
PANEL #3

LISBON
March 2025

# Theme
# Cognition, Intelligence, and AI

# InfoSys 2025 & InfoWare 2025

# PANEL #3

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## Moderator

**Dennis Folds, Lowell Scientific Enterprises, USA**

## Panelists

**Prof. Dr. Fernanda Eliott, Grinnell College, USA**
**Ping Wang, Jinqi-Micro, China**
**Dr. Leigh Johnston, Ulster University, Northern Ireland, UK**
**Dr. Martin Zinner, Technische Universität Dresden, Germany**

# Chair Introduction

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- Early humans learned to harness natural sources such as fire and running water to improve *survival* and *quality of life*.
- Early engineers modified natural objects to improve functional capabilities of the earliest human-machine systems.
- These eventually led to the Age of Machines

Dennis Folds
LSE

# Chair Introduction

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- Gradual development of capabilities machine-based information processing
- Machine intelligence is difficult to define in a generally acceptable way, but:
  - Involves machine-based information processing
  - That becomes capable of performing tasks that previous machines couldn’t do very well because of information processing limitations
  - Until it becomes well understood and ubiquitous

# Chair Introduction



Fears

- Malevolent machines
- Immature machine intelligence
- Rational machines that correctly perceive our deficiencies and conclude humanity should be destroyed or at least subjugated

Hopes

- Intelligent machines will find our intelligence useful and valuable, and will find a way to preserve it and make use of it
- Biological intelligence will merge with machine intelligence
- Transcendence (augmented biology, non-biological humanity)

# Panelist Position

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Fernanda Eliott
Grinnell College

- **Misalignment and the coordination/cooperation ambiguity**
  1. Does the cooperation/coordination ambiguity play a role into misalignment? (human/human and human/machine)
  2. Can the ambiguity cause potentially bad outcomes?
  3. How to treat variants, such as collaboration? Is opposite coordination the same as competition? What sort of ambiguities exist at the human level? Do these ambiguities contribute to misalignment?
  4. To what extent, if any, does a "cooperative" system need empathy?
- **Leadership and Accelerated Human Response**
  1. What are the challenges and opportunities available to leaders empowered by GenAI tools?
  2. What skills should one emphasize to be a powerful leader in today's world? How to assess leadership nowadays?
  3. How to cope with today's fast pace and reduced time for reflection before making big, irreversible decisions?

# Panelist Position

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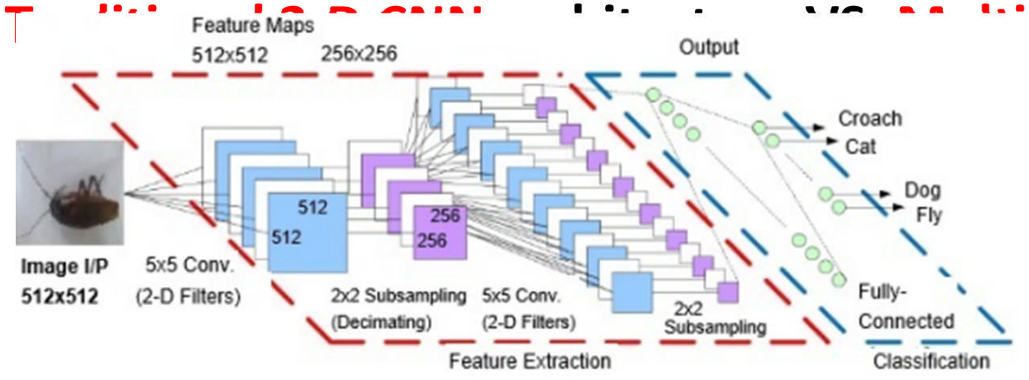
- **Multirate CNN Architectures for Efficient Implementation of Deep Learning**

**Ping Wang**
San-xin-dui Tech

During the rapid growth in computation power, Deep Learning (DL) using CNN has widened the areas of the Artificial Intelligent (AI) applications. In the layers of the convolution with pooling (decimating) in CNN some researchers [*i.e.* J. E. Franca and R. P. Martins, 1994] work has initially applied the multirate algorithms to the traditional (non-multirate) filtering kernel of using polyphase architectures resulting in the efficient implementation of the multirate convolution (filtering ) in the mixed-signal (digital-analog) domain. This work extends the multirate algorithms into 2-D CNN for in DL system.

