EDA Group

Massimo Poncino
Dipartimento di Automatica e Informatica

the EDA group

- **E**lectronic **D**esign **A**utomation
  - 6 Faculty members
    - Enrico Macii
    - Massimo Poncino
    - Alberto Macii
    - Andrea Acquaviva
    - Elisa Ficarra
    - Andrea Calimera
  - 4 post-doc researchers
  - ~10+ Ph.D. students & Research Assistants
- Three main areas of research:
  - ***EDA***
  - ***Technologies for Smart Cities***
  - ***Bioinformatics***

EDA in the EDA group

- Historical research area of the group
  - Are of major research achievements

- Summary in a nutsheel:
  design automation of **energy-efficient systems**

Recent Research Topics (1)

- **CAD for electrical energy systems (EES)**
  - **Battery modeling**
    - Battery m
    - Battery m (capacity
    - Macromo
  - **Hybrid EES**
    - Optimal c /recycling
    - Interactio and powe
    - Thermal m storage devices
  - **Smart battery chargers**
    - Non-standard algorithms/policies for fast charge

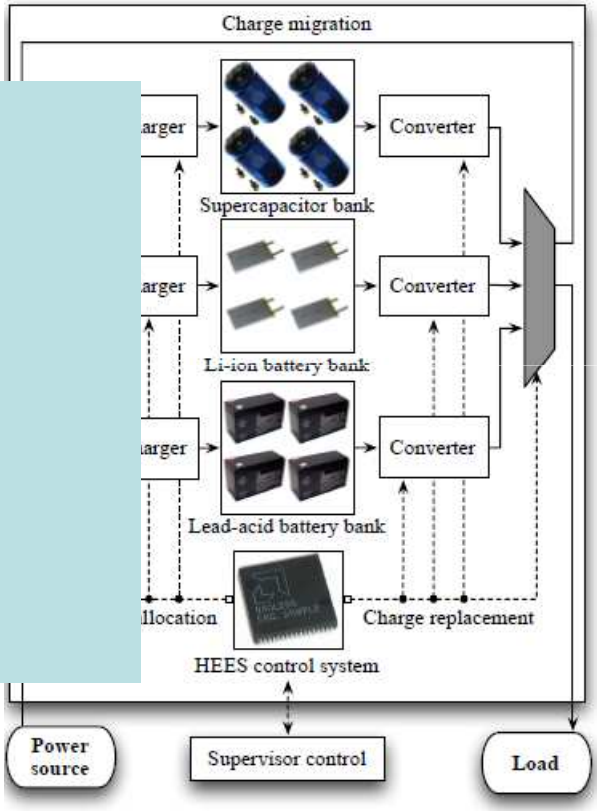
People:

Alberto Macii

Sara Vinco

Alberto Bocca

Yukai Chen



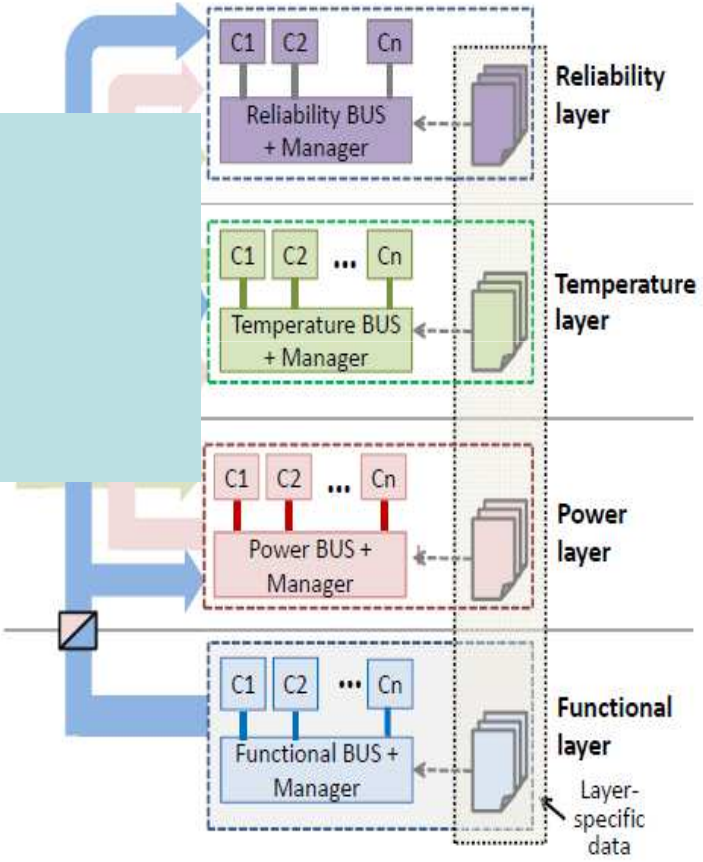
Recent Research Topics (2)

