Tour of machine learning and artificial intelligence activities at SU

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What is machine learning?

Classification

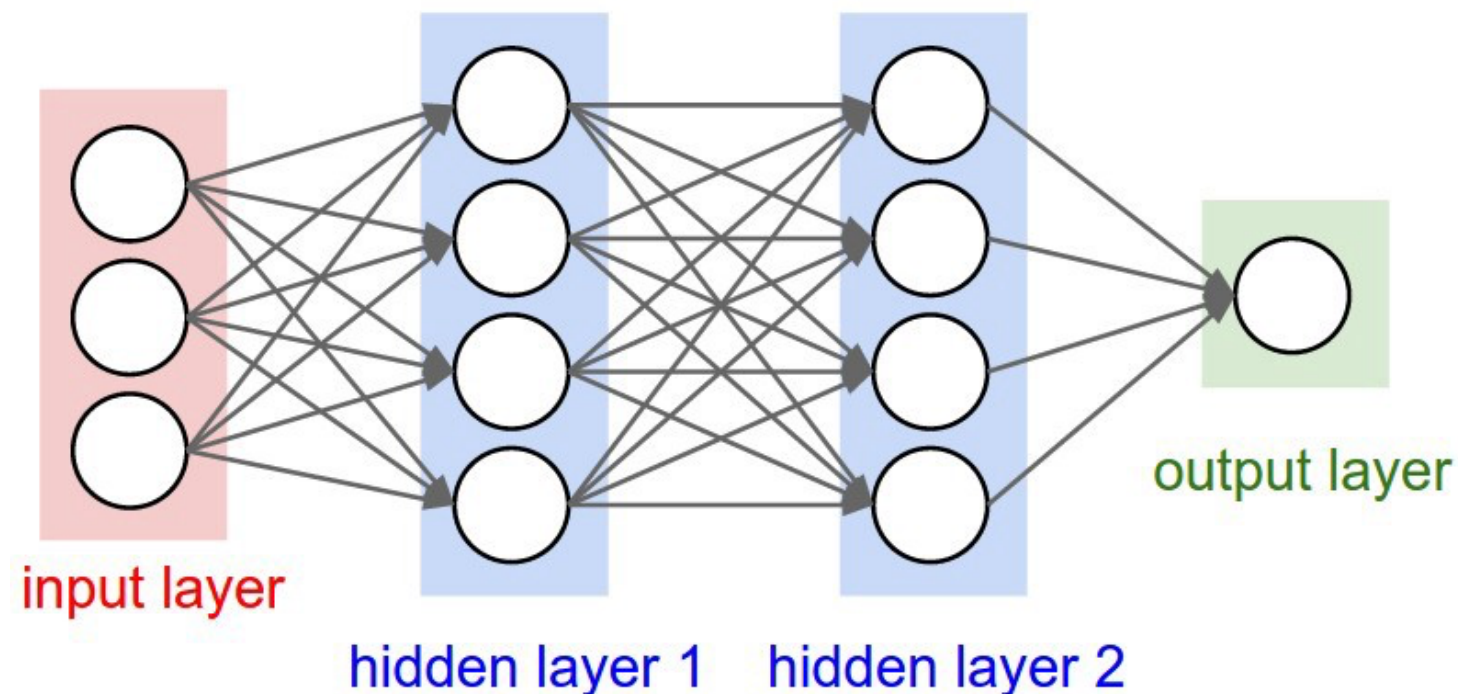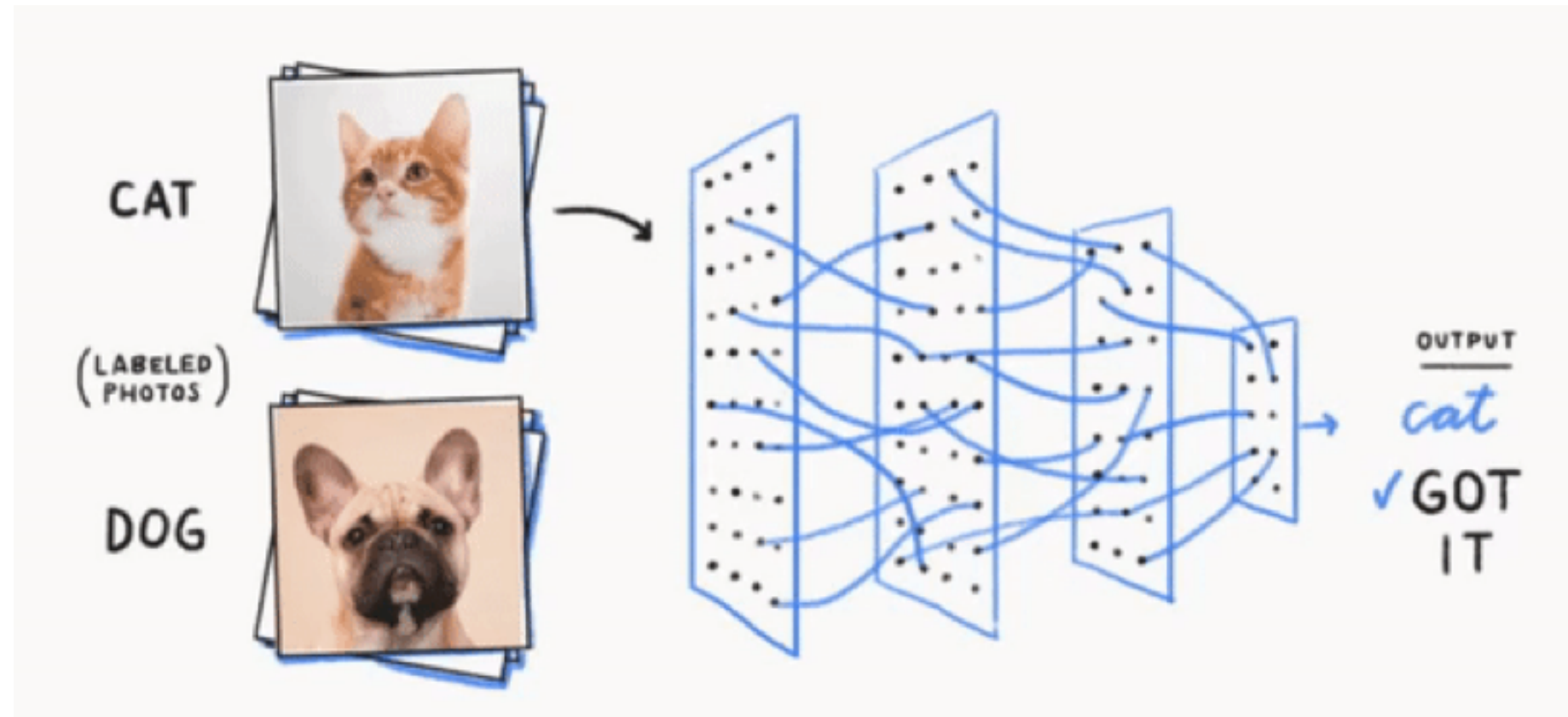- Supervised
- Unsupervised

