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Education

- 2009-2014 (expected)** **PhD, Microelectronic Engineering;** University College Cork (Cork, Ireland)
Thesis title: Simulation of Molecular Electronics
- 2007-2009** **MSc, Nanoscience and Nanotechnology** (cum laude); KU Leuven (Leuven, Belgium)
Thesis title: The Graphene Nanoribbon Field-Effect Transistor
- 2003-2007** **BSc, Electrical Engineering;** KU Leuven (Leuven, Belgium)
Minor: Materials Engineering

Research Experience

Tyndall National Institute (University College Cork):

PhD candidate (expected graduation date: September 2014); Advisor: Dr. James C. Greer

Computational study of electron correlation in open systems, with application to quantum transport.

- Modernized an in-house quantum chemistry (Configuration Interaction) code from Fortran 77 to Fortran 90, introducing modules, dynamic memory allocation and dynamic dispatch.
- Extended the program's sparse generalized eigenvalue solver to treat complex matrices.
- Worked with external collaborators to merge their enhancements to the program, and create a public release (see <https://github.com/MCCI>).

IMEC Microelectronics Research Center (KU Leuven)

Master's thesis research; Advisor: Prof. Dr. Ir. Guido Groeseneken

Identification of optimal device architectures for graphene nanoribbon-based transistors.

- Devised a semi-analytical device model (implemented in python) that takes novel quantum tunneling transport mechanisms into account, showing that a GNR is a promising channel material for a Tunnel-FET, a proposed device for future low-power integrated circuits.

Technical Experience

- Coin Acoustics Project** Cofounded a startup project with my brothers which aimed to catch forgeries of precious metal coins by analyzing the audio spectrum they produce when balanced on a finger and struck with a hard object. Informed by the physics of the problem, we extracted features from the characteristic frequencies and their damping rates, and used a Support Vector Machine for classification. My main contributions:

- Scientific advice regarding the physics of vibrating plates.
- Assistance debugging the feature extraction and machine learning components.
- Implementation of an HTTP interface (using Flask and Nginx), which couples the PHP frontend to the backend server running the machine learning code.
- Configuration (including implementation of a git-based deployment workflow) and maintenance of the backend server on EC2.

Open Source

Contributed documentation fixes to the open source projects Git (distributed version control) and SciPy (Scientific tools for the python language).

Relevant Activities

- Completed two ICHEC (Irish Centre for High-End Computing) graduate courses on HPC and parallel programming, covering **MPI**, **OpenMP**, parallel programming paradigms and scaling limitations of parallel algorithms.
- Completed Coursera's introductory machine learning course, covering topics such as **Linear/Logistic Regression**, **Support Vector Machines**, **Neural Networks**, **K-means clustering**, and Recommendation systems.
- Participated in an Amazon-organized workshop on cloud computing using Amazon Web Services.
- Linux user since 2002.

Programming Languages

python: Implemented several utilities in the course of my PhD work, mainly for data processing, input file generation, and visualization. Most are available at my github page: <https://github.com/mszep>. Also, used the Flask library to implement the backend interface of the Coin Acoustics Project (see above).

Fortran 77/90: Maintained and extended the Monte Carlo Configuration Interaction electronic structure program (see above). Also worked on one of Tyndall's in-house quantum transport programs, and implemented a number of small, number-crunching utilities.

Haskell: As a learning exercise, I wrote a binary parser for TeX's .dvi output format: <https://github.com/mszep/hsdvi>. I also wrote a utility to programmatically generate a type of vector diagram that is used in my research: https://github.com/mszep/occupation_diagrams.

Basic knowledge of **C**, **Matlab/octave**, **bash**

Additional Experience

- Human Languages:
 - English: native speaker
 - Dutch: native speaker
 - German: conversational
 - French: basic
- Tutoring of high-school students in mathematics, physics and chemistry (2006-2009).
- Student representative on the education commission of the Master's program in Nanotechnology at KU Leuven.
- Former captain of the KU Leuven rugby team, and certified rugby referee.