



# Applied Deep Learning

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Introduction to Deep Learning  
03.10.2019

Alexander Pacha

# Is this spam?

Congratulations! You have won €650.000,00 in the monthly Euro Millions / Google Promo lottery on April 26th 2019.

Please consult [timothy.berrel@my-email.com](mailto:timothy.berrel@my-email.com) for claiming your winnings with the following information:

1. Full Name
2. Address
3. Birth Date
4. Credit Card Number

Robert Avthantilayn  
Online Coordinator

# Is this spam?

Greetings,

I am Mrs.Margaret Ko May-Yee Leung Deputy Chairman, Managing Director and Executive Director of Chong Hing Bank Limited. I write briefly to seek your collaboration in a multi-million transaction with good return for us on participation. Reply for details.

Regards,

Margaret Ko Leung

# What do you see?



Source: <https://bristolcountyvet.com/wp-content/uploads/2018/11/pexels-photo-min.jpg>

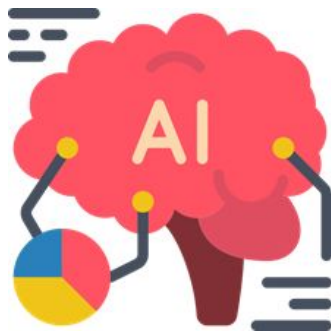
# What do you see?



Source: <https://www.boredpanda.com/dog-food-comparison-bagel-muffin-lookalike-teenybiscuit-karen-zack>

# Machine Learning as Alternative

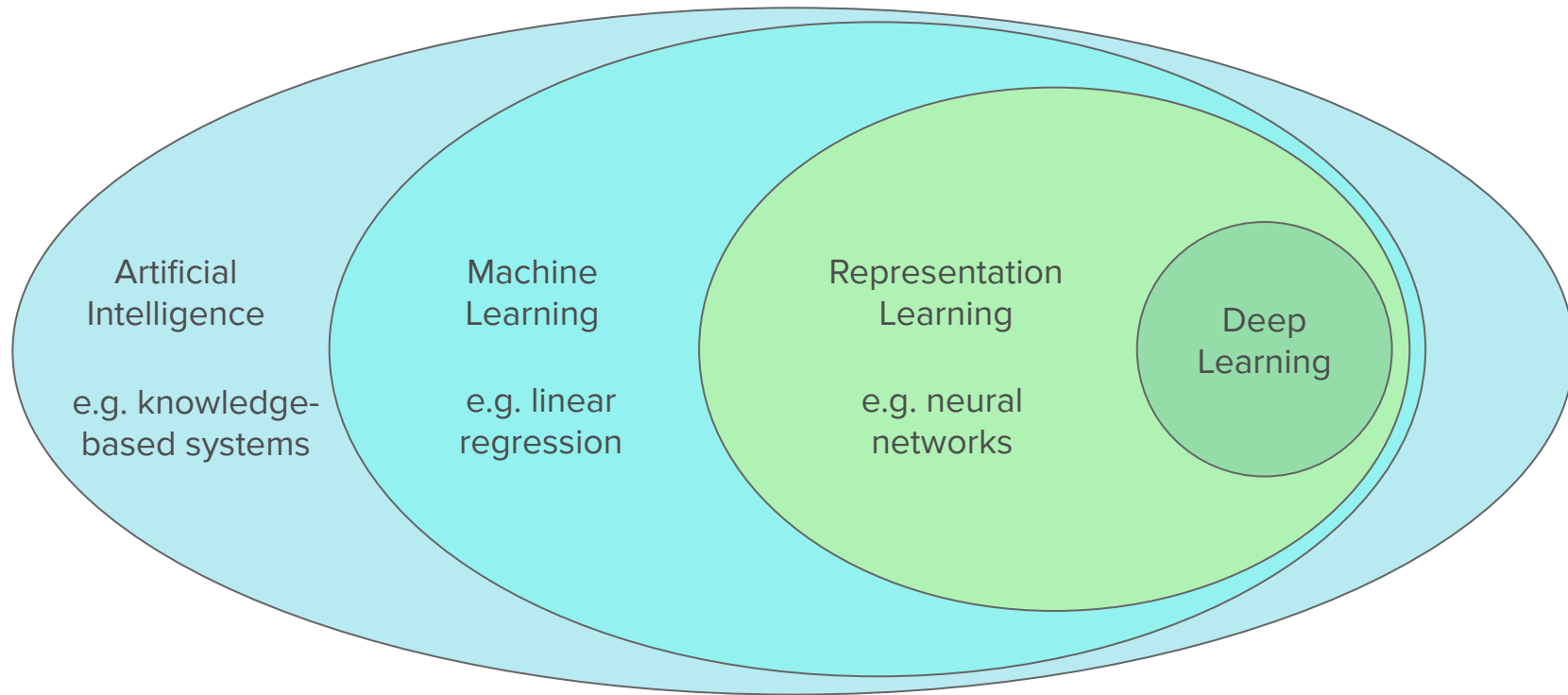
- Classical Programming quickly reaches its limits in certain situations
- Machine Learning can be a viable alternative to imperative programming