Neural networks

- Feedforward NN
- Auto-encoders
- Convolution NN
- Recurrent NN

Reinforcement learning

Why now?

- Availability of data
- Computational power
- Packages: Keras, TensorFlow

ML/AI at SU

Engineering

- Andries Engelbrecht (data science, swarm dynamics)
- Herman Kamper (language processing)
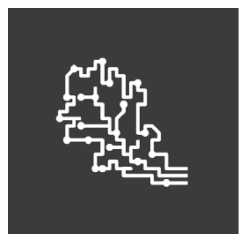
Computer science

- Steve Kroon (neural networks)
- Trienko Grobler (remote sensing)

Applied maths

- Willie Brink (machine vision)
- Hanno Coetzer (biometric)

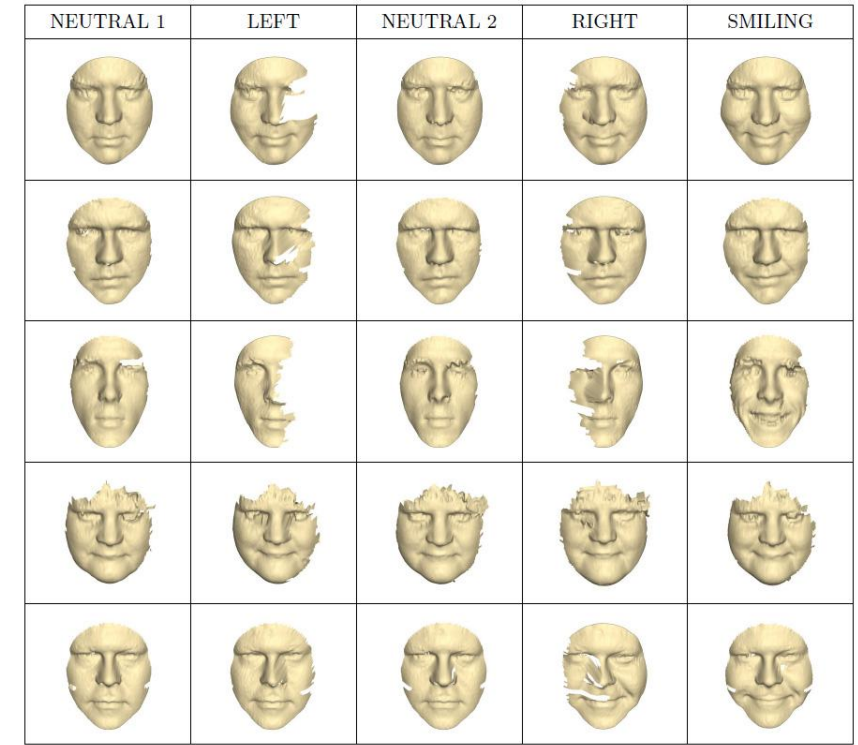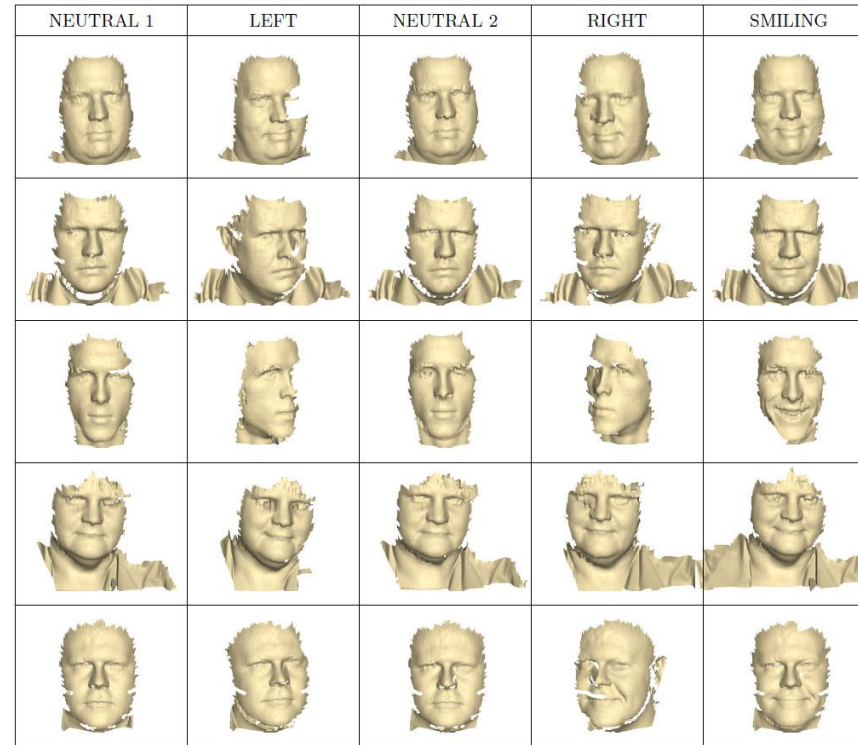## Statistics

