A New Master Module in High Performance Computing at Faculty of Technical Sciences

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DAAD Workshop 2018

Agenda

- Motivation
- Requirements and Expected Outcomes
- HPC Module Structure
- Conclusion

Motivation

- **High Performance Computing (HPC)**
  - Important infrastructure service for big data processing

- **A typical situation in modern business**
  - Acquisition and storing of huge data amounts
  - Practically, **exponential growth of amount** of acquired data, all over the world
  - Data are used in a **short time interval**, and then they are archived and not used effectively, at all
  - Data are a great **value** in support of reaching the business goals
  - There is a clear recognition of **significant, but unexploited worth** ingrained in stored data

Motivation

- **A Project founded by Ministry of Education, Science, and Technology Development of Republic of Serbia**
  - Program 2005 'High Education', Program Activity 0014 'High Education Development'
  - Implemented by: Faculty of Technical Sciences, Novi Sad
    - Department of Computing and Control
- **Goal**
  - Development of a new, contemporary module in HPC
 - Creating a knowledge offer for which IT sector in Serbia is significantly interested in

Motivation

- **Outcomes**
  - Addressing modern trends in academy education
  - Development of a new offer that is still not noticeably present in academy education in Serbia or region
    - for which IT industry expresses a strong interest
  - Continuous efforts in raising the visibility of Faculty of Technical Sciences
  - Providing a bridge between the two very recognized research and professional disciplines
    - Computing and Informatics, and
    - Data Science and Information Engineering
 - Information Engineering is a new study program, already in implementation in its 2nd year
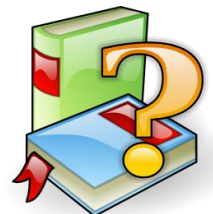
Motivation

- **Outcomes**
  - Providing a profile of an engineer well educated to address the most complex tasks
  - In the area of **software** and **computer architecture development**
  - Capable of **contributing effectively in producing recognizable and measurable values**
    - In companies and
    - Research institutions
  - By processing **extremely huge amounts of data**
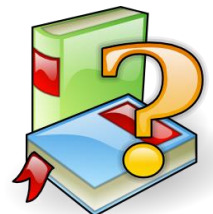
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Requirements and Expected Outcomes

- **Requirements for the HPC module project**
    1. Development of deep competencies of teachers and assistants in the HPC discipline
    2. Further improvement of the three M.Sc. programs
        - Computing and Control, 60 ECTS, 1-Year
        - Information Engineering, 60 ECTS, 1-Year
        - Information and Analytics Engineering, 90 ECTS, 1,5-Year
    3. Raising the quality of teaching process, by the acquisition of hardware and software equipment
    4. Closer collaboration with IT industry, through an implementation of common activities
        - Professional work of students, Invited Lectures
        - Common research activities

Requirements and Expected Outcomes

- **Requirements for the HPC module project**

  5. Development of students' creative capabilities and motivation for improvement of their entrepreneurship way of thinking

  6. Contribution to the Action Plan of Government of Republic of Serbia for IT sector development

Requirements and Expected Outcomes

- **Expected Outcomes**
  1. Initiate the new HPC module execution at M.Sc. level from 2018/19
     - Through minor changes of the existing programs and further accreditation process
  2. Development of new teaching resources
     - Measurable indicators: Promotion of the two new teachers to the level of Assistant Professor, the two young researchers to the level of Assistant, and employment of the two new researchers, from October 2018
  3. Raising the visibility of Faculty of Technical Sciences
     - Measurable indicator: providing at least 16 – 32 new students, at the level of each school year

Requirements and Expected Outcomes

- ## Expected Outcomes
  4. Improvement of research activities and establishing a collaboration with IT industry in the area of HPC and Data Science
     - Measurable indicator: providing at least one new project of applied research
     - That is to be founded by a Serbian IT company, and that will incorporate teachers and assistants included in the execution of the HPC module and Information Engineering study program

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HPC Module Structure

- **7 courses, 6 course slots, each 6 ECTS**

I Year, MSc, Comp. and Contr., and Inf. & Anl. Eng.	Sem.	Hours / Week
Parallel and Distributed Architectures and Languages	1	3+3
Parallel and Distributed Algorithms and Data Struct.	1	3+3
High Performance Computer Systems	1	3+3
Big Data Architectures	1	3+3
Cloud Computing	1	3+3
Elective Course	2	3+3
- HPC in Scientific Computing		
- HPC in Information Engineering		

HPC Module Structure

- **Referential Institutions and Programs**
  - Universitat Politècnica de Catalunya Barcelona, Facultat d'Informàtica de Barcelona
    - Master in Innovation and Research in Informatics (MIRI)
  - University of Edinburgh, Edinburgh Parallel Computing Center (EPCC)
    - Master in High Performance Computing and
    - Master in High Performance Computing with Data Science
  - The University of Dublin, Trinity College Dublin
    - Master in High Performance Computing
  - Université de Versailles, Paris
    - Master CHPC - Calcul Haute Performance Simulation

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Conclusion

- **Overcoming a problem of high inertia of the academy education system**
  - Not always easy to provide a continuous innovation of study programs

- **Agility in study program innovations**
  - In Computing and Informatics, one of the key success factors in the
  - Improvement of institution visibility in this area
  - Reaching the excellence in academic education

Conclusion

- **Study program innovations are possible and implementable in reality**
  - In the Computing and Informatics discipline
- **The most important outcome**
  - Creating attractive ambient for further expansion, as well as capacity and knowledge improvement of the researches and teachers
  - Without such ambient, we cannot successfully address emerging requirements and issues of the modern academy education
- **Stagnation in IT is not a sustainable state for a long term**

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End of presentation

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