



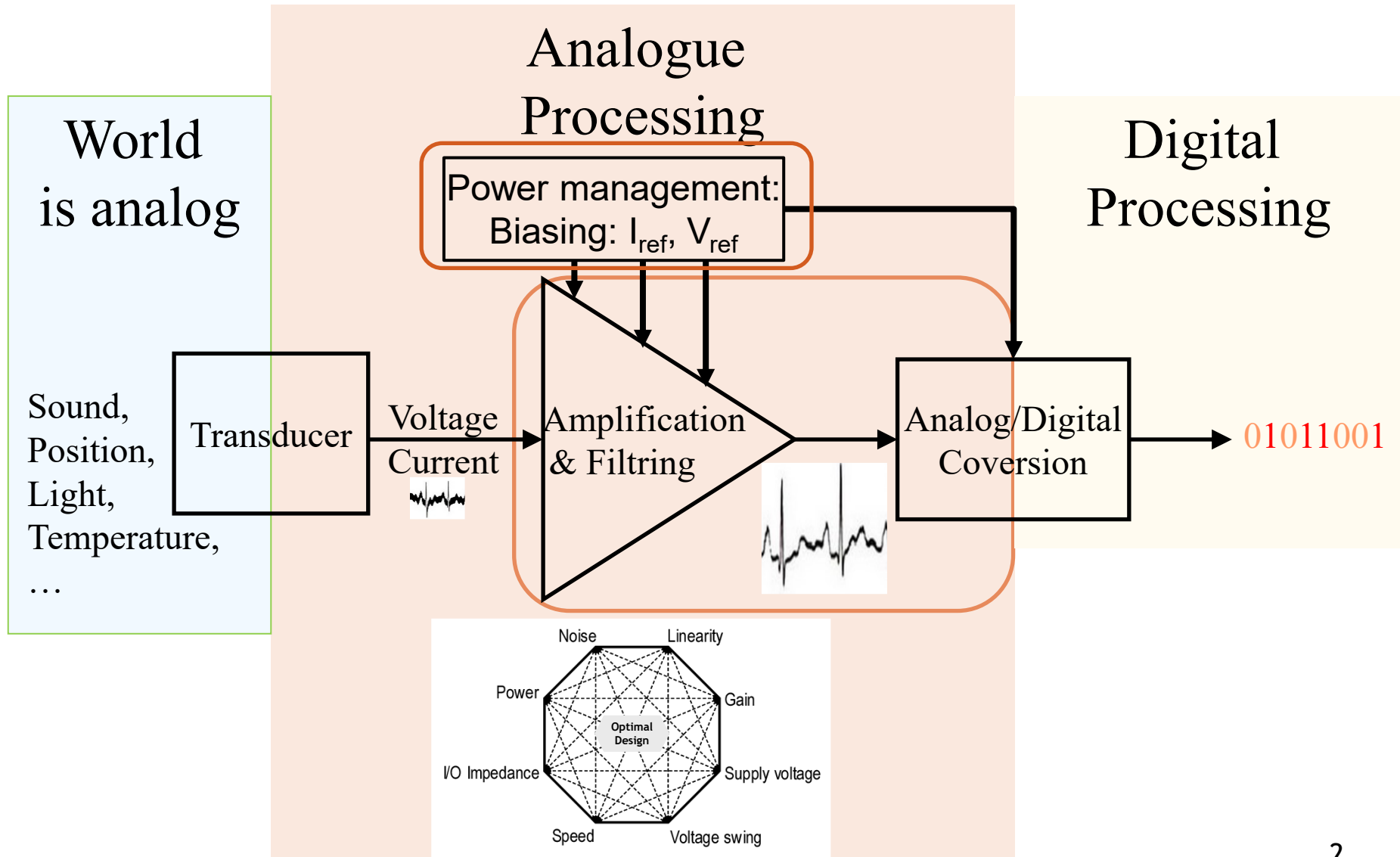
ÉCOLE POLYTECHNIQUE  
FÉDÉRALE DE LAUSANNE

# Analog Integrated Circuits Design II

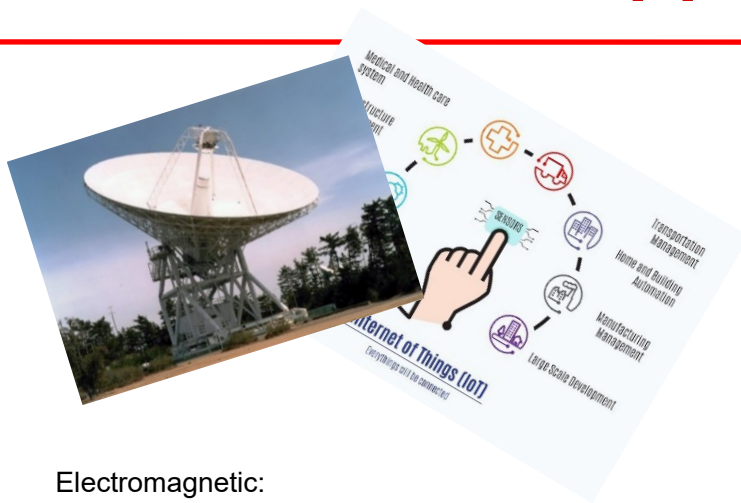
**A. KOUKAB**  
**[adil.koukab@epfl.ch](mailto:adil.koukab@epfl.ch)**