Centre for Artificial Intelligence Research

Maties Machine Learning
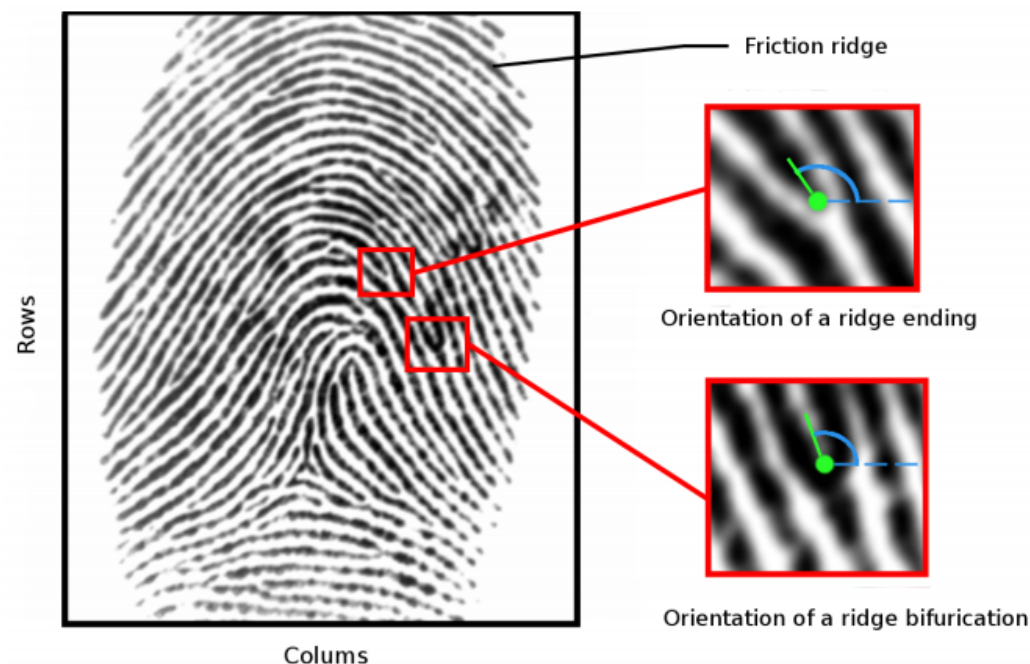https://mml.sun.ac.za

Machine vision

Willie Brink
wbrink@sun.ac.za

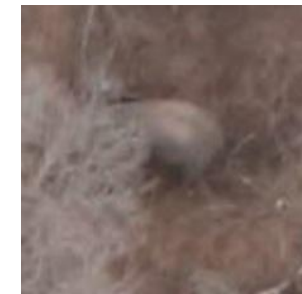Hanno Coetzer
jcoetzer@sun.ac.za

- Biometric identification
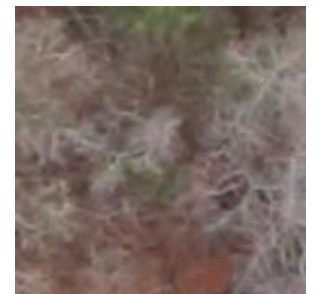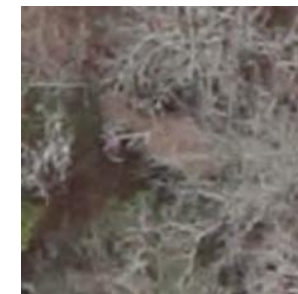- Image processing
- Ecological applications

Projects

Protea burchellii | Protea lorea

P. neriifolia | P. cynaroides

Protea laurifolia | Protea neriifolia

Examples of elephants.