- **CAD for electrical energy systems (EES)**
  - **General Cyber-Physical Energy Systems**
  - Open-source, exten… SystemC/AMS+IP-X… framework
  - Implementation of …
  - Extension to extra-f…
    - **Aging**
    - **Temperature**
    - **Operational cost**

People:

Sara Vinco

Yukai Chen



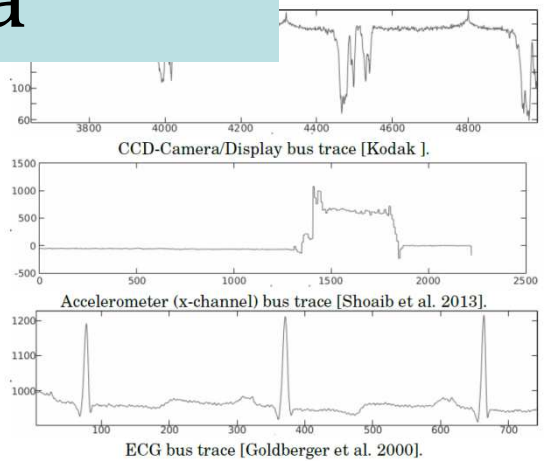
Recent Research Topics (3)

- **Approximations for energy-efficient systems**
  - **Computation**
    - **Architectural and circuit-level techniques for optimal accuracy/power tradeoffs**
  - **Data**
    - **Image mar**
  - **Sensing**
    - **Serial encodings for sensor interfaces**

People:

Daniele Jahier Pagliari

Andrea Calimera



Recent Research Topics (4)

- **CAD for smart systems/devices**
  - **Integration-aware synthesis in the digital domain**
    - Modeling of non-functional properties
    - Automated synthesis of self-detecting digital IP based on ti… abstractio… for TLM si…
  - **Modeling an… devices and … system co-si…** (fits into #2 a…
    - Abstract m… devices an… Abstract m… devices (ba…

People:

Sara Vinco

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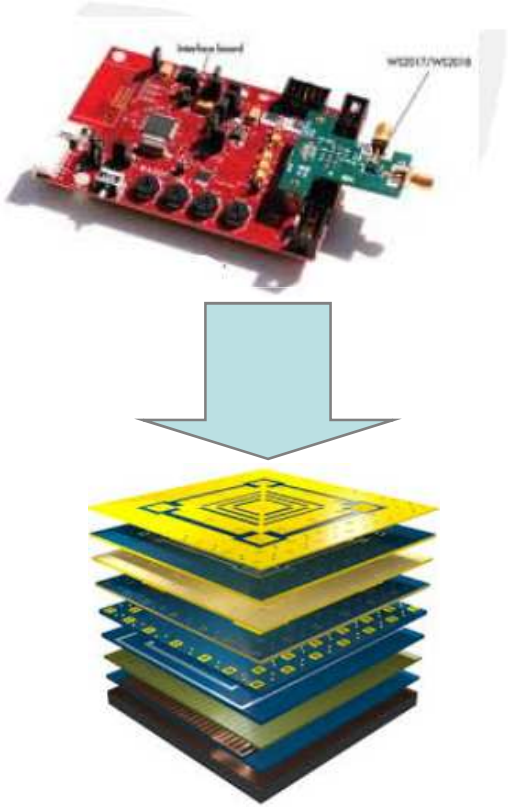
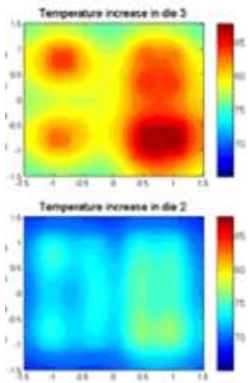
Yukai Chen