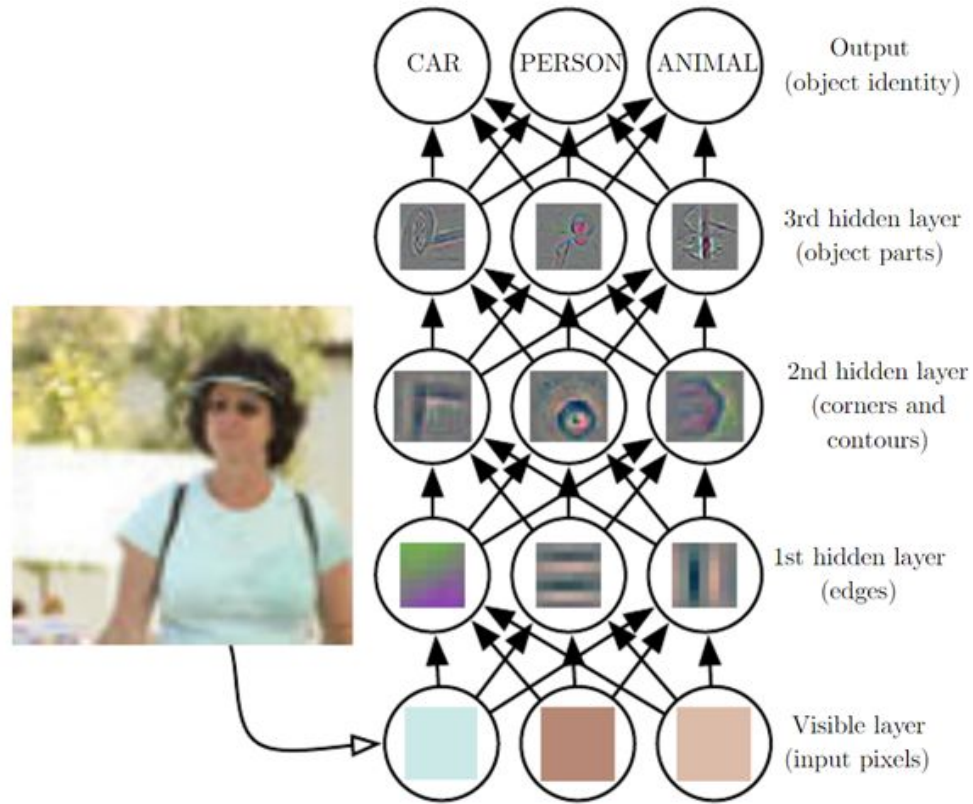
Training

Machine Learning = Use data to answer questions  
Inference

# Terminology



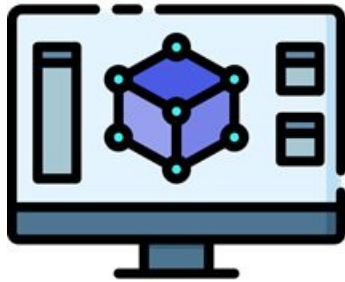
# Meaningful Representation



Source: <http://www.deeplearningbook.org/>



# How Can a Machine Learn?



Model



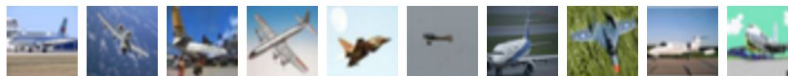
Loss



Optimization function

# Image Classification

**airplane**



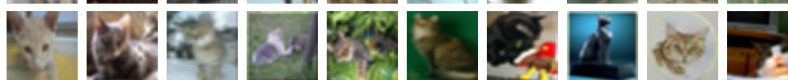
**automobile**



**bird**



**cat**



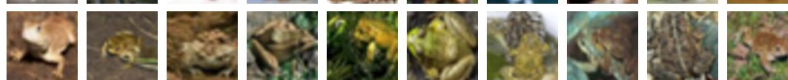