Examples of not-elephants.
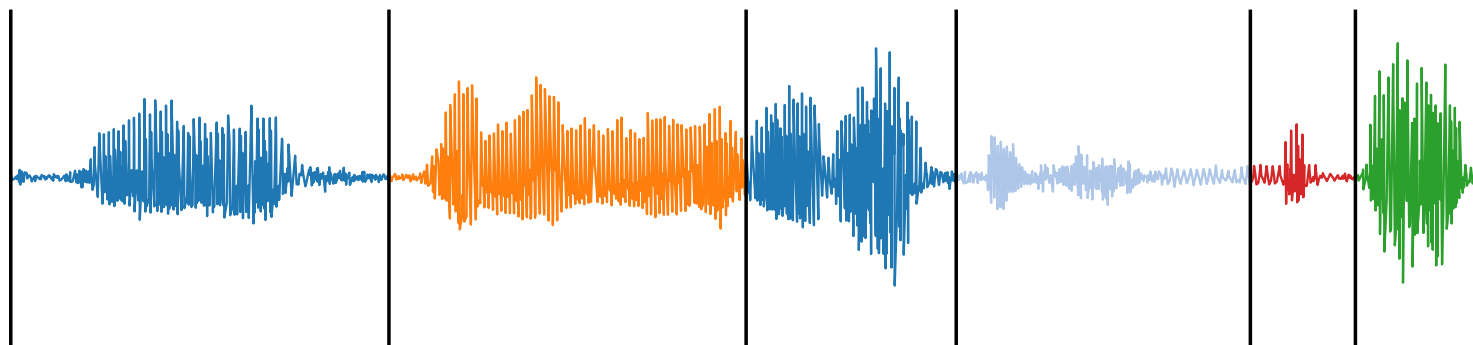
Natural language processing
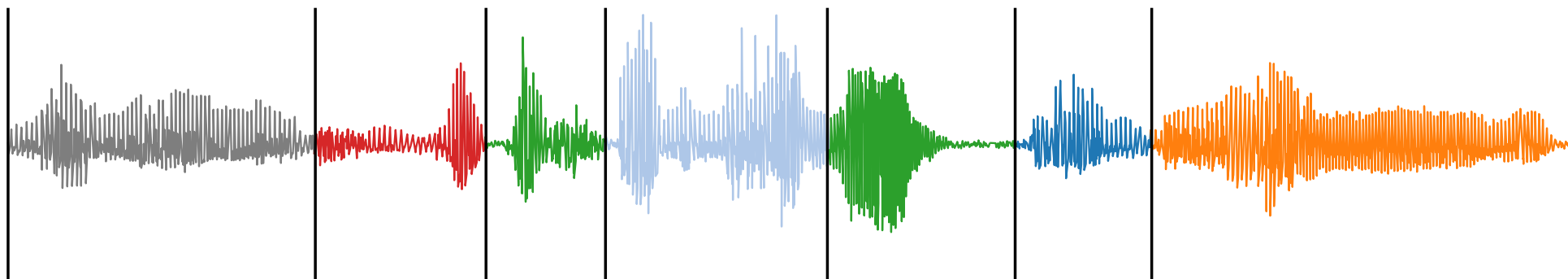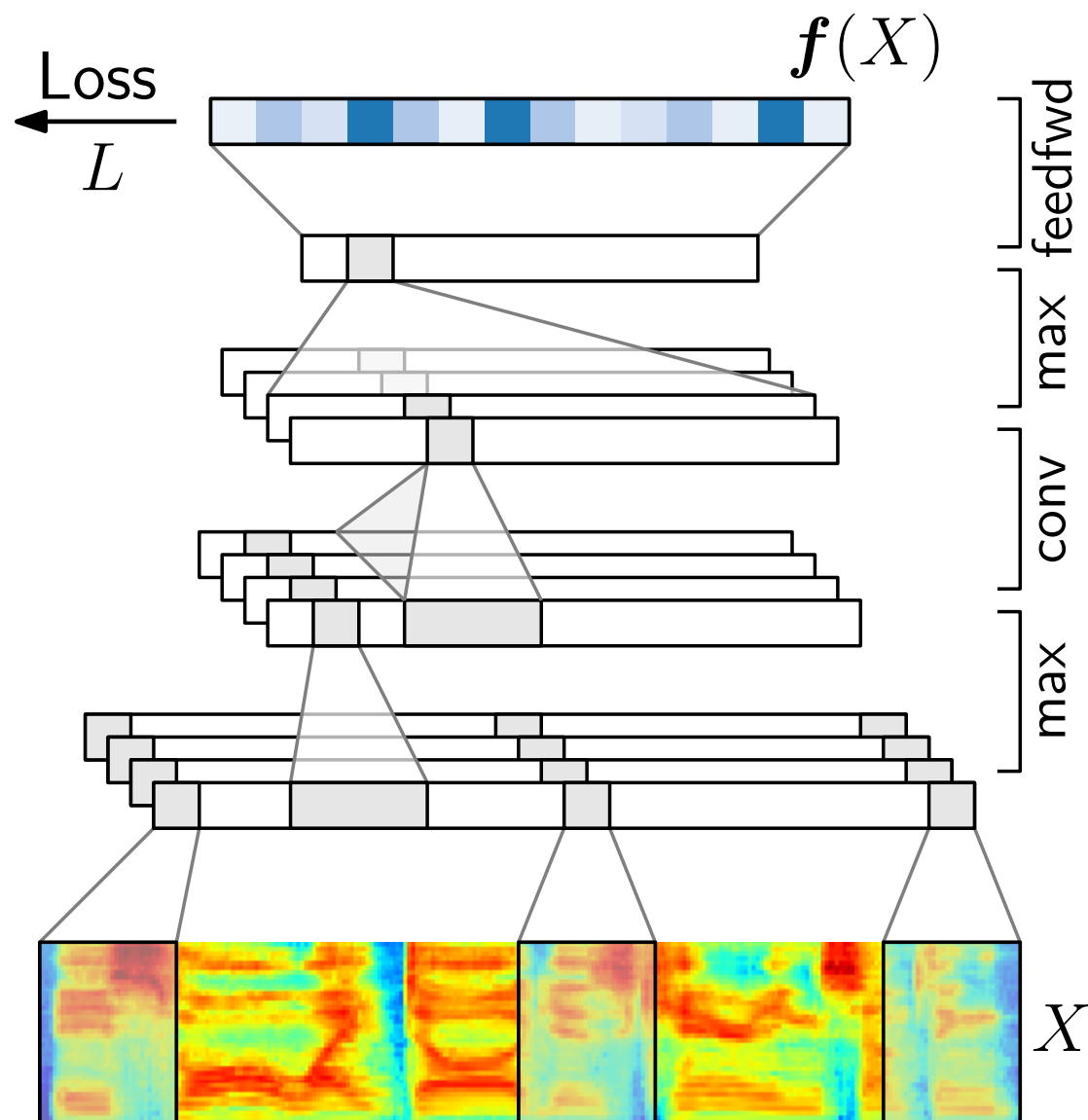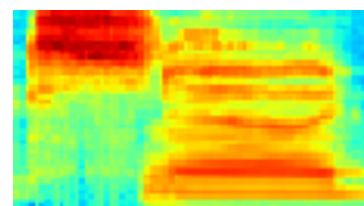
Herman Kamper
kamperh@sun.ac.za

