

## **Ph.D. in Information Technology: Thesis Defenses**

**February 3rd, 2021**

**online by Teams – at 10.00**

### **Gerardo MALAVENA – XXXIII Cycle**

“Flash memory technologies: evolution towards 3-D architectures and application to neuromorphic computing”

Advisor: Prof. **Christian Monzio Compagnoni**

#### **Abstract:**

The aim of the present thesis is twofold, reflecting the research activities carried out during the Ph.D. program. On one hand, the thesis investigates the GIDL-assisted erase operation in 3-D NAND Flash memory arrays; in particular, a compact model able to describe the string dynamics during erase is developed and challenged for different string geometries and working conditions. On the other hand, a novel operational scheme allowing to employ mainstream NOR Flash memory arrays in neuromorphic systems is suggested, and its feasibility is successfully demonstrated by means of the implementation of a prototype hardware neural network.

### **Aurelio MANNARA – XXXIII Cycle**

“TCAD modeling of current transport and main reliability issues of polysilicon-channel 3-D NAND Flash strings”

Advisor: Prof. **Christian Monzio Compagnoni**

#### **Abstract:**

The aim of this Ph. D. thesis is to present a broad analysis of current transport in 3-D NAND Flash strings by means of TCAD simulations. A TCAD model for polysilicon transport simulation will be discussed in details and the results obtained by comparing different physical models proposed over

the years will be presented. Then, the TCAD model will be validated by showing calibration results against experimental data and the results of statistical analyses regarding single-cell threshold voltage variability and random telegraph noise in 3-D NAND Flash strings will be given.

**PhD Committee**

Prof. **Daniele Ielmini**, DEIB

Prof. **Giuseppe Iannaccone**, Universita' di Pisa

Prof. **Cristian Zambelli**, Universita' di Ferrara