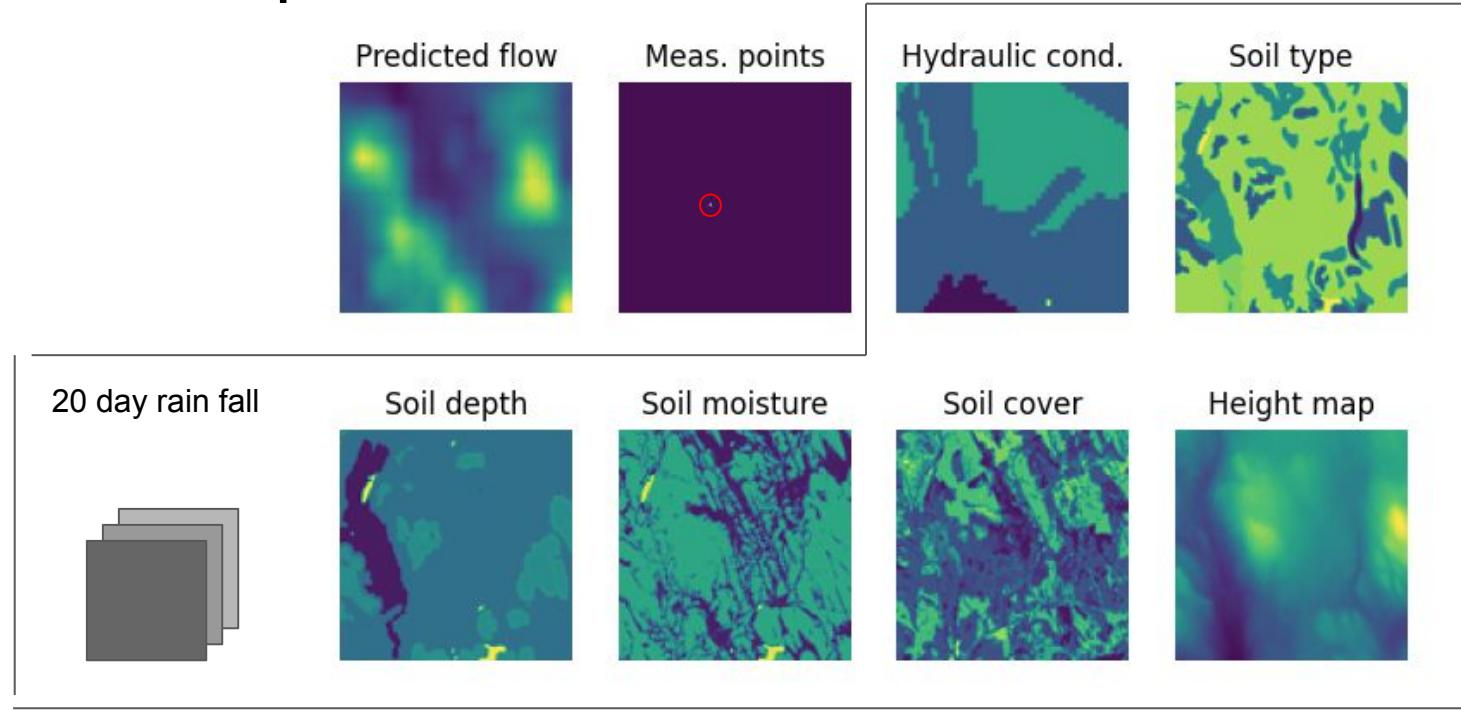
Rainfall and mean flow



Krycklan catchment



Feature maps



Preliminary insights, Krycklan

- Flow is predictable
- April/May more challenging
- Feature importance evaluation ongoing



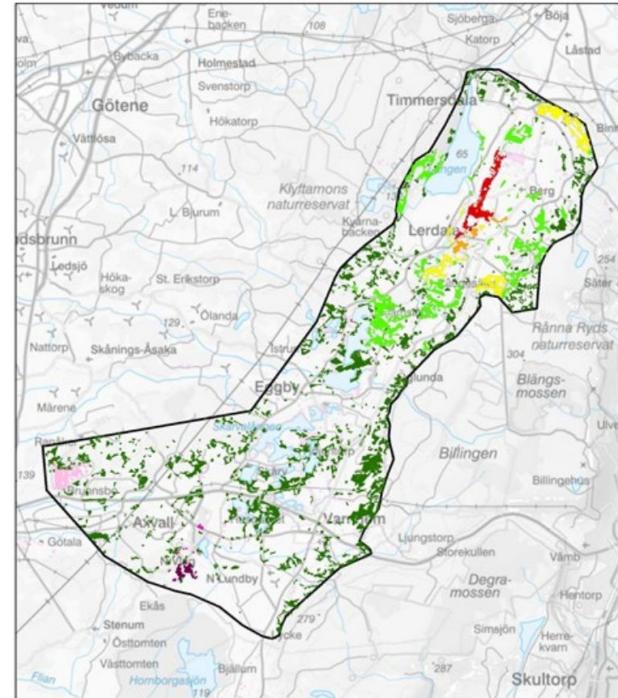
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Biodiversity quantification