Projects

- Speech to text processing
- Low resource speech processing
- No labels, images as labels
- Unwritten languages

Automatic
segmentation

$\boldsymbol{y}_{\text{vis}}$ hat man shirt

Loss L

$\boldsymbol{f}(X)$

feedfwd

max

conv

max

VGG

X
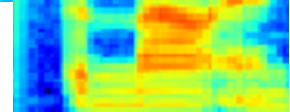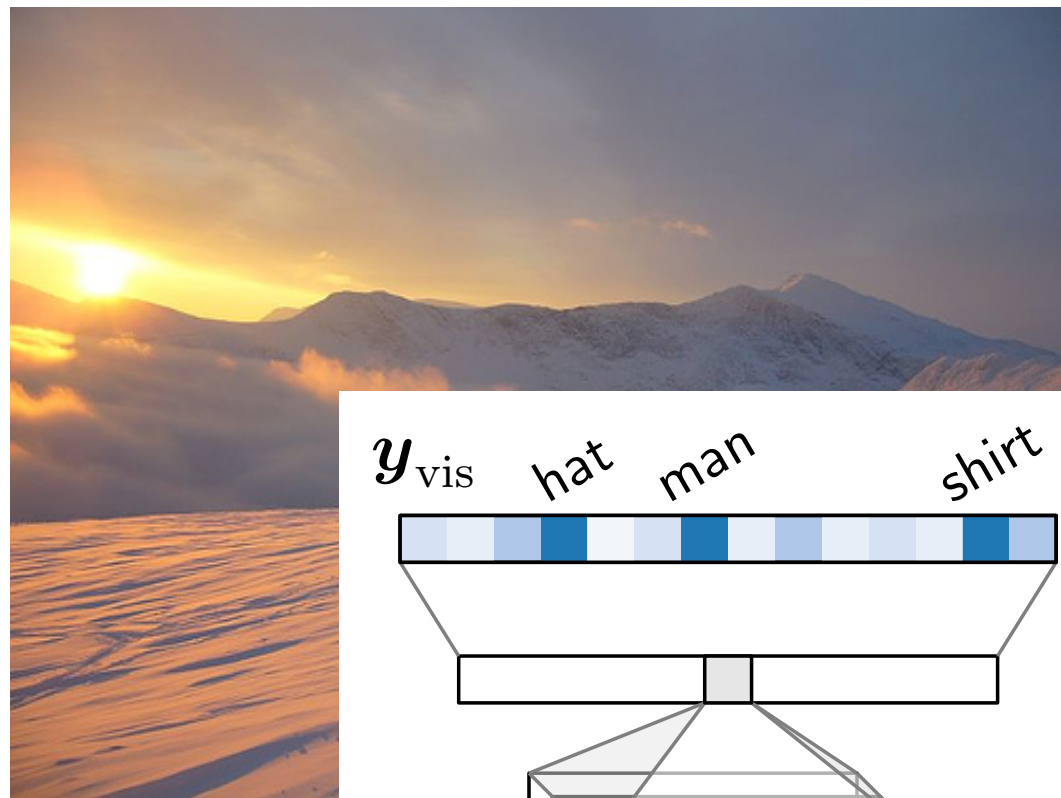
Neural networks

Projects

- Training algorithms
- Initialisation
- Regularisations
- Linear auto-encoders
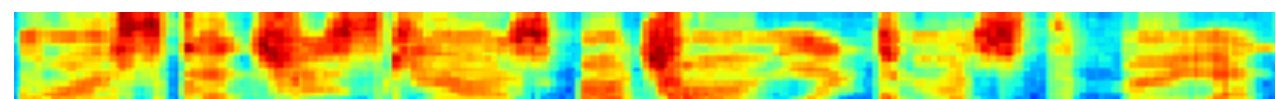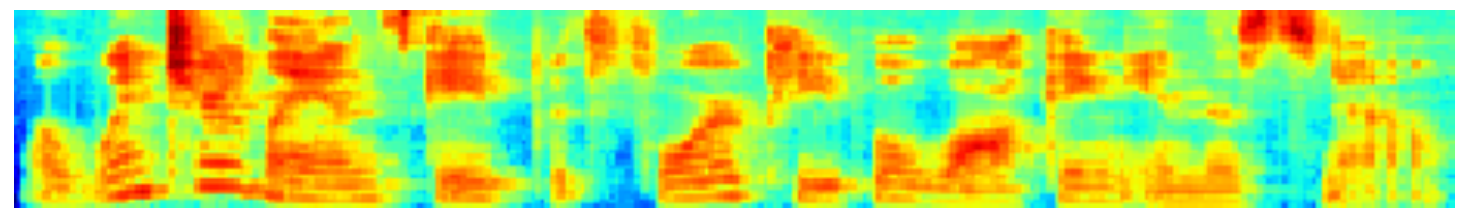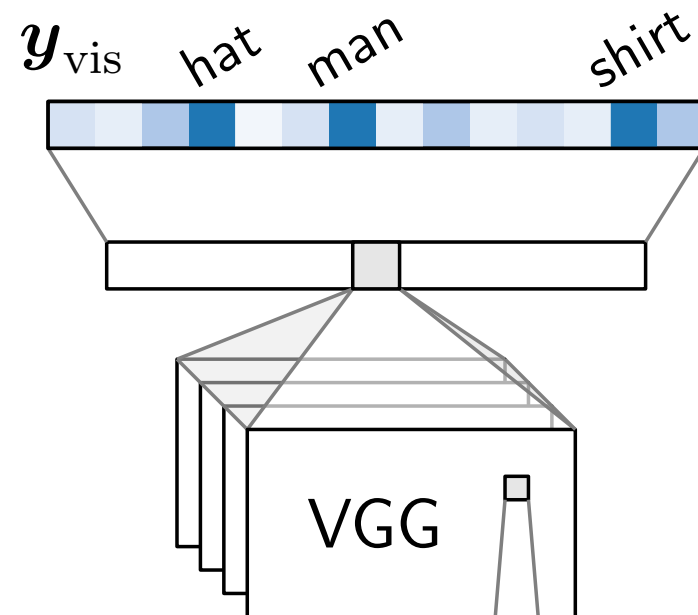- Information propagation