**deer**



**dog**



**frog**



**horse**



**ship**

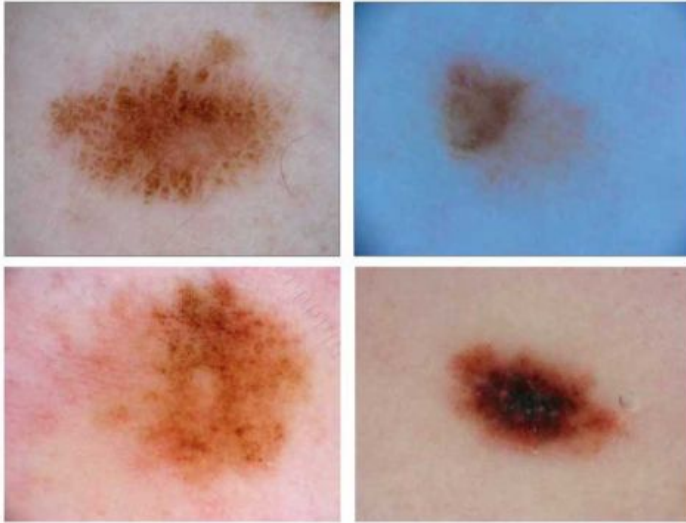


**truck**

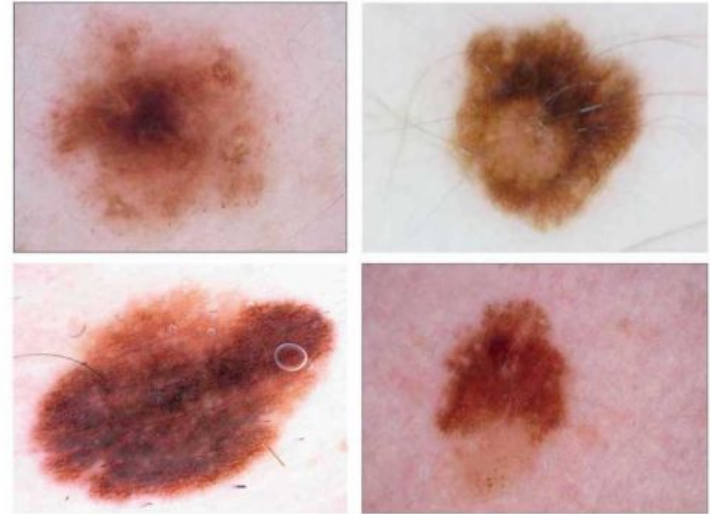


# Image Classification

Melanoma

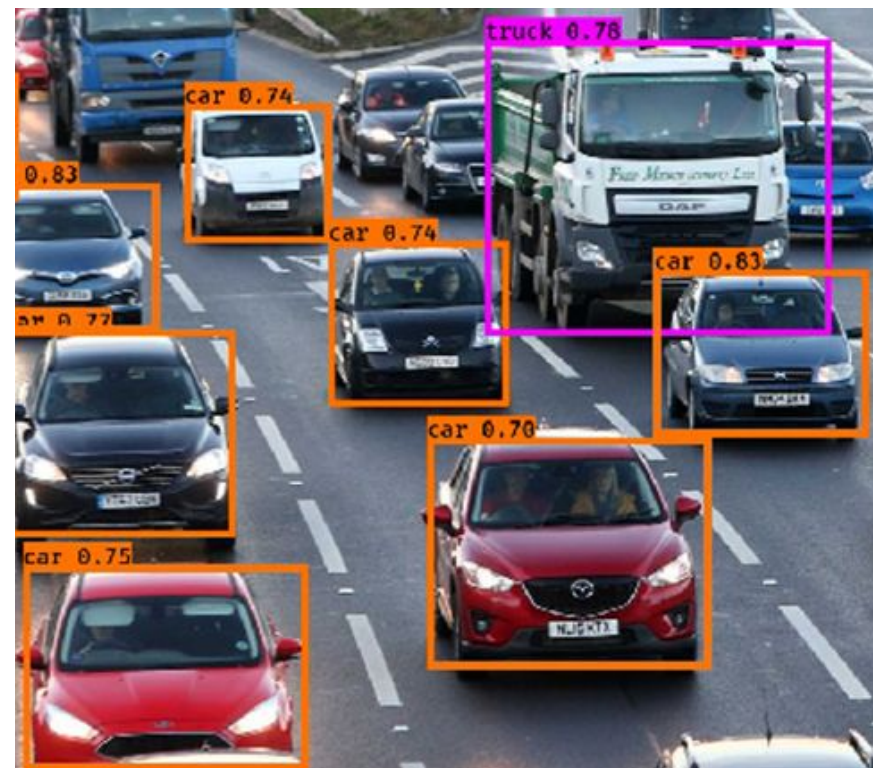


Benign



Source: Lopez et al. Skin lesion classification from dermoscopic images using deep learning techniques. 2017

## A handwritten musical score for the song 'The Rose Tree'. The score is written on ten staves, organized into five systems of two staves each. The notation includes treble and bass clefs, a key signature of one sharp (F#), and a common