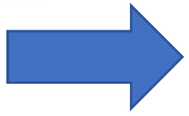
- **Traditional 2-D CNN architecture VS Multira**

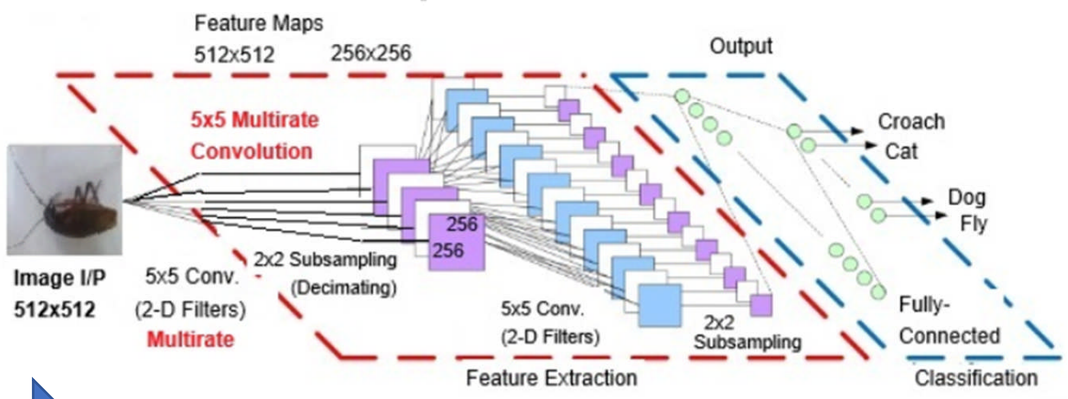



Traditional CNN

*Example*: 1st Convolution Layer with

Image memory (512x 512x 6frames)






Multirate CNN

Larger image memory size can be reduced

# Panelist Position

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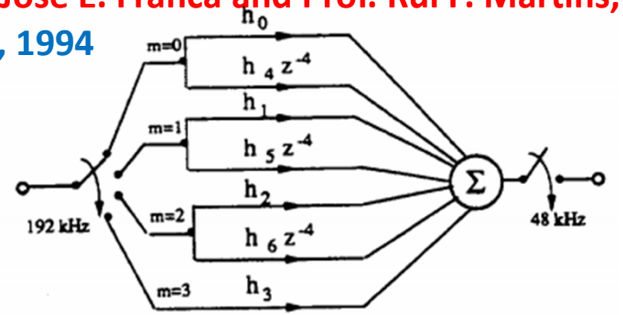
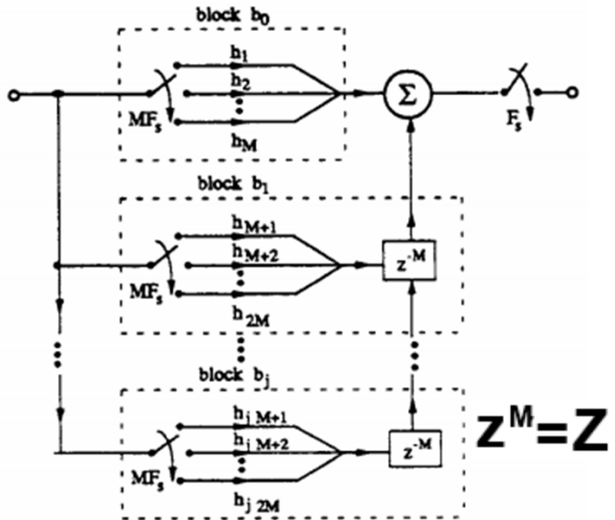
Courtesy of Prof. Jose E. Franca and Prof. Rui P. Martins, "*Multirate Switched-Capacitor Filters*", 1994