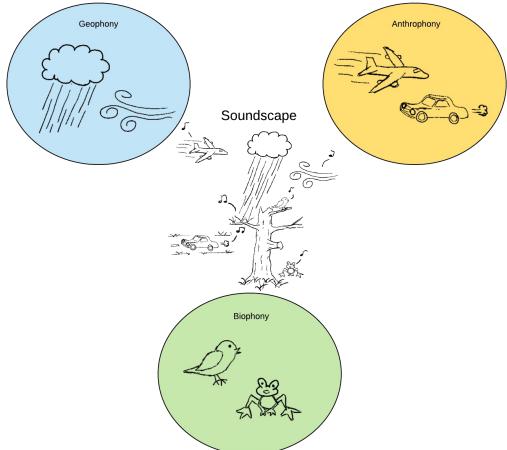
Habitat diversity for biodiversity

- Multimodal holistic analysis of habitat diversity
- Remote sensing
- Swedish National Land Cover Database (NMD)
 - geographic forest data
 - land-cover data from sources such as the
- National Inventories of Landscapes in Sweden (NILS)
 - substrate information

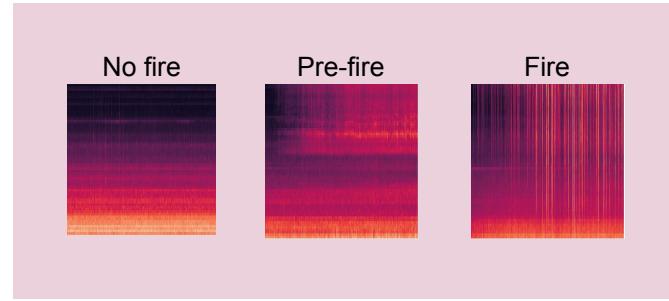
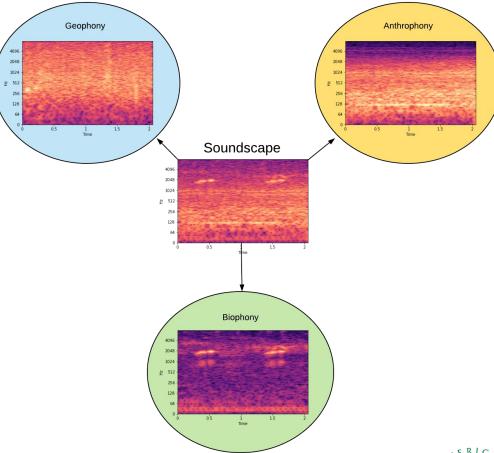


Soundscape analysis for biodiversity modelling

- PhD project
- Environmental monitoring
 - weather events
 - marker species



Acoustic source separation



Sound event detection

Data

“Does the recorded data meet expectations?”
Noise? Missing values?

Band A: Appropriateness

Is the data actually useful to solve the task?

Band B: Faithfulness and representation

From “Hearsay data” to “data is accessible”

