[Energy] Efficiency for Artificial Intelligence

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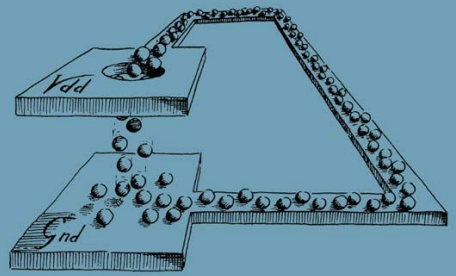
PURDUE UNIVERSITY®

2002/06

Dynamic Power Management

Design Techniques and CAD Tools

Luca Benini
Giovanni De Micheli



Kluwer Academic Publishers

POWER-AWARE OPERATING SYSTEMS FOR INTERACTIVE SYSTEMS

A DISSERTATION
SUBMITTED TO THE DEPARTMENT OF ELECTRICAL ENGINEERING
AND THE COMMITTEE ON GRADUATE STUDIES
OF STANFORD UNIVERSITY
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY

Yung-Hsiang Lu
December 2001

I certify that I have read this dissertation and that, in my opinion, it is fully adequate in scope and quality as a dissertation for the degree of Doctor of Philosophy.

Giovanni De Micheli
(Principal Adviser)

I certify that I have read this dissertation and that, in my opinion, it is fully adequate in scope and quality as a dissertation for the degree of Doctor of Philosophy.

Dawson-Engler

I certify that I have read this dissertation and that, in my opinion, it is fully adequate in scope and quality as a dissertation for the degree of Doctor of Philosophy.

Teresa Meng

Approved for the University Committee on Graduate Studies:

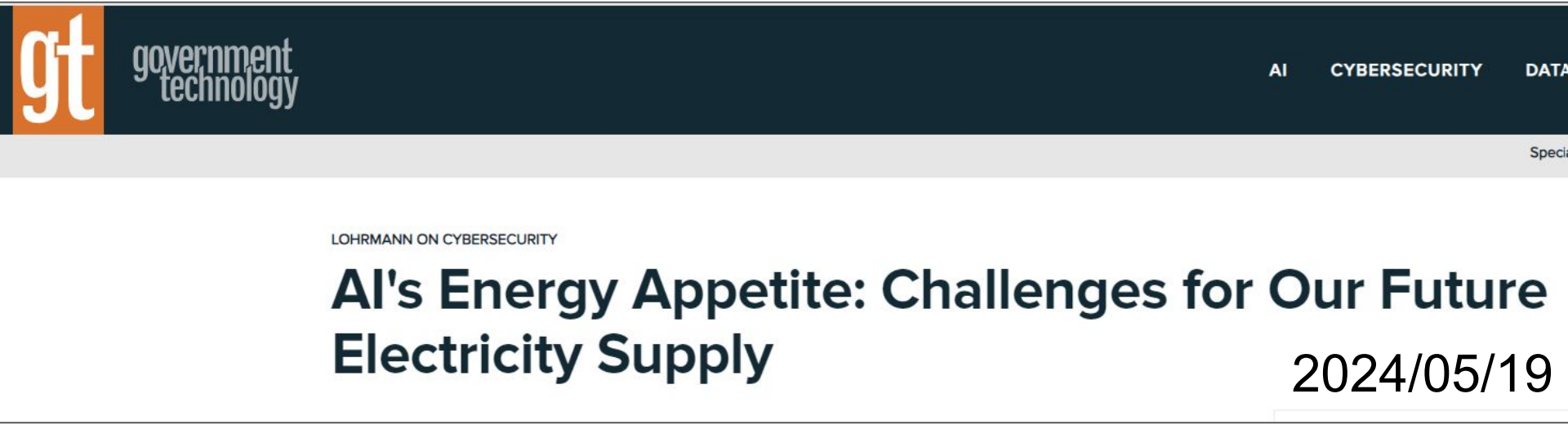
IEEE Spectrum FOR THE TECHNOLOGY INSIDER

2023/10/29

NEWS | ARTIFICIAL INTELLIGENCE

Generative AI's Energy Problem Today Is Foundational

Before AI can take over, it will need to find a new approach to energy


government technology
AI
CYBERSECURITY
DATA
LOHRMANN ON CYBERSECURITY
AI's Energy Appetite: Challenges for Our Future Electricity Supply
2024/05/19