time signature (C). The melody is written in the upper staff of each system, while the lower staff contains accompaniment, often featuring chords and arpeggiated figures. The lyrics 'The Rose Tree' are written below the first staff. The score is marked with various performance instructions such as 'P' (piano), 'F' (forte), and 'Cresc.' (crescendo). There are also dynamic markings like 'p' and 'f' within the notes. The handwriting is in purple ink on white paper.



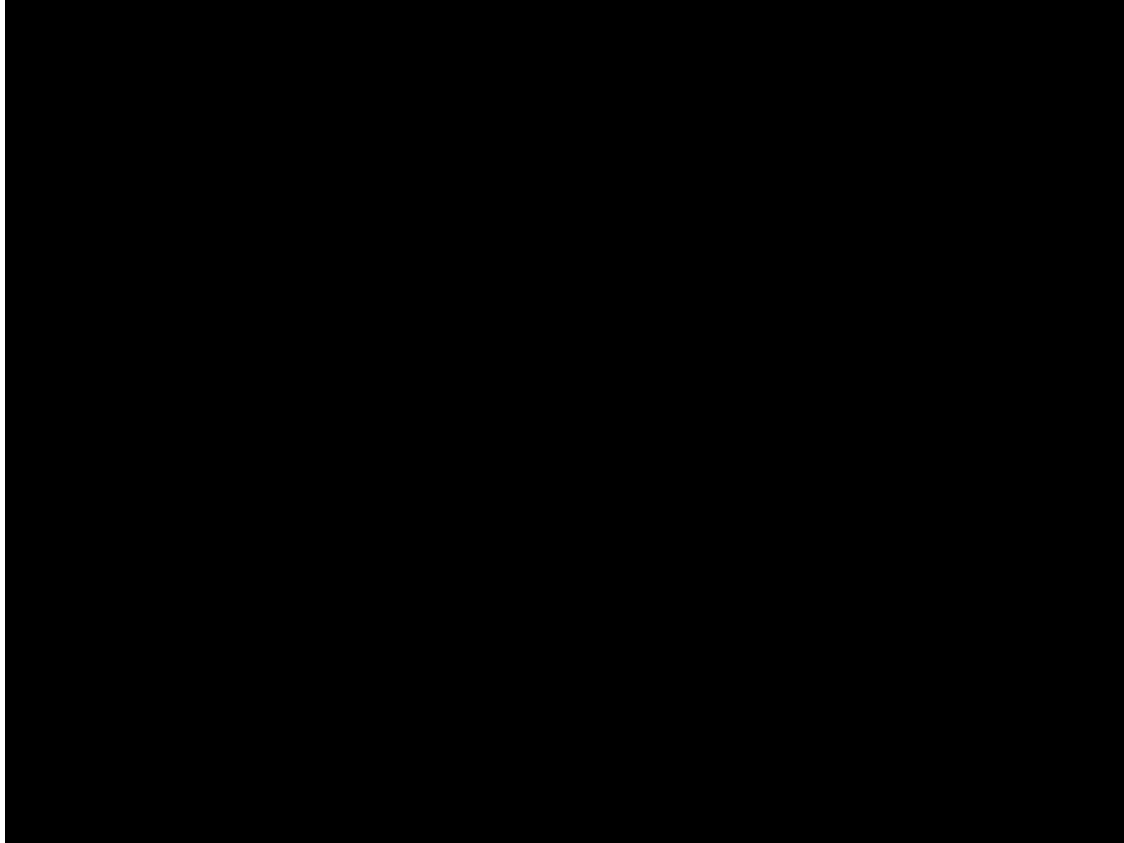
# Voice Recognition and Natural Conversation