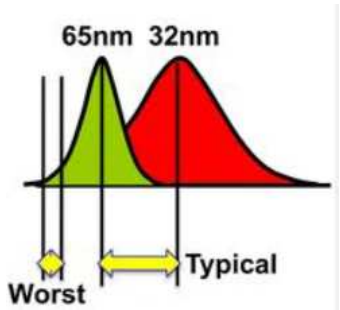


Other Research Topics

- **EDA for energy-efficient systems**
  - **Leakage management in DSM designs**
    - Power-gating of standard-cell designs and memories
  - **Energy-efficient chip multicore**
    - Energy-efficient memory sub-system design
    - Technology implications of voltage/frequency scaling

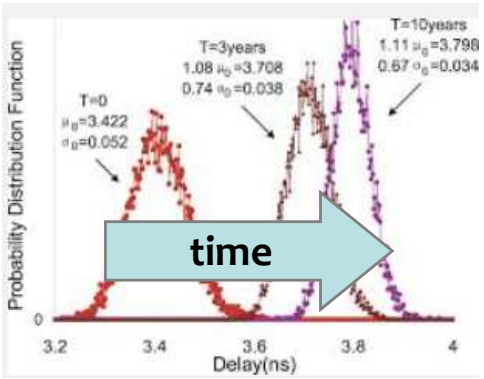
- **EDA for "indirect metrics"**
  - **Thermal-aware design & architectures**
    - Adaptive compensation of thermal gradients
    - Leakage/Thermal-aware co-synthesis
    - Thermal-aware design of clock trees
  - **Variation-tolerant design** techniques
    - Latency/skew control
    - Use of power management knobs (power gating) to compensate variations





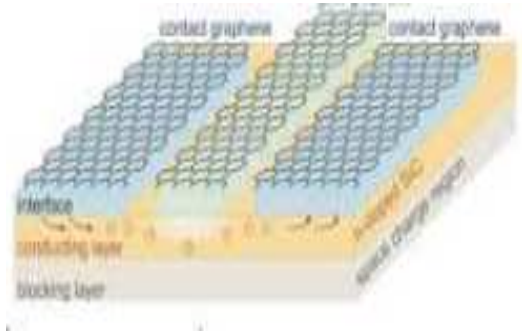
Other Research Topics

- **Aging management in circuits and systems**
  - **NBTI-aware memory architectures**
    - Partitioned memory architectures for improved aging
    - Time-varying cache indexing
    - Aging-driven graceful degradation of performance in memories



  - **Aging/energy co-optimization via power management**

- **CAD for beyond-CMOS technologies**
  - **Graphene devices**
    - Delay and power modeling of devices based on p-n junctions based on polarized graphene
    - Automated synthesis techniques for re-configurable gates based on these devices



Ongoing Projects

- Strong record of EU funded projects
  - 30+ in the last 10 years
- Not just strictly "technology" projects
  - Cross-domain application of EDA methods to
    - **Energy/smart grids**
    - **Automotive**
    - **Smart buildings/cities**
    - **Smart devices**

Funded research

- JU ENIAC
  - ~~MOTORBRAIN~~
  - ~~ERG~~
  - ~~E2SG~~
  - ~~IDEAS~~
- JU ARTEMIS
  - ~~IOE~~
  - ~~VETESS~~
  - ~~DEMANESS~~
  - ARROWHEAD

- FP7/FET
  - ~~SMAC (IP)~~
  - ~~TOUCHMORE (STREP)~~
  - CONTREX (IP)
  - TRIBUTE (STREP)
  - DIMMER (STREP)
  - READY4SMARTCITIES (CSA)
  - HUMAN BRAIN PROJECT (FET)
  - ~~LAB4MEMS (KET)~~
  - GRAPHENE (FET)

Legend:

AUTOMOTIVE
ENERGY
SMART CITIES/BUILDING
TECHNOLOGY/CAD