Steve Kroon

kroon@sun.ac.za

$$\mathbf{x} + \epsilon = \tilde{\mathbf{x}} \qquad \tilde{\mathbf{z}} = \phi(W_1\tilde{\mathbf{x}}) \qquad \hat{\mathbf{x}} = W_2\tilde{\mathbf{z}}$$

W_1 W_2

Encoder   Decoder

α
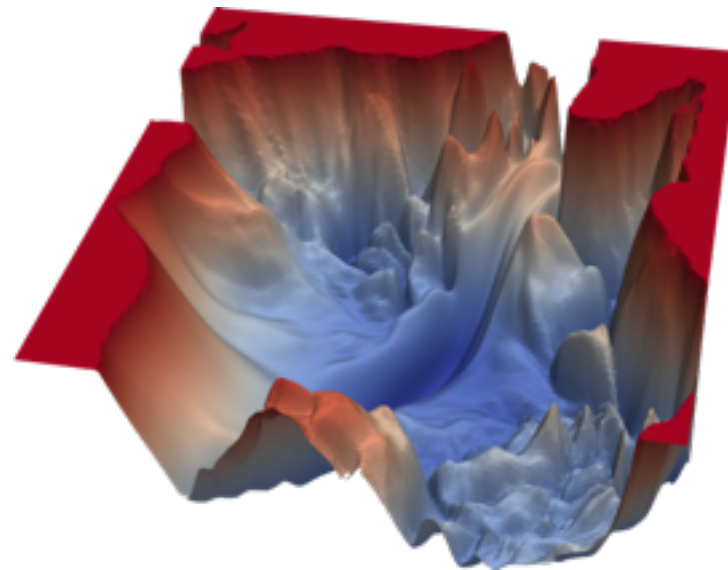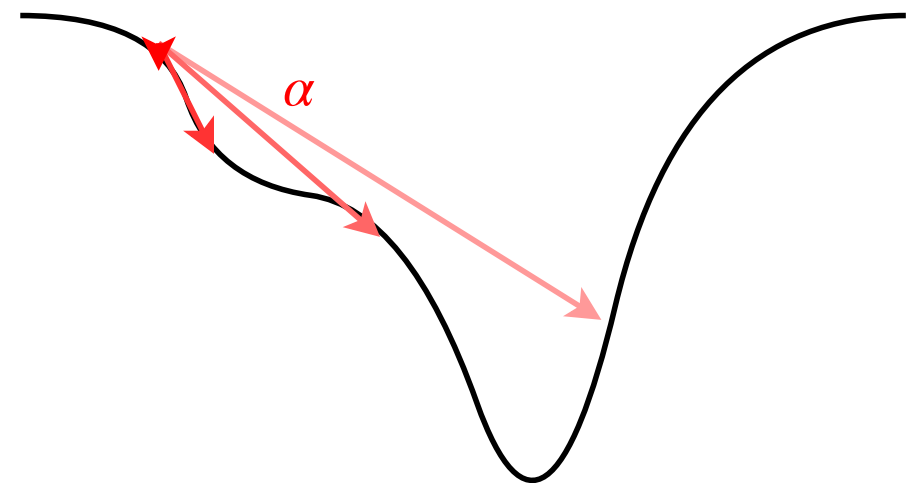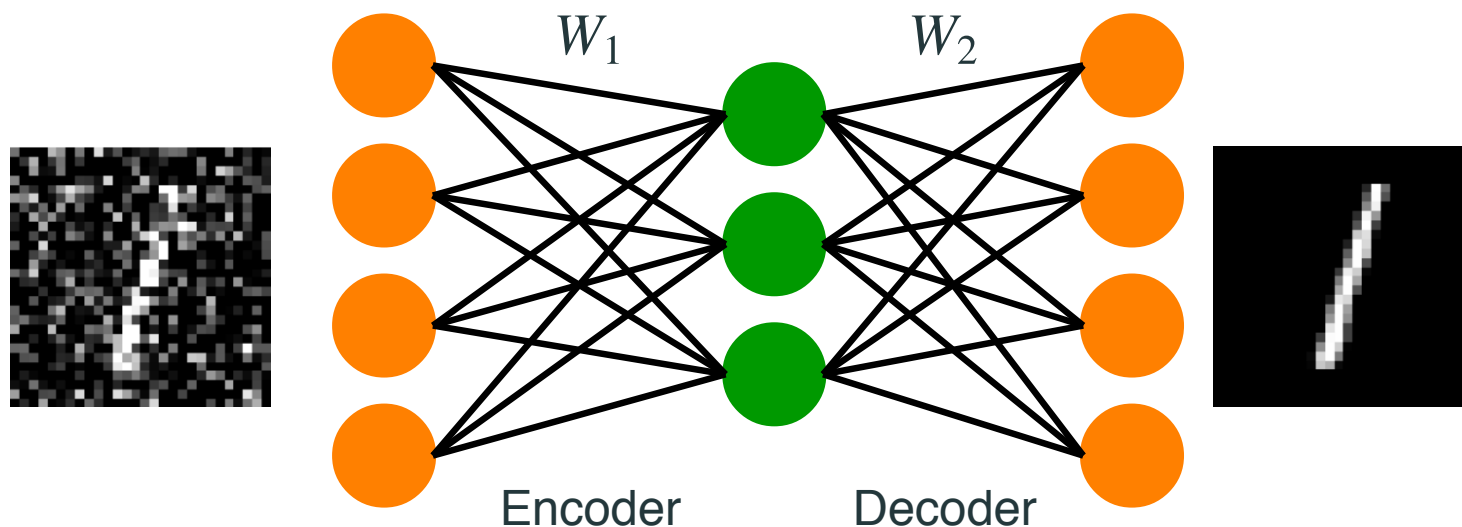
Prediction and simulations