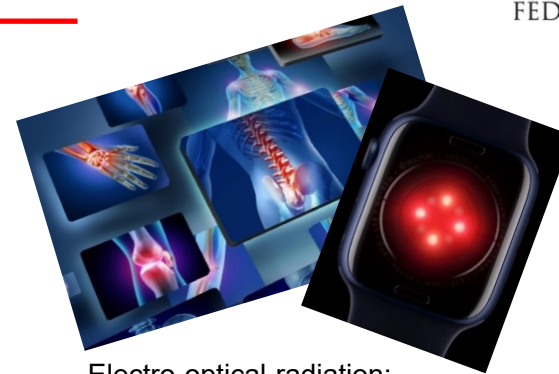
# Why Analog Design?



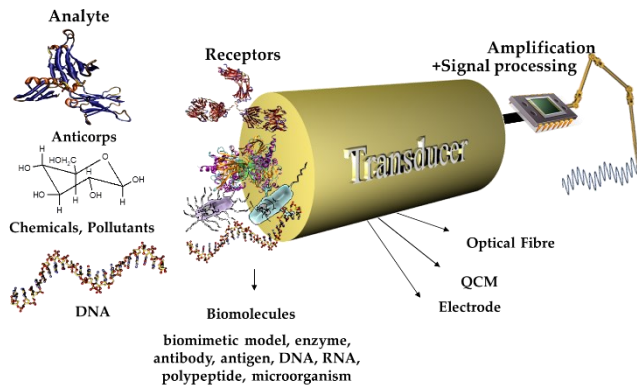
# Some applications



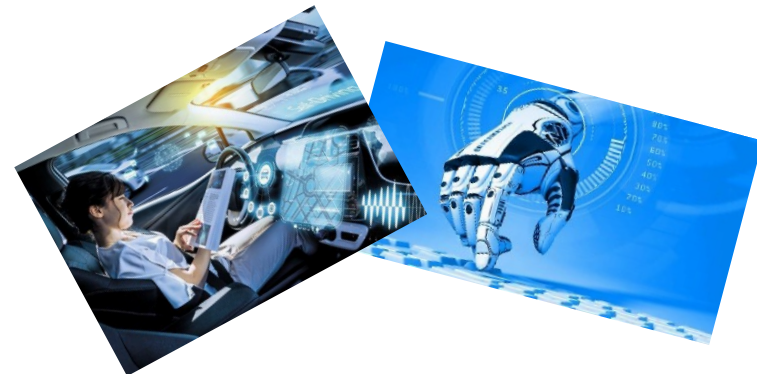
Electromagnetic:  
**Antennae**  
Telecom: IoT, 5G ...



Electro-optical-radiation:  
Photodiodes,  
Photomultipliers  
Photodetector  
Bio-Medical imaging



Electro-Chemical, Photo-chemical, Bio Sensors:  
IS-FET, Lab on a chip  
Bio-Medical applications, POCT ...



Electromechanical (actuators):  
**Accelerometers**  
**Galvanometers**  
**Pressure sensors**  
Automotive, Robotic ...:

- **MOST Operation, Modelling**
  - [13-17 Sep](#) MOSFETs: Operation and Modelling
  - [20-24 Sep](#) Noise1 : (in time and frequency domains)
  - [27 Sep-1 Oct](#) Noise-2 : (Analog circuits noise analysis)
- **Voltage references and regulators**
  - [04 Oct](#) Current Sources and Mirrors
  - [08 Oct](#) Voltage and Temperature independent References
  - [11 Oct](#) Exercises
- **OTA and Op-Amp Design**
  - [15 Oct](#) OTA Analysis and Design (DC, AC, Stability ...) (1)
  - [18-22-25 Oct](#) Vacation
  - [29 Oct](#) OTA Analysis and Design (DC, AC, Stability ...) (2)
  - [1 Nov](#) [Lab1-a: OTA Structural Design \( \$g\_m/I\_D\$  Methodology\) théorie](#)
  - [05 Nov](#) [Lab1-b: OTA Structural Design \( \$g\_m/I\_D\$  Methodology\) Lab \(C05\)](#)
  - [08 Nov](#): Multistage OTA (Stability and Frequency Compensation)
  - [12 Nov](#): Fully-Diff Amplifiers & CMFB
  - [15 Nov](#): Variability, offset and noise in OpAmp (1)
  - [19 Nov](#) [Lab2: Folded cascode amplifier & its CMFB \(C05\)](#)
  - [22 Nov](#): Variability, offset and noise in OpAmp (2)
  - [26 Nov](#): Rail to Rail input and output amplifiers
- **Mixed-signal design**
  - [29 Nov](#): Comparators
  - [03 Dec](#) [Lab3: Comparators \(C05\)](#)
  - [06-10 Dec](#): AD and DA converters (introduction)
  - [13 Dec](#): Digital calibration of analog circuits
- [20 Dec](#) General revision (zoom)

- Reference books (*electronic version available at [epfl.library.ch](http://epfl.library.ch)*):
  - **Analog Design Essentials (Willy Sansen)**
  - **CMOS Circuit Design, Layout, and Simulation (Jacob Baker)**
  - **Design of Analog CMOS Integrated Circuits (Behzad Razavi)**