The Washington Post
Democracy Dies in Darkness

2024/03/07

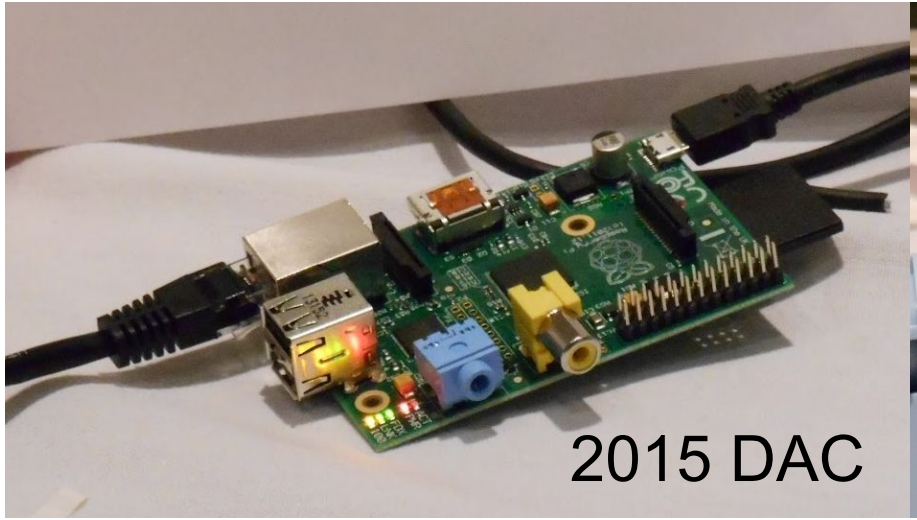
BUSINESS

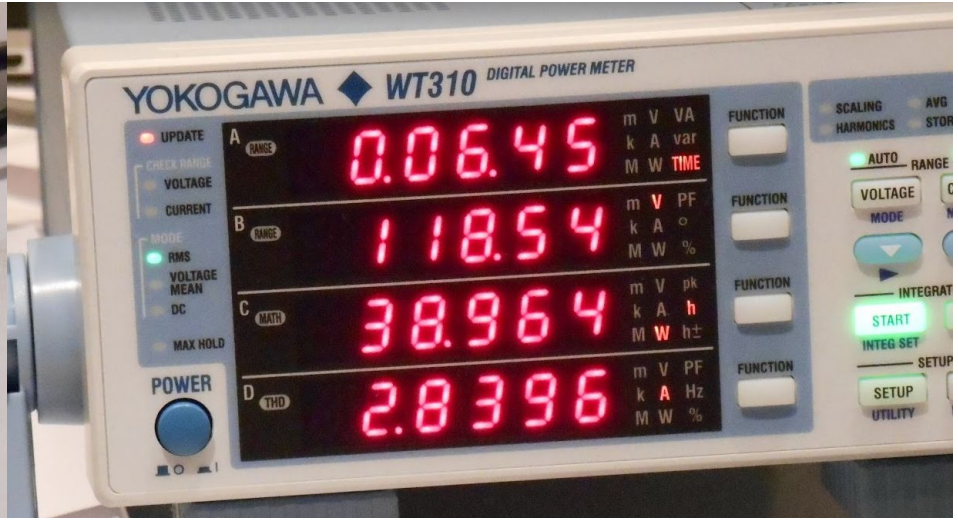
Amid explosive demand, America is running out of power

AI and the boom in clean-tech manufacturing are pushing America's power grid to the brink. Utilities can't keep up.