Google Duplex calls a hairdresser



Source: <https://ai.googleblog.com/2018/05/duplex-ai-system-for-natural-conversation.html>

# Robo Calls



Source: [https://www.youtube.com/watch?v=FO0iG\\_P0P6M](https://www.youtube.com/watch?v=FO0iG_P0P6M)

# Music Harmonization

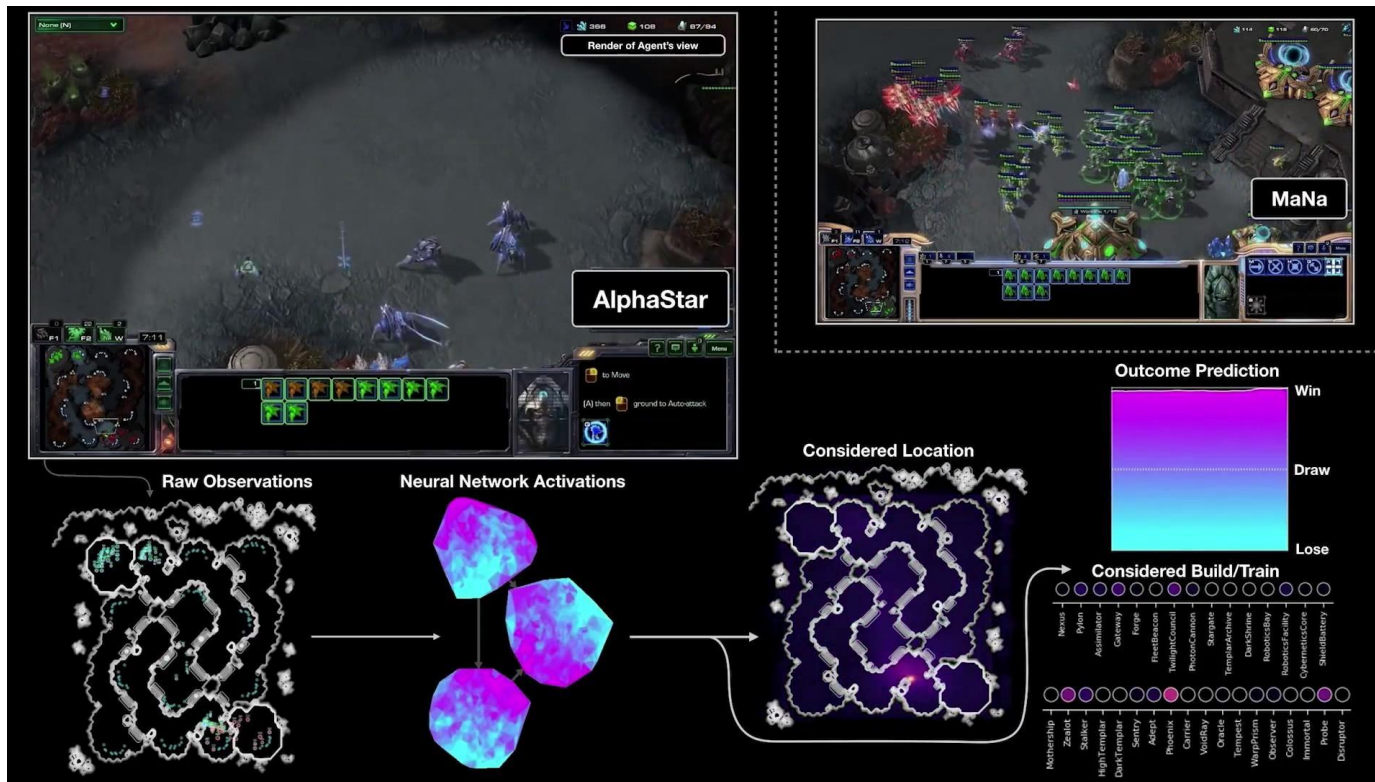
DeepBach



Source: <https://www.youtube.com/watch?v=QiBM7-5hA6o>



# Deep Mind Plays Star Craft II





# Summary

Machine Learning can be an alternative to imperative programming

Machine Learning = Using data to answer questions

Deep Learning can do pretty cool stuff