Projects

- Stochastic modelling

- Trajectory simulations

- Rare event prediction

- Financial prediction

- Artificial generation

- Recurrent NNs, VAEs

Teaching

Courses offered

- Statistics
- Machine vision
- Natural language processing
- Neural networks
- Statistical pattern recognition
- Time series
- Markov processes
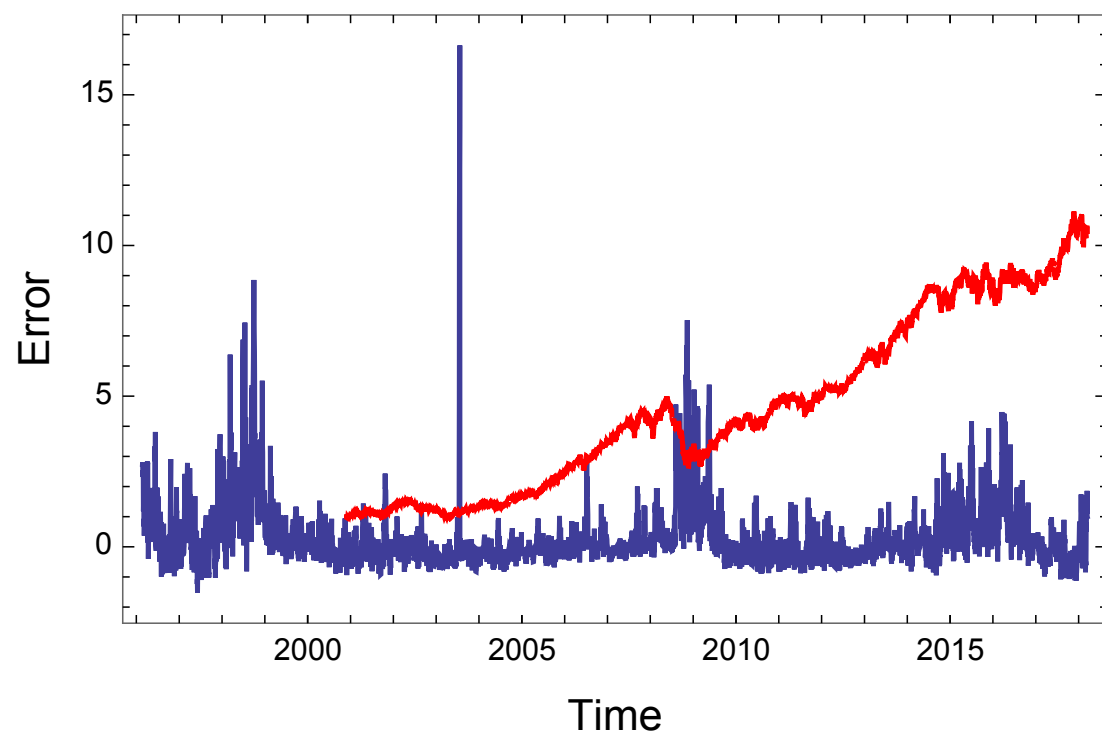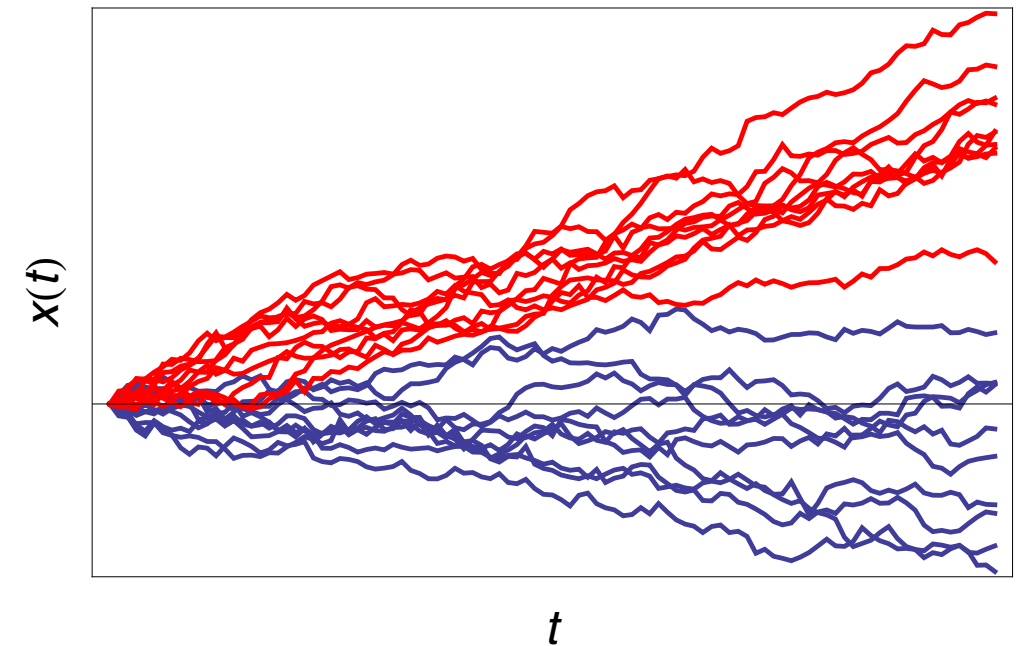
Future offering