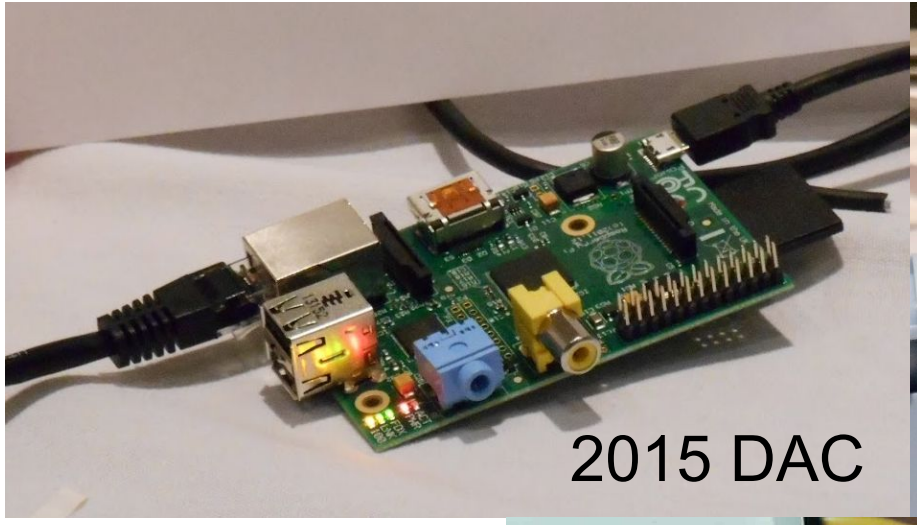
IEEE Rebooting Computing
Summit
2013
IEEE

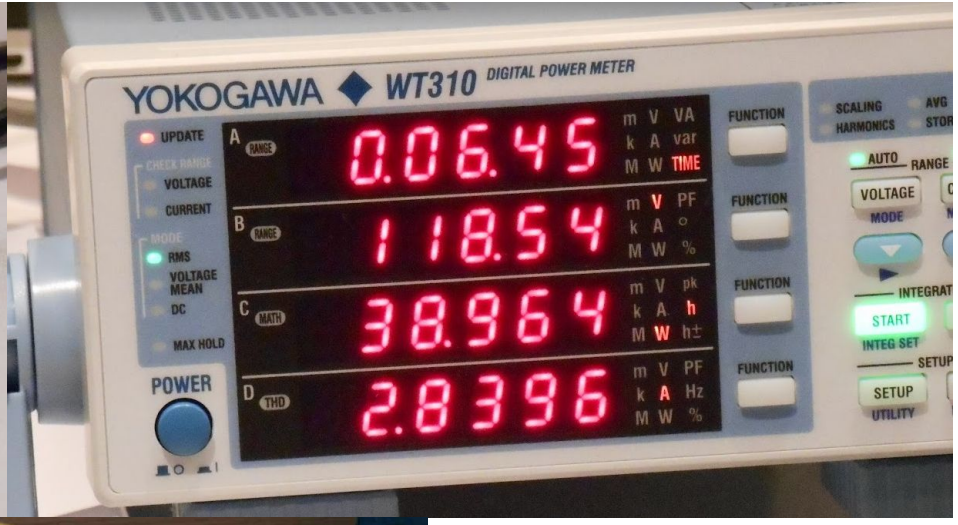
IEEE
2015
Low Power Image Recognition Challenge
Congratulations to All Winners