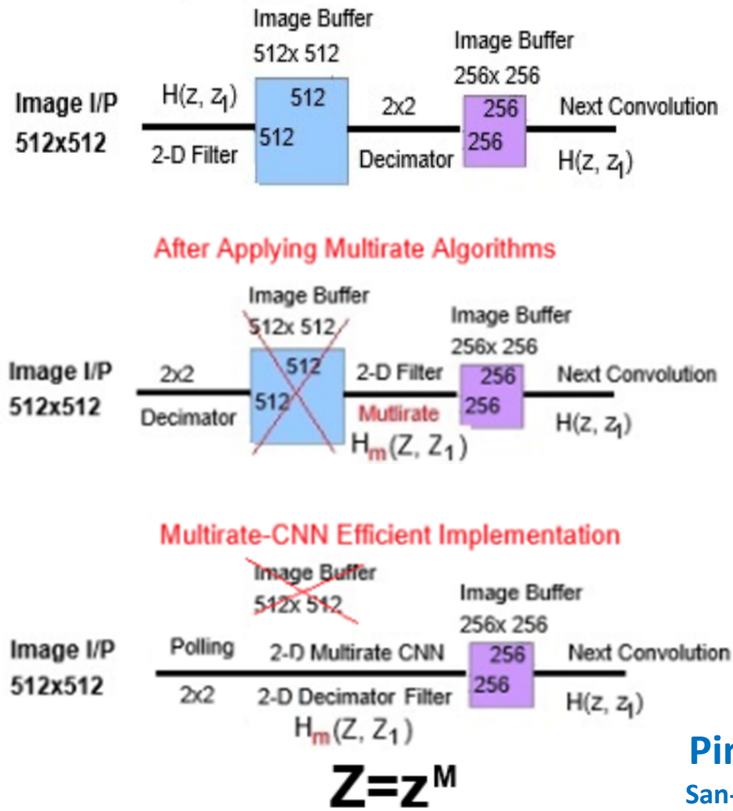

FIR polyphase filter for a polling (decimator) *M*=4 can be considered as an 1-D multirate CNN implementation.




Polyphase efficient structures result in the operating frequency and memory size are reduced by factor *M*=3

Similar to 1-D CNN, the 2-D multirate CNN with a polling (decimator) *M*=2x2 can achieve more efficient implementation as illustrated below

*Example*: Look at only one-channel from above Deep Learning System





**Ping Wang**
San-xin-dui Tech

# Panelist Position

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## Cognition, Intelligence and AI from a UX perspective

Dr Leigh Johnston
Ulster University

- **AI should augment, not replace, human cognition in UX**
  AI applications should *enhance* human cognitive abilities, not just automate decision-making.
  Predictive interfaces should anticipate user needs based on their behavioural data, opposed to overwhelming with redundant information.
  AI should be transparent, explainable and sustainable to build user trust.

- **IoT frameworks prioritise technology over human interaction, this can be addressed by:**
  Adopting a human-centred design approach for the well-being of users and their needs.
  Combining the needs of industry with individuals and IoT to enhance the human-machine experience of Smart Manufacturing systems.

# Panelist Position

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- **Cognition, Intelligence and AI** ***(Human vs. Machine Intelligence, Neuroscience-Inspired AI, Reasoning and Decision-Making, Embodied, Cognition and Robotics, Cognitive Bias and AI Interpretability, Consciousness and Sentience in AI, etc.)***

Martin Zinner
Technische Universität Dresden

- **Artificial Intelligence is the discipline that focusses on the development of computers and robots that are capable of exhibiting behaviours that both emulate and surpass human capabilities.**
  - **AI-enabled programs can analyse and contextualise data to provide information or automatically trigger actions without human interference.**
- **Computer programmers and software developers enable computers to analyse data and solve problems — essentially, they create artificial intelligence systems — by applying tools such as,**
  - **a) machine learning,**
  - **b) deep learning,**
  - **c) neural networks,**
  - **d) computer vision, and**
  - **e) natural language processing.**

Artificial Intelligence (AI) vs. Machine Learning | Columbia AI

# Panelist Position (cont'd)



- **How Companies Use AI and Machine Learning**
  - **AI in the Manufacturing Industry**
    - **Identifying equipment errors before malfunctions occur, using the internet of things (IoT), analytics, and machine learning.**
    - **Using an AI application on a device, located within a factory, that monitors a production machine and predicts when to perform maintenance.**
    - **Studying energy consumption patterns and using machine learning to adjust to optimal energy saving and comfort level**
  - **AI and Machine Learning in Banking**
    - **Using machine learning to detect and prevent fraud and cybersecurity attacks,**
    - **Integrating biometrics and computer vision to quickly authenticate user identities and process documents.**
    - **Incorporating smart technologies such as chatbots and voice assistants to automate basic customer service.**
  - **AI Applications in Health Care**
    - **Analysing data from users' electronic health records through machine learning to provide clinical decision support and automated insights**
    - **Integrating an AI system that predicts the outcomes of hospital visits to prevent readmissions and shorten the time patients are kept in hospitals.**
    - **Capturing and recording provider-patient interactions in exams or telehealth appointments using natural-language understanding**
  - **Applying lessons learned:**