Band C: Accessibility

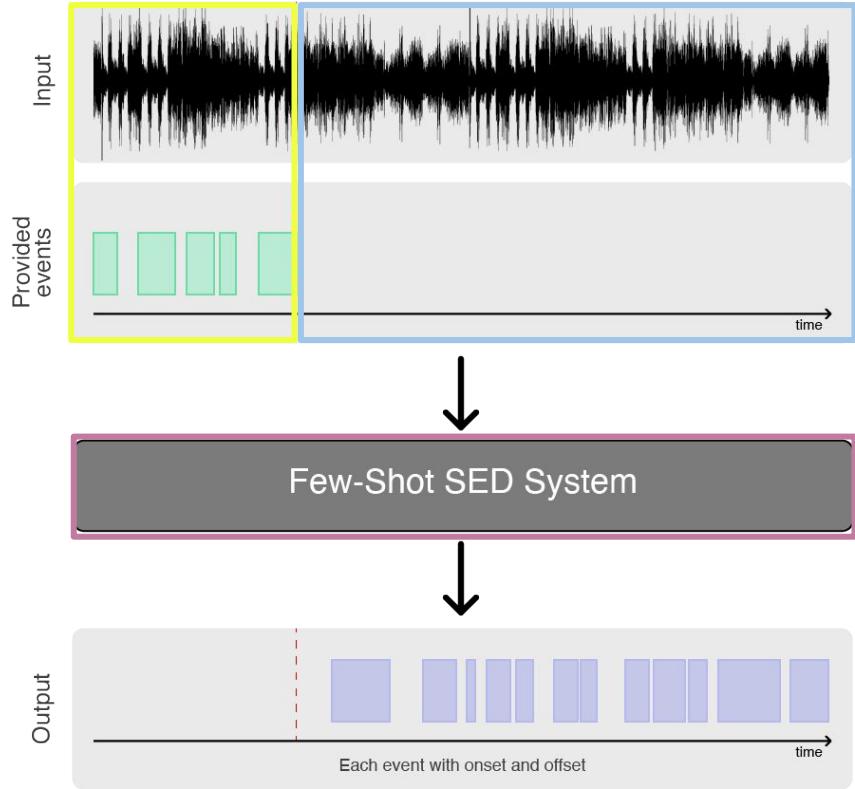
Sound event detection

- Large amounts of data
- Laborious annotation
- Learn from few examples



Sound event detection

- Support set from provided events
- Query set
- Goal: Predict event onsets and offsets in the audio

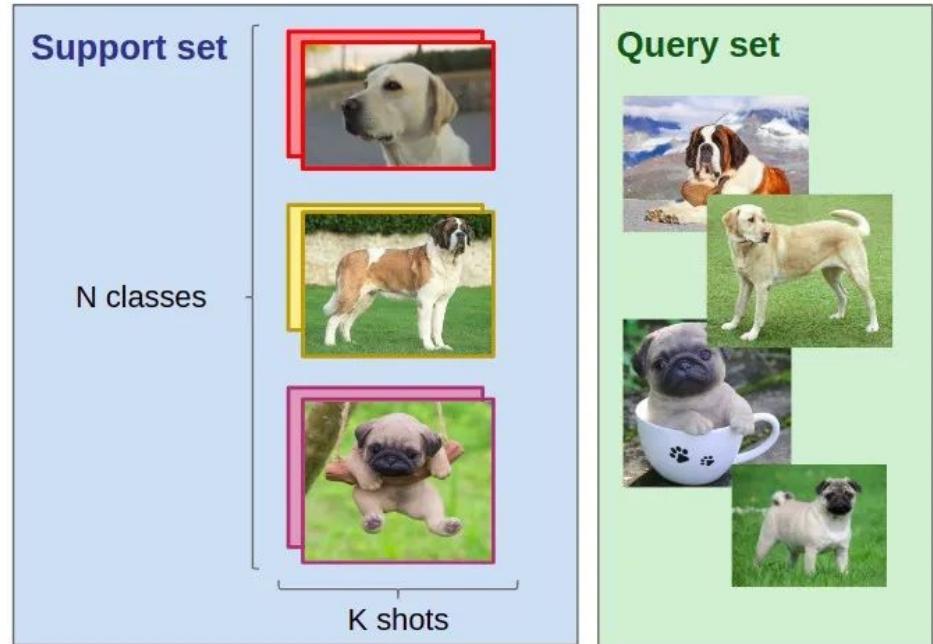


DCASE 2021 Task 5

Few-Shot Learning

Small set of examples of each class

- K-shot
- N-way
- Support set
- Query set

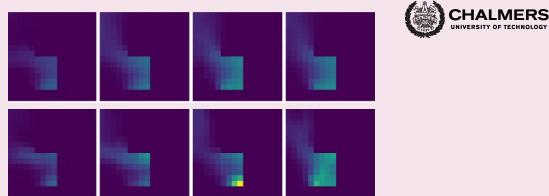


Self- or semi-supervised few-shot learning for sound event detection

- Leverage large unannotated data sets
- State-of-the-art few-shot learning



Related activities at RISE



Physics simulations, Edvin Lam & Mogren, MSc proj.

Martinsson, Listo Zec, Gillblad, **Mogren**. Adversarial representation learning for synthetic replacement of private attributes. IEEE Big Data 2021 <https://arxiv.org/abs/2006.08039>, 2020.

Onoszko, Karlsson, **Mogren**, Listo Zec. Decentralized federated learning of deep neural networks on non-iid data 2021 FLUPDC workshop at ICLM, <https://arxiv.org/abs/2107.08517>

Martinsson, J., Schliep, A., Eliasson, B., **Mogren**, O., Blood glucose prediction with variance estimation using recurrent neural networks. Journal of Healthcare Informatics Research. 2020. <http://mogren.one/publications/2019/blood/>

Learning Machines Seminars

Thursdays at 15:00



- 2021-12-16: Stéphane d'Ascoli, FAIR Paris and ENS Paris.
 - *Double descent: insights from the random feature model.*
- 2022-01-13: Andrew Jesson, University of Oxford.
 - *Head in the clouds? Why decision making is hard.*
- 2022-01-20: Jon Nordby, Soundsensing.
 - *Monitoring noise, machinery and processes using Machine Learning.*
- 2022-01-27: Aleksis Pirinen, RISE.
 - *AI and Climate Change.*
- 2022-02-03: Josephine Sullivan, KTH.

**Register to
receive
invitations!**

ri.se/lm-sem

Thank You!



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Notable collaborators in this talk: Martin Willbo, John Martinsson, and Alexis Pirinen.

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