- BSc Data Science
- MSc ML/AI

MSc ML/AI

- 1 year structured Masters
- Springboard for industry
- Can lead to PhD
- Developed with Ulrich Paquet (DeepMind Google)

Modules

- Maths for ML
- Foundations of deep learning
- Computer vision
- Natural language processing
- Probabilistic modelling
- Reinforcement learning

www.stellenbosch.ai

ML/AI in Africa

Deep Learning Indaba

- 2018: Stellenbosch
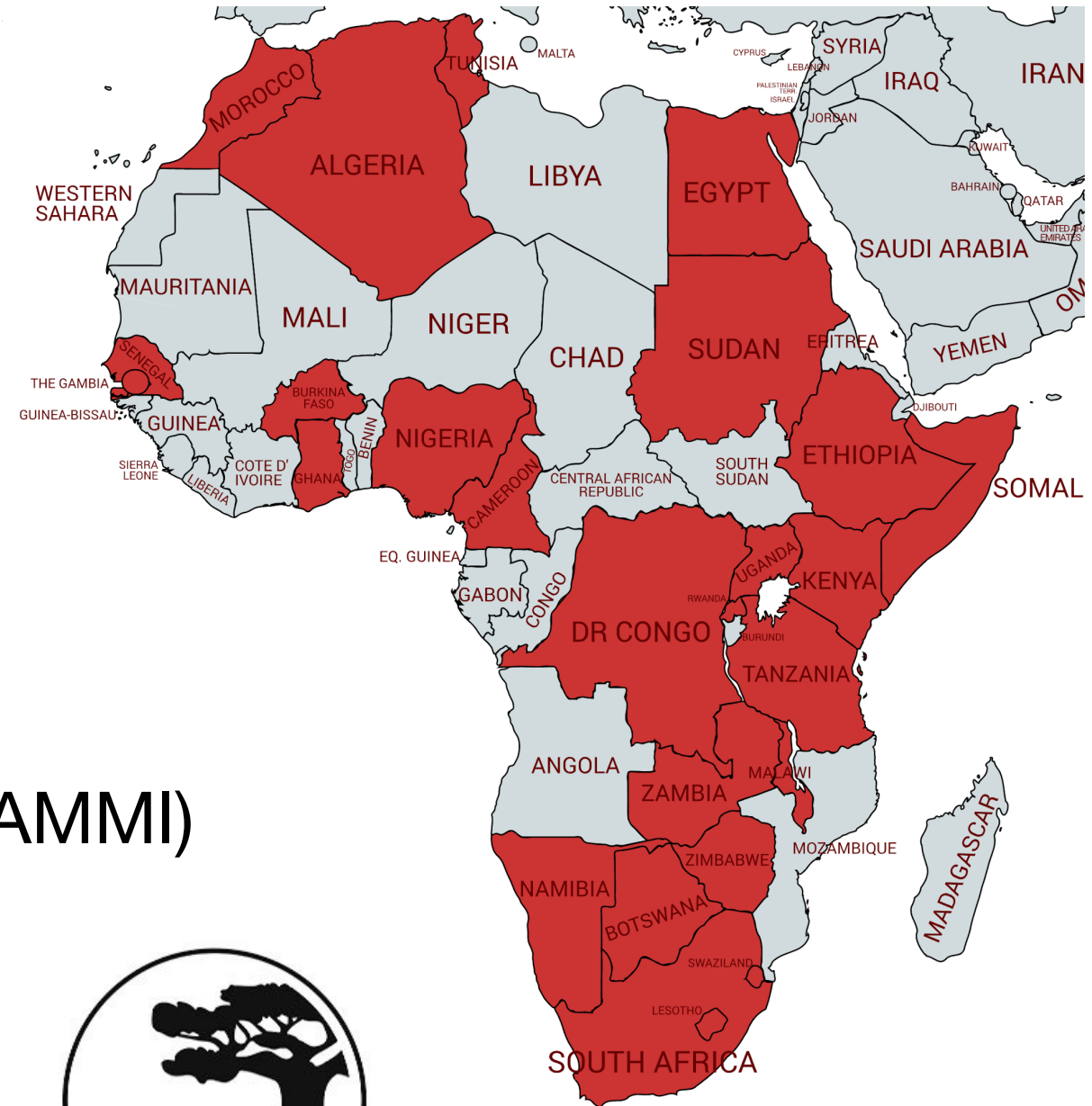- 2019: Nairobi, Kenya

IndabaX

MLDS Africa

AIMS Rwanda

- African MSc Machine Intelligence (AMMI)

Companies

- Amazon (Cape Town)
- Google (Ghana)
- Praelexis (Stellenbosch)
- Aerobotics (Cape Town)

DEEP LEARNING
INDABA

Partnerships

- Technical courses
  - R, Python
  - Data science
  - ML, neural nets
  - TensorFlow, Keras, etc.
- Networking
  - IndabaX
  - MLDS Africa
  - Local startups
- Research collaborations
- Consultancy

- Advisory board
- Scholarships
- Internships
- Support for visitors
- Course suggestions

SU School of Data Science
- Inter faculty school
- Space for DS activities
- Launch: July 2019