$$\text{score} = \frac{\text{accuracy}}{\text{energy}}$$


2015 DAC


YOKOGAWA
WT310
DIGITAL POWER METER
0.06.45
118.54
38.964
2.8396
POWER

SCB-68
NOTICE
NATIONAL INSTRUMENTS
2001 Stanford

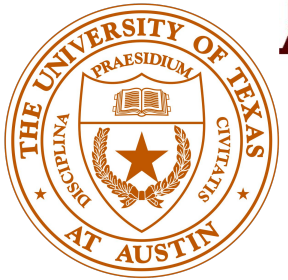
2019 Award Announcement at CVPR

IEEE Low-Power Computer Vision Challenge

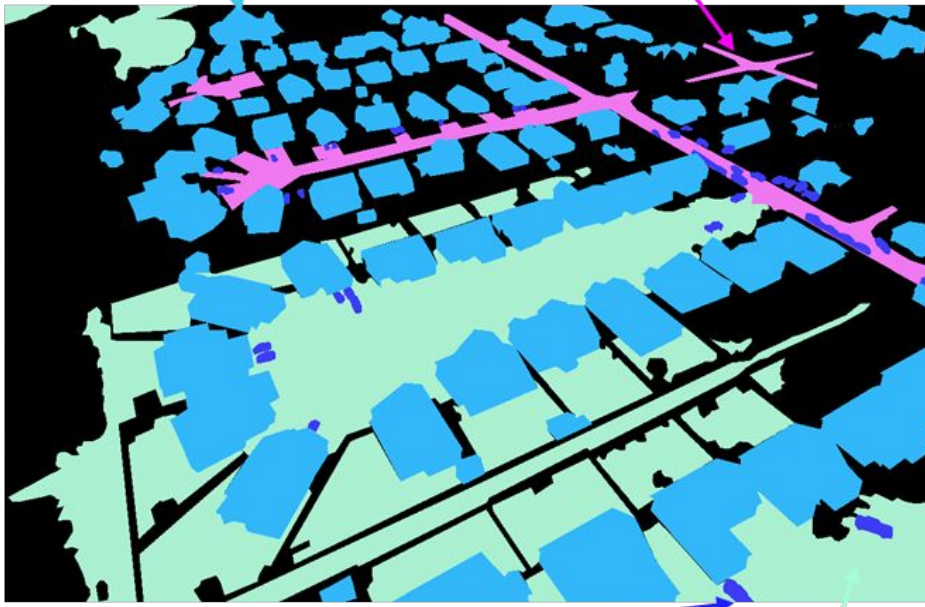
Sponsors:

Winners since 2015

Massachusetts Institute of Technology

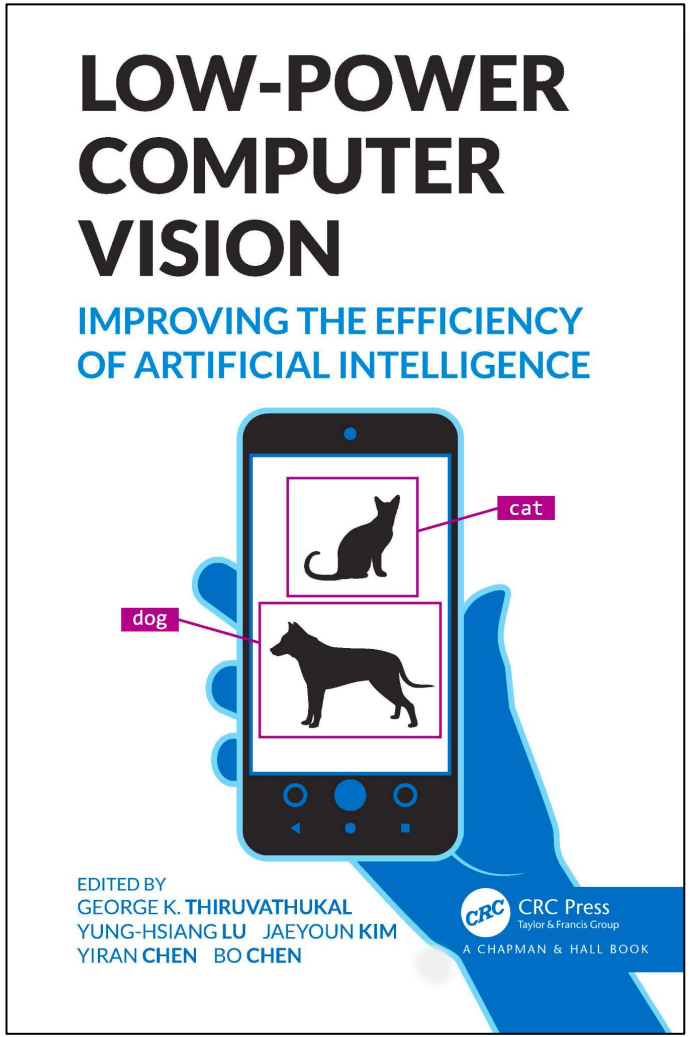


2023 Segmentation Challenge (117 teams)



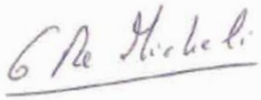
Growth of the competition (online since 2018)

Year	Teams	Submissions
2018	21	131
2019	22	234
2020	46	378
2021	53	366
2023	117	676
Total	**259**	**1,785**



The search for bettering energy efficiency would not be possible without realistic drivers and a world-wide participation of researchers. This is why the low-power computer vision challenge has been, and currently is, an important instrument for advancing the state of the art. The challenge was taken by some of the best groups in the world, and their effort has tackled the problem with different means and perspectives. Overall, this challenge has brought us very important results, that are fully documented in this book, and that will provide a strong impact on industry and academia.

Lausanne, March 2021
Giovanni De Micheli



February 23, 2022 by Chapman & Hall